The Development of Military Nuclear Strategy and

Anglo-American Relations, 1939 – 1958

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

(Signature) ……

Abstract

There was no special governmental partnership between Britain and America during the Second World War in atomic affairs. A recalibration is required that updates and amends the existing historiography in this respect. The wartime atomic relations of those countries were cooperative at the level of science and resources, but rarely that of the state.

As soon as it became apparent that fission weaponry would be the main basis of future military power, America decided to gain exclusive control over the weapon. Britain could not replicate American resources and no assistance was offered to it by its conventional ally. America then created its own, closed, nuclear system and well before the 1946 Atomic Energy Act, the event which is typically seen by historians as the explanation of the fracturing of wartime atomic relations.

Immediately after 1945 there was insufficient systemic force to create change in the consistent American policy of atomic monopoly. As fusion bombs introduced a new magnitude of risk, and as the nuclear world expanded and deepened, the systemic pressures grew. It was these pressures which forced America to review its security alignment.

Science can hold a mirror to changing strategic relationships during the militarisation of nuclear affairs. From leadership during the inception phase, through to becoming one part of a multi-dimensional defence environment as technical progress accelerated, science reflected wider atomic developments in both Britain and America during the 1950s.

It was the benefits resulting from its increasingly linked internal science-military structures, combined with the changing worldwide geopolitical forces of the late

1950’s, which encouraged and constrained America to consider previously unthinkable external nuclear relationships.

In 1958, America moved away from separatism in atomic affairs. It chose to create a nuclear state partnership with the nation that best reflected its new security orientation, and which had also reached a significant level of maturity in fusion weaponry. That country was Britain.

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List of Abbreviations

ACAE	British Advisory Committee on Atomic Energy
AEC	American Atomic Energy Commission
AENPSC	British Atomic Energy Nuclear Policy Steering Committee
AFOAT-1	American Office of Atomic Testing
CDT	Combined Development Trust
COS	British Chiefs of Staff
CPC	Combined Policy Committee (Quebec Agreement).
DOD	American Department of Defense
FRUS	Foreign Relations of the United States (records of)
GAC	American General Advisory Committee
GSP	British Global Strategy Paper (1952)
ICBM	Intercontinental Ballistic Missile
IRBM	Intermediate Range Ballistic Missile
JCAE	Congressional Joint Committee on Atomic Energy
JCS	American Joint Chiefs of Staff
JIC	British Joint Intelligence Committee
JPS	British Military Joint Planning Staff

JSSC	American Joint Strategic Survey Committee
KWI	Kaiser Wilhelm Institute of Chemistry
MAUD	Unknown - British nuclear committee, 1940 / 1941
MDA	Anglo-American Mutual Defence Agreement of 1958
MLC	American Military Liaison Committee
MPC	American Military Policy Committee
NDRC	American National Defence Research Council
NSC	American National Security Council
OSRD	American Office of Scientific Research and Development
OSS	American Office of Strategic Services
SAC	American strategic Air Command
SACEUR	NATO Supreme Commander Europe
SSAW	British Committee for the Scientific Survey of Air Warfare
TATSC	Tube Alloys Technical Sub Committee
UKAEA	U.K. Atomic Energy Authority
USAEC	United States Atomic Energy Commission

Introduction

"Steer clear of permanent alliances with any portion of the foreign world."

George Washington's farewell address, 1796.[1]

The works of the British Official Historian Margaret Gowing suggest that, despite various difficulties along the way, America and Britain cooperated together in atomic affairs during the Second World War.[2] Her use of sweeping phrases such as "full atomic collaboration", when describing the wartime nuclear relationship, gives an impression of one-dimensional, positive interactions between the nations.[3] It is then often argued that such a partnership was only separated by the terms of the American Atomic Energy ('McMahon') Act of 1946.[4] Indeed, these wartime transatlantic atomic relations have sometimes attracted the term 'special'.[5] This interpretative line goes on to suggest that there followed a 'long wait' from 1946 until the state partnership were restored under the Mutual Defence Agreement (MDA) of 1958.[6]

Once a more holistic view of American actions and policy is added to the inconsistencies that will be shown to exist in the historiography, this broad brush assessment requires re-calibration. There would be multiple levels to transatlantic wartime atomic relations – scientific, economic (particularly resource

[1] Quoted in Tim Marshall, *Prisoners of Geography* (Elliott and Thompson, 2015), p. 74.
[2] For instance see Margaret Gowing, *Britain and Atomic Energy, 1935 – 1945* (Macmillan, 1964) and Margaret Gowing, 'Britain, America and the Bomb', in David Dilks (ed.), *Retreat from power, Studies in Britain's Foreign Policy of the Twentieth Century, Vol.2* (Macmillan, 1981).
[3] Margaret Gowing, 'Britain and the Bomb', *Contemporary Record*, 2:2, (1988), 36 - 40.
[4] The Atomic Energy Act of 1946 is often named after its eventual sponsor, Senator Brien McMahon. See Part Two, p. 186 for more details. See Edward Spiers, 'The British Nuclear Deterrent: Problems and Possibilities', in David Dilks (ed.), *Retreat from Power, Studies in Britain's Foreign Policy of the Twentieth Century, Vol.2* (Macmillan, 1981), p. 156 and also Margaret Gowing*, Independence and deterrence: Britain and Atomic Energy, 1945 – 1954. Volume 1: Policy Making*, (Macmillan, 1974), p. 110.
[5] Gowing, *Independence and Deterrence Vol .1*, p. 110.
[6] For the classic expression of this view, see Timothy Botti, *The Long Wait, The Forging of the Anglo-American Nuclear Alliance, 1945 – 1958* (Greenwood, 1987).

management) and political. America pursued atomic domination from the outset and this essentially confined wartime nuclear Anglo-American relations to scientific and economic exchanges, and only rarely to close political partnership.

In the immediate post-war period, atomic affairs can broadly be split into two phases. The first covers the failure to develop fission technology into a useable weapon, the acquisition of an atomic weapon capability by a second power (thus ending America's monopoly), together with America's reaction and the consequent move to fusion power. In this phase, science would reflect the turmoil in political and military strategy as the realities of the nuclear age were debated and assessed. The second period, after 1952, would see the intensification of the effects of nuclear risk across the world and their impact on Anglo-American atomic relations. Science would be central to the emerging suggestion that technical integration would be an effective response to the demands of the atomically-fuelled Cold War. The result of international systemic pressures would be a realignment in American geopolitical priorities which, in turn, produced the MDA signed in 1958. It also will be argued that any 'specialness' in Anglo-American nuclear relations derived from the nature of the agreement, not any unique political or cultural affinities between the two nations, a fact proven as America would go on to establish similar arrangements with others. The previous tendency in the literature to see Anglo-American special linkages as emanating from the wartime atomic alliance is thus erroneous.

The 1958 Anglo-American Mutual Defence Agreement was the first nuclear treaty partnership of its kind in history. It gave information about weapons of mass destruction from one state to another, data which potentially could be used later against the donor. It is thus an extra-ordinary arrangement which was, at that

time, unparalleled in its nature and risk. Matthew Jones, the current official historian of Britain's nuclear deterrent, has recently argued that "the 1958 Agreement certainly stands as one of the most remarkable examples of pooling of sensitive national security information by two sovereign states."[7] The importance of the MDA has also been reinforced by a host of other writers. For instance, Alistair Horne called the pact "one of the most mutually beneficial accords ever achieved in peacetime."[8] Furthermore, John Baylis has said that "the Atomic Energy Defense Agreement reached between Britain and the United States on 3 July 1958 is one of the most remarkable agreements ever reached between two sovereign states."[9]

The MDA was renewed again in 2014. However, possibly due to the secrecy that surrounds such inter-governmental nuclear agreements, the agreement is not generally well known and, as Nigel Chamberlain points out, "its implications remain shrouded in mystery to this day."[10] A British Parliamentary Briefing paper in that same year stated the MDA was "the cornerstone of the UK-US nuclear relationship for nearly 60 years", ranking it alongside the Polaris and Trident agreements. Of course, without the MDA the latter two arrangements could not have happened in the form they did. This briefing raised contemporary issues such as the fact that some considered the MDA's renewal might contravene the Nuclear Non-Proliferation treaty, signed in 1968.[11] This House of Commons paper also revealed that, in 2012, there were 33 groups operating under the

[7] Matthew Jones, *The Official History of the UK Strategic Nuclear Deterrent: Volume 1. From the V-Bomber Era to the Arrival of Polaris, 1945 – 1964* (London and New York: Routledge, 2017), pp.117 - 118.
[8] Alistair Horne, *Harold MacMillan: 1957-1986: Volume 2: 1957-86* (Macmillan, 1989), p. 87.
[9] John Baylis, 'Exchanging Nuclear Secrets: Laying the Foundations of the Anglo-American Nuclear Relationship', *Diplomatic History,* Volume 25, Issue 1 (1 January 2001), 33 – 61.
[10] Nigel Chamberlain, 'US-UK Mutual Defence Agreement Renewal 2014: a foregone conclusion?', *British American Security Information Council* (24 February, 2014).
[11] Claire Mills, UK-US Mutual Defence Agreement, *Library of House of Commons*, SN/IA/3147, (24 October, 2014).

auspices of the MDA between Britain and America.[12] The British government's 2012 Atomic Annual Review described such activity as "fundamental" for the maintenance of Britain's deterrent.[13] In the early twenty-first century, therefore, the MDA is clearly still a very active facilitator in transatlantic nuclear affairs.

The British media also regained interest in 2014 with inaccurate summations being employed such as that the renewal was a "secret new deal".[14] The essentially passive nature of British re-approval of the agreement (the House of Commons is not legally required to debate such treaties) was also noted in the press, as was the importance of the treaty in the context of Britain's world status.[15] This latter factor also had a considerable presence in the debates leading up to the MDA's original signing, perhaps indicating that Britain is still facing largely the same questions about its place in the world as it did in 1958.

Ten years ago, in his piece to mark the then 50th anniversary of its signing, John Baylis summed up the impact of the agreement as "there can be no doubt that the MDA has been of central importance in the development and maintenance of nuclear interdependence between the United States and Britain during the past 50 years."[16] Given that over a further decade has elapsed since Baylis' excellent analysis, it seems additionally appropriate that, now over 60 years on, the history leading to the signing of this landmark treaty is studied once more. The MDA has endured and continues to sit at the centre of Anglo-American affairs. In fact, the agreement's nuclear nature, when married to Britain's intelligence sharing with

[12] House of Commons debate, 18 June, 2012, c656W, quoted in ibid, p.5.
[13] *Atomic Weapons Annual Review, 2012*, quoted in ibid, p. 3.
[14] 'UK-US sign secret new deal on nuclear weapons', *The Guardian*, 29 July, 2014.
[15] Ibid.
[16] John Baylis, 'The 1958 Anglo-American Mutual Defence Agreement: The Search for Nuclear Interdependence', *Journal of Strategic Studies,* Volume 31 (2008), 461.

America, is at the core of claims that the governmental relationship of those two countries was, and is, unique and 'special'.

Before commencing a review of the historiography of the period of this work, it is useful to examine the state of relations that existed between Britain and America in the period before 1939. This forms a sensible foundation for any assessment of the later Anglo-American nuclear relationship. A key question is: were the two states starting from a position of intimacy and trust, or suspicion and division? Was it therefore logical that the MDA would be signed between Britain and America, given their previous positive relationship? Or was the exceptional agreement of the MDA made *despite* prior periods of hostility and, if so, what created and underpinned such distrust across the Atlantic?

The restrictions of space do not permit a full analysis of pre-war Anglo-American relations. Only a 'snapshot' is thus possible. David Reynolds has described the relationship between the two countries, though sometimes close especially at the height of the Second World War, as "one of persistent rivalry."[17] In fact this history of tension between the wartime allies is surprisingly deep and long lasting. Winston Churchill, in 1927, described the situation as "no doubt it is quite right in the interests of peace to go on talking about war with the United States being "unthinkable". Everyone knows that this is not true."[18] And, while the naval issues between the two countries were largely settled in 1930, Britain's financial weakness, made worse by the economic depression, was leading it to establish a system of imperial preference in trade that became a target for American policy

[17] David Reynolds, 'Rethinking Anglo-American Relations', *International Affairs*, Vol. 65, No. 1 (Winter, 1988-1989), 91.
[18] Martin Gilbert, *Winston S. Churchill* (London: Heinemann 1979), p. 1033. See also, Christopher Bell, 'Thinking the Unthinkable: British and American Naval Strategies for an Anglo-American War, 1918-31', *International History Review*, 19 4 (November 1997), 789 - 808.

both before, and after, the Second World War.[19] As Robert Bryce says, after the Ottawa Conference of July 1932, which was called to examine methods of alleviating the effects of the Great Depression through enhanced trade, imperial trade grew as a result of "additional trade barriers and forms of discrimination which were bound to have an adverse effect on world trade and antagonise Britain's foreign trading partners, not least the United States."[20] However Reynolds, for one, believes the distrust between the nations goes even deeper, and that "behind all this was America's rooted distaste for the British Empire, from Woodrow Wilson's demands for international accountability in 1916-1917 to John Foster Dulles's pillorying of Anglo-French colonialism at the UN in November 1956."[21] This deep cultural, economic and almost philosophical divide between Britain and America has also been noted by Christopher Thorne. He argues that mistrust, differing views of world politics and 'mutual ignorance' did not allow a coherent alliance between the nations to exist even during wartime.[22]

A brief look at the views of key British figures in the years before the Second World War shows mixed opinions of America and not a great deal of warmth. The letters sent by Neville Chamberlain to his sisters, for instance, give a surprisingly forthright view of the poor relations that existed between Britain and America for over a decade before the war. Chamberlain was a part of the political elite in Britain during the 1930s and held the office of Chancellor before becoming Prime

[19] The London Naval Treaty was signed between Britain, Japan, France, Italy and America on 22 April 1930 and regulated submarine warfare and limited naval shipbuilding. Imperial Preference can in fact be dated back to a speech by Joseph Chamberlain in 1903, see Richard Toye, *Churchill's Empire*, (Macmillan, 2010), p. 92.
[20] Robert Brice, 'The Significance of 1931 for British Imperial and International History', *Histoire@Politique*, No.11 (2010/2), 32.
[21] Reynolds, 'Rethinking Anglo-American Relations', 92. Woodrow Wilson was American President from 1913 to 1921. John Foster Dulles was Secretary of State under Eisenhower from 1953-1959 and was a key figure in early Cold War history.
[22] Christopher Thorne, *Allies of a Kind: The United States, Britain and the War against Japan, 1941-1945* (New York, Oxford University Press, 1978).

Minister in 1937. His tenure included the Munich Conference with Hitler in 1938 and he resigned after the invasion of France by Germany in 1940. His views are thus those of a key political player. Starting as early as March 1929, Chamberlain was moved to observe that "the path of peace with the USA is hard indeed with such sabotage on their side."[23] By 1933 the future Prime Minister was writing that there was a terrible gulf between Europe and America.[24] And in the same year it seems that the Cabinet were being briefed that Roosevelt was a slippery politician, one whom Chamberlain felt was "as a dangerous and unreliable horse in any team."[25] Chamberlain's view was still that overall "it is always best and safest to count on nothing from the Americans except words."[26]

Other British figures held more balanced views about America and its potential influence. On 7 February 1938, Sir Ronald Lindsay, the British Ambassador in Washington, wrote to Antony Eden, then Foreign Secretary and later to be Prime Minister during the Suez Crisis of 1956, stressing an almost constructivist point in that what brought Britain and America closer was a shared identity of ideas and desires. The caveat was that "if we try to push or pull the Americans forward they inevitably resent it, because they must take their measures in their own American way."[27] This same innate stubbornness in America's character would lead it to move at its own pace in early nuclear development, regardless of scientific developments elsewhere in the world. In the same letter the ambassador presciently stated that "there are many elements in the situation

[23] Chamberlain's correspondence is held in the Cadbury Archive, University of Birmingham. They have been chronicled by Ronald Self and his references are used for ease of access. Initially therefore Letter to Ida Chamberlain, 9 March 1929, in Ronald Self, *Neville Chamberlain: The Diary Letters, Vol 3* (Ashgate: Aldershot, 2002), p. 128.
[24] Letter to Hilda Chamberlain, 18 March 1933, ibid, vol.3, p. 382.
[25] Letter to Ida Chamberlain, 28 Oct 1933, ibid, vol. 3, pp. 409 – 410.
[26] Letter to Hilda Chamberlain, 17 December 1937, ibid, vol. 4, p. 294.
[27] Lindsay to Eden, 7 February 1938, Avon Papers, Cadbury Archive, Birmingham.

favourable to us, and with such an emotional people a dramatic incident might have astonishing results."[28] Pearl Harbor would be just such a beneficial incident (for Britain).[29]

In practical terms, these feelings of distance and lack of trust were confirmed when, despite President Franklin Roosevelt's promises of support communicated privately to Chamberlain during the winter of 1938, the President failed to amend the American neutrality legislation in June 1939. This left Chamberlain, the Cabinet and the Foreign Office deeply despondent, and fearing that Congress would never agree to its amendment in peacetime.[30] In a Foreign Office Paper of 23 July 1939, a new arrangement was argued as desperately needed and "in spite of the Neutrality Act it may be possible for the administration to arrange the supply to us of some armament stores in the form of components which could be classified in such a way that they evade the strict embargo placed on all forms of armaments."[31] The neutrality legislation reflected a strong desire in America to keep itself separate and it was increasingly resented by Britain as war loomed large against fascism.

In addition to actions to limit its military exposure, America acted in ways more specifically hostile to Britain. The Johnson Act of 1934 prohibited countries, especially Britain, from raising credit in America.[32] As will be seen in Part One of this thesis, British concerns over American intentions often centred on this Act.

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[28] Ibid.

[29] The Japanese bombing of the American naval base at Pearl Harbor in Hawaii precipitated the American entry into the Second World War on December 8, 1941, a key turning point in the war.

[30] Arthur Murray Memorandum, 14 December 1938, PREM 1/367 and CAB 35 (39) 8, 5 July 1939, the British National Archives (hereafter TNA). The American Neutrality Acts were passed in several years during the later 1930s with the aim of America avoiding becoming involved in an overseas war. A reflection of isolationist opinion, they initially affected all states equally.

[31] S.W.R 10, 26 July 1939, FO 1093 / 126, Point 18, TNA. The Neutrality Act was amended in November 1939 to permit trade with Britain and France on a 'cash and carry' basis.

[32] See Part One, p. 67, for the impact of this Act in wartime British thinking.

Later, many in the British government felt aggrieved by the fact that the war had raged for eighteen months, and Britain's gold reserves were almost completely exhausted, before America replaced its revised stance of 'cash and carry', with Lend-Lease taking its place.[33] Even then, as Richard Toye has pointed out, America still attempted to leverage the power of its purse, through Lend-Lease, to dismantle British imperial preference.[34] This was at a time when Britain was fighting for its life. Thus it is fair to conclude that American actions in the years before 1939 largely support a view of British frustration and anger over American policy, together with the sense that America would plough its own furrow.

From the American perspective, rivalry and suspicions of Britain also ran deep. It was argued by some that Britain had tricked America into World War One.[35] Also, possibly based on the initial 'DNA' of the founding principles of America, the 1930s often saw anti-English sentiment get mixed with a dislike of royalism and the sense that Britain lived off the back of the poor of its empire.[36] These strident tones existed as a backdrop to the more immediately self-centred economic and commitment-avoiding policies above. In short, isolationism was a popular American position, domestically, in the 1930s.[37] In fact Republican Senator Gerald Nye, of South Dakota, who was one of the leaders of that view, did not even leave the continental United States during his lifetime.[38] Such a lack of

[33] Lend-Lease and the Destroyers for Bases scheme were attempts by America to assist Britain's anti-fascist war, which American opinion supported, without significantly assisting Britain itself.
[34] Toye, *Churchill's Empire*, pp. 238 – 239.
[35] Robert Jenner, *FDR's Republicans: Domestic Political Realignment and American Foreign Policy* (Lexington, 2010), pp. 7 – 9.
[36] Ibid.
[37] American isolationism, as a policy of avoiding engagement with the world, has often seen to be at its height in the 1930s. The reasons and nature of this position are contested. See Robert Art, *A Grand Strategy for America* (Ithaca, N.Y.: Cornell University Press, 2004), pp. 172–73 as against Bear Braumoeller, 'The Myth of American Isolationism', *Foreign Policy Analysis*, 6 (2010), 349–71.
[38] Gerald Nye assisted in the establishment of the Neutrality Acts in the mid-1930s and set up the America First Committee which sought to prevent American involvement in another war. He lost his Senate place in 1944.

practical contact with the wider world simply reinforced existing prejudices in favour of separatism from it.

One final, slightly unexpected, aspect to America's pre-war orientation were the plans for its defence in the inter-war years. These included a strategy to ward off a British threat through military action. Any such Anglo-American concept of mutual hostility, from the perspective of a world shaped by the cooperative qualities of the MDA for over 60 years, is shocking. 'Basic War Plan Red' was designed to defend the Atlantic coast of America against war with the British Empire. The Plan was approved in May 1930 and updated in 1934 – 1935. In 1939 a decision was taken that no further planning was required but, even then, the plan was still retained. It was never formally approved by Congress and therefore remains a quirky insight into American wider military thinking, rather than formal policy.[39]

Overall, and while these are only brief comments, the observations above support the view the America and Britain were not cooperative partners before the Second World War.

Any discussion of Anglo-American historiography on nuclear relations must start with the works of Margaret Gowing. Gowing was the archivist at the U.K. Atomic Energy Authority (UKAEA) from 1959 to 1966 and was given unique access to the files of the British nuclear weapons industry including 'Tube Alloys', the codename for the British nuclear wartime programme.[40] She wrote her first work on the subject of wartime atomic history in 1964 while at the UKAEA.[41] In 1966

[39] Kevin Lippert, *War Plan Red: The United States' Secret Plan to Invade Canada and Canada's Secret Plan to Invade the United States*, (Princeton Architectural Press, 2015)..
[40] For details on the naming of Tube Alloys' - see p. 94. It was the counterpart of the American 'Manhattan' programme.
[41] Margaret Gowing, *Britain and Atomic Energy 1935 – 1945*, (Macmillan, 1964).

Gowing took up an external academic appointment but was still commissioned by the UKAEA to write the official history of the immediate post-war years. Her subsequent two volume history, covering the period 1945 to 1952, was published in 1974.[42] The volumes received widespread acclaim at the time. The first volume was concerned with policy making and the second with its execution.[43] Her excellent scholarship produced an influential and long-lived argument that Anglo-American cooperation was deep and prolonged. This was strengthened by Gowing's official British status and supported by the fact that she had direct access to many of the key players of the day, including Rudi Peierls and James Chadwick.[44] Her conclusions reflected a British perspective, unsurprising given her role. However when a new analysis of American actions and policy are linked to consequent reinterpretations of elements of her work, it will become clear that a re-calibration in the nature and extent of the Anglo-American wartime nuclear relationship is required.

Gowing describes Britain as the birthplace of the bomb.[45] She also states that in 1941 - 1942 Anglo-American relations were close, though without offering any extensive analysis that could support such a claim.[46] Gowing then ascribes disruption to relations in 1942 - 1943 as being caused by individuals on both sides interfering with the proper state of partnership. This better relationship was apparently "resurrected" by Churchill's actions in gaining the Quebec

[42] Gowing, *Independence and Deterrence Vol .1* and Margaret Gowing, *Independence and Deterrence: Britain and Atomic Energy, 1945 – 1954. Volume 2: Policy Execution* (Macmillan, 1974).
[43] Ibid, *Independence and Deterrence, Vol. 1*, p. ix.
[44] Sir Rudolf Peierls was the co-author of the 'Frisch-Peierls Memorandum', discussed in Part One, pp. 48 - 50, and was a future Wykeham Professor of Physics at Oxford, and Sir James Chadwick won the Nobel Prize for physics in 1935 and would become the leading British scientist at Los Alamos during the war.
[45] Ibid, *Independence and Deterrence, Vol. 1*, p. 1.
[46] Ibid, p. 6.

agreement.[47] The Quebec Agreement of 1943 between Britain and America created a mechanism to jointly oversee fission development and in it the countries agreed that neither would use atomic weapons against each other, nor other nations without joint agreement.[48] Gowing argues that this led directly to British scientists going to Los Alamos in a spirit of renewed cooperation.[49] She also sees the agreement between Roosevelt and Churchill in September 1944 as "putting to rest" any concerns over post-war collaboration because that deal would form the basis of the stability of the post-war world.[50] This is despite such agreement having no legislative substance in either country. The argument, that Anglo-American atomic governmental cooperation should be seen as significant, nevertheless has strong resonances in recent historiography. This includes the work of Richard Moore, who states that "during World War II, the British and American *governments* had worked together on a range of secret defence matters with a trust and closeness quite unprecedented among sovereign states in wartime (my italics)."[51]

Somewhat in conflict with the above assertions of overall cooperation, it is Gowing herself who points out that "the United States was extremely niggling in handing over any information that might conceivably be classified."[52] This does not seem to square with claims of trusting and full partnership. By the end of the war, Gowing's view is that Britain had acquired a great deal of "atomic know-how in North America when the war ended" but that, in the key area of production,

[47] Ibid, p. 6.
[48] See Appendix 1 for the whole text of the 1943 Quebec Agreement and see p. 155 for a full discussion of its importance.
[49] Los Alamos in New Mexico was the technical development centre of America's 'Manhattan' programme which developed the first fission weapon.
[50] Ibid, p. 7.
[51] Richard Moore, British nuclear warhead design 1958–66: how much American help?, *Defence Studies*, 4:2, (2009), 207-228
[52] Gowing, *Independence and Deterrence, Vol 1*, p. 348.

"progress had been disappointing."[53] This indicates that a discrepancy exists in Gowing's own work – was America, at the governmental level, a good 'partner' of Britain in nuclear affairs during the Second World war or not? Did it hand over critical technical material, especially on industrial processes, as well as receive it? Gowing sums up Anglo-American cooperation, outside of joint uranium procurement, as being that Britain "received very little help indeed from that quarter."[54] A contradiction thus exists that requires explanation.

Not surprisingly given her overall line of argument, Gowing describes the McMahon Act of 1946 as a breach of trust, both in terms of the spirit and the written agreements of the war. The Act codified America's atomic programme after 1945 and it also formalised an estrangement from other countries by making it illegal to share militarised, and other, atomic data. Gowing concludes "it seems extraordinary that the McMahon Bill, with its complete disregard for the solemn commitments to the British and Canadians should have been allowed to reach the statute book" by the American administration.[55] The myth of the McMahon Act as a betrayal of the wartime cooperative alliance in nuclear affairs started here. In contrast to this view, this thesis will argue that McMahon was consistent with the principles of American nuclear monopoly seen during the war years.

Gowing sees the subsequent British fission programme as having been "dominated by military considerations."[56] Her conclusion was that the technical achievement was, at the end, both diluted by moral concerns and by the realisation that America and the Soviets had already moved to a higher level – fusion. Gowing also accurately confirms that the British fission test of 1952 did

[53] Ibid, p. 11.
[54] Ibid, *Independence and Deterrence, Vol. 2*, p. 499.
[55] Ibid, *Independence and Deterrence, Vol. 1*, pp. 106 - 107
[56] Ibid, p. 450.

not have much impact in America. “The United States was not particularly impressed”, as she put it.[57] This thesis takes matters forward by arguing that it would be the ending of the atomic monopoly by the Soviet Union, followed by the advent of fusion weaponry, which would lift the systemic pressures of the nuclear world to the level required for the MDA to be signed. A prime limitation of Gowing’s work overall is thus that it concluded just as the key technological and social effects of these changes were starting to take full effect.

Gowing sees the nuclear weapon as a yardstick of ‘great power’ status and that the transatlantic “shift of power had been dramatically emphasised by the atomic bomb.”[58] The degree to which ‘great power and influence’ underpinned Britain’s decision to acquire nuclear weapons is another example of important themes started by Gowing’s work. Consequently, she states, “Britain’s deterrent was perforce an independent one.”[59] This is the seed of the key interdependence v. independence debate of the 1950s. As Gowing notes, it was a contradiction that Britain had insisted on “the essentials of independence” in nuclear affairs and yet “pressed relentlessly….for the atomic cooperation which the United States was so reluctant to concede.”[60] This dichotomy requires additional analysis and especially so in the light of the greater archival material available over sixty years later.

Gowing makes only one allusion to the MDA, in the epilogue of her second volume. She claims that the “very full Anglo-American co-operation especially in atomic weapons which began in 1958” was not stimulated by what she refers to as constant hammering at the door, but by Britain’s capability to build the bomb

[57] Ibid.
[58] Ibid, p. 3.
[59] Ibid.
[60] Ibid, *Independence and Deterrence, Vol. 2*, p. 500.

as well as a domestic nuclear power plant of industrial size. She is certainly correct that British technical competence was an important prerequisite for the MDA. Because this development was years after the period of her analysis, Gowing does not go on to contextualise the agreement within the wider world, within America's own defence priorities or by referencing the sense of threat from outside the Anglo-American bubble.[61] Given the restrictions of scope and focus therefore, the fact that it was *America's*, not Britain's, decision to finally undertake governmental atomic partnership in 1958, is not given sufficient focus by Gowing's work.

Nevertheless, in areas such as the rationale for Britain's nuclear programme, its relationship with America, the history of that relationship and the importance of technical elements, it was Margaret Gowing who shaped the British view. Indeed, even in terms of recent American historiography, Gowing's influence persists. Andrew Rotter, for instance, recently quotes her as saying "the scientists, helped by the engineers, had drawn a line across history so that the centuries before August 6 1945 were sharply separated from years to come."[62] This identification of a symbolic marker having been brought into being by the Hiroshima bomb also supports the structure of this thesis. Gowing's pivotal works, which form a key element of the existing historiography, will be examined in detail in the following relevant sections of this thesis.

Linked to Gowing is the British historian Lorna Arnold. Arnold assisted Gowing with her work and then took over as the lead from the official British perspective. In addition to works on the 1957 Windscale fire and British tests in Australia, she

[61] Ibid, p. 501.
[62] Andrew Rotter, *Hiroshima: The World's Bomb* (Oxford: Oxford University Press, 2008), p. 6.

produced a work on the hydrogen bomb in 2001.[63] In it she focuses on "the nuclear weapons programme itself, how it was carried out and by whom."[64] As one of her reviewers puts it, "Arnold eschews consideration of deeper issues and simply lets the documents do the talking."[65] Arnold resorts to the simple explanation that 'circumstances' caused Britain to build the fusion bomb. She argued that Britain was technologically more advanced than had been previously supposed, but again without dealing with any of the wider geopolitical issues.

Arnold's strength is that she brings science and technology to the fore in the history of British nuclear affairs. This reflects the growing role of science in the construction of weapons during the twentieth century. Whether this was the mustard gas of the First World War trenches or the bouncing bomb of the Second World War, science was designing new ways for humankind to destroy itself. The development of nuclear weapons, after 1939, took the role of military science to new levels of importance in intra- and also inter-state relations. Yet this technical aspect of Anglo-American affairs has not featured to a proper degree in recent British historiography. The two works of Richard Rhodes concerning the construction of first the America's fission bomb and then its fusion big brother, will be examined in this regard. They also contain American important source material that sheds light on how this technological element shaped transatlantic relations.[66] For Rhodes himself, however, foreign analysis was not a major focus.

Richard Aldous and Sabine Lee have more recently argued that the cutting edge of militarised science in the late 1950s involved missiles, and that these were

[63] Lorna Arnold, *Britain and the H-Bomb* (Palgrave Macmillan, 2001).
[64] Ibid, p . xi.
[65] Philip Gissing, 'Britain and the H-Bomb by Lorna Arnold', *Minerva*, Vol. 42, No. 3 (September 2004), 315 - 319.
[66] Richard Rhodes, *The Making of the Atomic Bomb* (Simon and Shuster, 1987), and *Dark Sun* (Simon and Shuster, 1995).

prohibitively expensive. Thus it was a financial-security conundrum that "inextricably bound Britain as a very junior technological partner to the United States."[67] The impact of the missile threat in creating a sense of new systemic dangers as embodied in Sputnik's flight, the satellite launched by Russia in 1957 and which caused concerns over the apparently advanced state of Soviet technology, certainly needs to be assessed. This thesis will review Sputnik from a geopolitical and technical viewpoint, rather than a financial one. Sputnik was not a weapon itself: it was an indicator of risk based on technological advancement. However Aldous and Less are correct to highlight weapon delivery systems as a whole, as it was their spread across nations which drove the construction of the new geopolitical relations of the emerging nuclear world.

Whether it is these weapons systems that are examined, or the fission and fusion bombs that they contained, there is one common underlying component – science. The initiation of militarised nuclear science transformed the way that leading state actors approached military affairs. It also underpinned the way in which the post-war world has subsequently evolved and the way in which the Cold War has been characterised. As David Kaiser has stated, "we stand little hope of understanding these ubiquitous interactions if we continue to parse "science" and "politics" as circles on a Venn diagram, perhaps sharing some overlapping region here or there, but distilled into pure forms on either side."[68] Science will be brought far more to the fore in this thesis than in other works, and the mirror that it holds to the various military, political and strategic debates will be highlighted.

[67] Richard Aldous and Sabine Lee, (eds.), *Macmillan and Britain's World Role* (Palgrave Macmillan, 1996), p. 86.
[68] David Kaiser, 'The Physics of Spin: Sputnik Politics and American Physicists in the 1950s, An Historical View', *Social Research*, Vol. 73, No. 4, Politics and Science (Winter 2006), 1246.

Rotter proposes a 'republic of science' view of early fission development.[69] Such a framework did not replace the nation state as a key actor in scientific progress, but instead created a consolidated scientific world, with its own rules and norms, operating transnationally above and between such states. It was thus an "article of faith among the world's physicists before the Second World War….that discoveries concerning the atom would be shared", Rotter argues.[70] Laura Fermi echoes this viewpoint, stating that "the chain of scientific events that led to the threshold of the bomb….had been zigzagging without interruption from one country to another."[71] This supports the argument of this thesis that no single country may be uniquely identified as the birthplace or point of departure for militarised fission; many nations developed a scientific consensus and supporting structures on fission, although at different paces dependent on their circumstances.

A further element that will be considered, by reference to the evidence uncovered, is the role of science in leading technical, and then military/political, affairs. This has been termed the 'Zuckerman thesis', after one of its main proponents.[72] Sir Solly (later Lord) Zuckerman's views have particular interest because, as Chief Scientific Adviser to the Ministry of Defence, he played a critical role in stalling British nuclear weapons development in the 1960s. According to Zuckerman,

> "military chiefs ... merely serve as a channel through which the men in the laboratories transmit their views. For it is the man in the laboratory - not

[69] For the origins of this view see Michael Polanyi, John Ziman and Steve Fuller, 'The Republic of Science: Its Political and Economic Theory', *Minerva*, Vol. 38, No. 1 (2000), 1 – 32 and Rotter, *Hiroshima*, p. 12.
[70] Ibid.
[71] Ibid, p. 13.
[72] See also Margaret Blunden, Owen Greene and John Naughton, 'The Alchemists of Our Time: the Weapons Scientist as Scapegoat', in Blunden and Greene (eds), *Science and Mythology in the Making of Defence Policy*, (London: Brassey's Defence Publishers, 1989), pp. 77-117.

> the soldier or sailor or airman - who at the start proposes that for this or that arcane reason it would be useful to improve an old or devise a new nuclear warhead; and if a new warhead, then a new missile; and given a new missile, a new system within which it has to fit. It is he, the technician, not the commander in the field, who starts the process of formulating the so-called military."[73]

Picking up on Zuckerman's assertions, the thesis will examine whether key changes were led by the scientists, or were developed in response to military need, specifically during the emergence of fission, and then fusion, weaponry. The argument proposed is that scientists inevitably took the lead when a new weapon capability emerged from their research, but that they became partners with other political and military decision-makers in subsequent iterations of the technology. Policy changes would then follow.

Recent writers have drawn attention to two other streams in the historiography of the 1940s and 1950s. The first is one in which Anglo-American relations are seen from a position of British imperial decline and this, it has been stated, created a landscape of gloom and "subservience".[74] This work will examine exactly how Britain and America's relative status interacted, but then argue that the wider nuclear world was more important than the relative status of the two powers. Secondly, a stream of writing has focused on summitry and heads of government as an explanatory angle.[75] Recently, Winston Churchill has been the focus of two

[73] Solly Zuckerman, 'Science Advisers and Scientific Advisers', *Proceedings of the American Philosophical Society*, Vol. 124 (1980), 241-255.
[74] See Richard Moore, *Nuclear Illusion, Nuclear Reality* (Palgrave Macmillan, 2010), p. 6. Typical of this school, Moore cites Corelli Barnett, *The Collapse of British Power* (Eyre Methuen, 1972), C J Bartlett, *The Long Retreat: a short History of British Defence Policy 1945–70* (Macmillan, 1972), John Baylis, *Anglo-American Defence Relations 1939–84* (Macmillan,1984) and Michael Carver, *Tightrope walking: British Defence Policy since 1945* (Hutchinson 1992), amongst others.
[75] Ibid, p.7, citing Bruce Geelhoed and Anthony Edmonds, *Eisenhower, Macmillan and Allied Unity, 1957–61* (Palgrave, 2003) and Nigel Ashton, 'Harold Macmillan and the "Golden Days" of

such important studies of Anglo-American nuclear relations by leading British historians Kevin Ruane and Graham Farmelo.[76]

Farmelo, with an academic background in theoretical physics, focuses on two matters. The first is the increasing role of the scientist in political affairs. He quotes Desmond MacCarthy's comment, made in 1932, that "the destiny of mankind has slipped from the hands of politicians (we are all aware of it) to the hands of scientists, who know not what they do, but pass responsibility for results on to those whose sense of proportion and knowledge are inadequate to the situations created by science", as indicative of the change under way.[77] He is also critical of Churchill's indecisiveness and his changes in policy, especially in the later 1940s and 1950s. Farmelo bases many judgements on material concerning Frederick Lindemann, Churchill's wartime scientific advisor, and concludes that atomic decision-making, from the British perspective, was too often shaped by this individual.

This thesis will also explore this relationship between science and politics but in a different way by removing Farmelo's focus on individuals and focusing instead on the wider dynamics of technological development and geopolitics. It also rejects Farmelo's employment of basic cause and effect linkages. For instance, Farmelo traces a simple causal line in his explanation of the MDA in 1958. He states that, with its first fusion explosion, in May 1957, "Britain had demonstrated its nuclear competence and was rewarded with the renewal of its close nuclear partnership with the United States, eleven years after the relationship had been

Anglo-American Relations Revisited, 1957–63, *Diplomatic History*, 29/4 (Summer 2005), 691 – 723.

[76] Kevin Ruane, *Churchill and the Bomb* (Bloomsbury, 2016), Graham Farmelo, *Churchill's Bomb* (London: Faber and Faber, 2013).

[77] Farmelo, *Churchill's Bomb*, p. 58 quoting MacCarthy's article in the *New Statesman and Nation*, 7 May 1932, pp. 584 - 585.

sundered by the McMahon Act."[78] This thesis will use American archive resources to demonstrate that the Eisenhower administration demonstrated no such commitment to closer partnership in mid-May 1957. Signs of such partnership only emerged in 1958 after the impact of the Sputnik satellite, and following the growing domestic American linkages of science and defence. Farmelo does, however, support the longer timespan of this work when he notes that "the dropping of the (nuclear) bomb was not so much the last military act of the Second World War, as the first act of the cold diplomatic war with Russia now in progress."[79]

Kevin Ruane focuses on the geopolitics of Churchill's atomic history in direct contrast to Farmelo's primary concern with the politics of nuclear science.[80] Ruane argues that the wartime alliance was not as close as Gowing had outlined, but he ascribes the growing separation of the powers to heightened inter-governmental tensions.[81] The analysis put forward here, based on archival material on Tube Alloys and America Manhattan papers, argues something different, namely that the American government made separateness an active policy objective. The distinction in Anglo-American atomic relations between the government on the one hand, and science on the other, is also not clearly made in this literature. Ruane supports Farmelo's view of the alleged 1941 'offer' from Roosevelt to conduct a joint atomic programme, stating that "Churchill missed the bus because his advisors chained him to the bus-stop. There is something in this."[82] In this respect both Ruane and Farmelo follow the views of Margaret

[78] Ibid, p. 441.
[79] Farmelo, *Churchill's Bomb*, p. 309, quoting Patrick Blackett, *Military and Political Consequences of Atomic Energy* (London: Turnstile Press, 1948), p. 127.
[80] Ruane, *Churchill and the Bomb*, p. 6.
[81] Ibid, p. 7.
[82] Ibid, p. 54.

Gowing.[83] Her influence thus remains strong in the historiography. This thesis will, in contrast, show that the Roosevelt-Churchill relationship, which Ruane says yielded a "substantial degree of congruity on the Bomb", never had any beneficial effects for Britain in this domain.[84] Roosevelt's actions, including the October 1941 telegram, formed part of a consistent American policy of knowledge extraction which was, in turn, part of a broader effort to achieve an atomic monopoly. No genuine intention to create a joint atomic wartime programme ever appears in the archives on the American side.

Ruane points out that atomic militarisation created systemic threats to Britain during the period of his study.[85] This thesis will amplify this argument to cover both Britain and America, as fusion extended the geopolitical effects of nuclear weaponry. Specific analysis of the points from these two recent authors will be highlighted at the relevant place in the forthcoming pages. They give interesting insights but these are principally seen through the eyes of their main subject. Additionally a key limitation here is that Churchill ended his involvement in 1955, well before the key events leading up to the MDA.

In terms of American historical works, Timothy Botti has a prominent place in the literature. His work also did not seek to draw any distinctions between the various strands of Anglo-American cooperation in the nuclear field. Hence Botti makes broad statements reinforcing Gowing's view, that "wartime collaboration between the United States and Britain, including development of the atomic bomb, had been very close."[86] Botti also places considerable influence on the role of

[83] For the accord between the historians, see Farmelo's review of Ruane's book at - https://winstonchurchill.hillsdale.edu/churchill-bomb-kevin-ruane/
[84] Ibid.
[85] Ibid, p.10 and 12.
[86] Botti, *The Long Wait,* p. 7.

individuals, rather than social groups, which perhaps reflects the period of his writings. For instance, he sees it as possible that Eisenhower alone was able to drive change, post-Sputnik, to a greater degree than had previously been achieved. Thus he states that "the Eisenhower administration accomplished more in Anglo-American nuclear relations in two months than American officials had in twelve previous years."[87] It will be argued here that Presidents', or even their Administration's, policy alone could not effect such changes in Anglo-American relations. Change would be the product of systemic pressure acting on wider governmental social groupings. However the strength of Botti's work, particularly from a British perspective, is that he brings the workings of Congress and the wider American governmental system to the centre of the page. This is an important element of the story.

In another American perspective, by Peter Malone, the central icons of debate in the Anglo-American nuclear relationship were developed further. There are descriptions here of how Britain's wartime programme was "merged" with Manhattan, the code name given to the American development of a fission bomb, in 1943 and this was after "long and tortuous negotiations."[88] The same author goes on to confirm that British scientists "participated quite extensively" at Los Alamos during the war and then he assigns the reasons for the MDA, summed up in just a few lines, as being Suez, Sputnik and bomb tests.[89] Finally such a similar broad brush view of relations states that the MDA "restored nuclear collaboration to its central position in the special relationship."[90] This work does, however, highlight important questions in the history of the Anglo-American

[87] Botti, *The Long Wait*, p. 210.
[88] Peter Malone, *The British Nuclear Deterrent* (Croom Helm, 1984), p. 1.
[89] Ibid, p. 3 and p.58.
[90] Ibid, p. 58.

nuclear relationship – to what extent did 'Tube Alloys' and 'Manhattan' merge, why was the MDA signed and was collaboration a constant central reality? All these subjects will be explored in this thesis.

In the recent official history of Britain's strategic deterrent, Matthew Jones continues his assessment of the MDA by saying that it "has rightly been seen as one of the fundamental pillars of the post war Anglo-American relationship.....the MDA was to form the bedrock of the subsequent Anglo American nuclear relationship."[91] However Jones still ascribes an important element in the final decision to build a British bomb to the closing of the American door. So, even in this modern view, the McMahon Act is seen as a critical step on Britain's journey. "Estrangement was made complete by the passing of the McMahon Act of 1946….the umbilical cord that had tied together the military nuclear efforts of the United States and Britain was now completely severed", Jones argues.[92]

Simon Ball states that "an understanding of military relations is essential for an understanding of the high politics of the nuclear relationship."[93] He sees the emergent collaboration between Britain and America in 1958 as essentially military in origin and driven by advocacy-style transatlantic air force linkages between wartime officer comrades. He also confirms the importance of the MDA, suggesting that it created the outlines of a policy which would be continued by the supply of American missiles that makes the British nuclear force effective in the twenty-first century.[94] John Baylis and Kristan Stoddart continued to bring

[91] Jones, *Official History,* p. 116.
[92] Ibid, p. 10.
[93] Simon Ball, 'Military Nuclear Relations Between the United states and Great Britain under the terms of the McMahon Act', *The Historical Journal*, 38, 2 (1995), pp. 439 - 454.
[94] Ibid, 453.

such constructivist thinking to the fore in British nuclear history.[95] These authors highlighted Paul Sabatier's study of 'advocacy coalitions' in particular as being a useful tool for analysis of change in nuclear decision making. The authors described how Sabatier used the concept of a 'belief system', or a shared set of societal lenses through which information is processed, in order to analyse how new thinking can shape progress, even across systemic and political boundaries.[96] Baylis and Stoddart argued that "'advocacy coalitions' are formed by individuals with a common world-view and similar deep core beliefs" and that they then (re) shape policy outcomes.[97] We will see how the scientists of Britain, America and Germany did re-shape potential beliefs of the validity of fission as a weapon and then, later, provided a similar rationale for fusion. Other groupings debated and made decisions around these new options. Baylis and Stoddard see these coalitions as sometimes international in nature and that Anglo-American alliances, such as those of military figures, moved matters forward.[98] This work will question this transatlantic effectiveness of 'advocacy coalitions' at the military and political level in this period.

There are thus inconsistencies and limitations in the principal historiography. Additionally, gaps exist in the application of thinking about factors such as science, technology and wider systemic factors to the early history of Anglo-American nuclear affairs. It is proposed to address the above concerns in two ways. The first will be by blending the components of existing studies with new archival research. An example is the analysis of the primary records of the

[95] John Baylis and Kristan Stoddart, *The British Nuclear Experience: The Roles of Beliefs, Culture and Identity* (Oxford: Oxford University Press, 2014).
[96] For an example of his ideas on advocacy coalitions, see Paul Sabatier, .An Advocacy Coalition Framework of Policy Change., *Policy Sciences*, Vol. 21 (June, 1988), 129 – 168.
[97] Baylis and Stoddart, *The British Nuclear Experience*, p. 4.
[98] Ibid, p. 5.

militarisation of fission in Britain which will be used to give a new view on the existing history of its bomb programme. This will reflect the style of Rhodes' work in America and allow a counterbalance to be achieved in terms of the technical development in both nations. Primary sources used will include the papers of scientists at the Royal Society and also the many that are held at Churchill College, Cambridge. Of particular note in this regard are the papers of James Chadwick and G.P. Thomson in Cambridge together with those of Franz Simon in London. Also in Cambridge, the papers of Churchill's son-in-law and prominent Conservative politician, Duncan Sandys, will be used in a way that gives a new view on the author of the 1957 British Defence White Paper.

The U.K. National Archives will, of course, also be a main source of primary material. These will, however, not only be the more standard Cabinet and Service Ministry records, but also for intelligence affairs and the records of prominent individuals such as Air Marshal Sir John Slessor. The papers of other key individuals, for instance Frederick Lindemann, a close confidant of Churchill and also an Oxford professor, will re-examined through primary sources, in this case Lindemann's papers at Nuffield College, Oxford. A significant new analysis of the records of the Tube Alloys Technical Steering Committee, also housed at Kew, will be undertaken.

While it has not been possible to travel to the United States in person, for reasons of cost, there are considerable resources now available online and these have been utilised extensively in the writing of this thesis. The original location in which documents are held will be cited as the source throughout. The key material will be from the official Foreign Relations of the United States (FRUS). These many volumes of American proceedings are an invaluable resource and can be used

to shed new light on the thinking of key players such as Dulles and on America's true thoughts concerning the Modus Vivendi of 1947 with Britain. The Modus acted as a key post-war staging post in Anglo-American nuclear relations as it saw the formal ending of wartime agreements. Further, as America started to realise that its existing policy of separation from Britain required change, the FRUS records in 1957 and 1958 reveal how American policy came to reflect the new nuclear reality. Materials housed in the American National Archives, the Presidential libraries of Dwight Eisenhower and Harry Truman and the Library of Congress will also be helpful in substantiating the points made here. Papers held at the Library of Congress will be used to suggest a new and specific date on which the 'Manhattan' programme was actually authorised by President Roosevelt.

Records relating to the technical development of American nuclear weaponry will also be brought into play, including those of the Los Alamos National Laboratory, New Mexico and the history of Manhattan Engineer District of the US Army Corps of Engineers. Special focus will be on the involvement of Vannevar Bush who, in many ways, mirrored the changing thinking within various American Administrations. Bush was an engineer who firstly came to prominence through academic appointments at MIT and the Carnegie Institute of Washington.[99] He was one of the key architects of America's early consistent policy of not sharing information with Britain. This continued as the fission weapon neared reality and reflected the emerging realpolitik of the time. This policy would simply be maintained in the period leading up to 1958.

[99] Pascal Zachery, *Endless Frontier: Vannevar Bush, Engineer of the American Century* (MIT: MIT Press, 1999).

This work will be structured in four parts, with separate footnote numbering adopted for each. The first part will track the conceptualisation of military fission from the early days of the twentieth century through to 1942. The argument will be made that worldwide science meant that militarised fission was a possibility in several countries, and that they experienced similar steps on that journey. It was America, however, which determined to build an atomic monopoly, and far earlier than has been recognised to date. In Part Two, and during the fission weapon's first industrialisation period, the case will be made that there was never any true congruence in the wartime nuclear relations of Britain and America at the inter-governmental and strategic level. This is distinct from the existing historiography which sees the two governments as broadly cooperative. It will be argued here that the wartime interactions between the two nations in the atomic realm require a subtler, multi-level assessment. Thus relations will be shown to be collaborative at the level of science and atomic resources, but rarely at the level of political exchanges or strategic partnership. America's pursuit of its atomic goal would not permit sharing of meaningful data with other nations at this time. The McMahon Act will then be argued to simply be a reflection and codification of the existing state of affairs. It was crafted with domestic structures primarily in mind and should not be seen the significant breakpoint in Anglo-American affairs often argued by historians.

In the Third Part of this thesis, the years after the war and up until 1952 will be examined. Here the argument will be made that fission weaponry was not fit for purpose. Thus there was insufficient militarised systemic pressure to change the existing estranged geopolitical relations of Britain and America. Science, however, did continue to move ahead and resulted in the creation of a multilateral

atomic world. Science was also a mirror that reflected how states' military strategies were shaped by the emergence of the structures of the Cold War.

In Part Four, the reasons for the eventual amendment in Anglo-American relations will be set out. This will focus on the growth of systemic pressure, driven by technical developments which manifested themselves across the globe. This wider focus is new to the analysis of Anglo-American nuclear affairs before 1958. Once again, science will also be used as a focus of change. Technical advances granted Britain the ability to talk with America using the shared language of nuclear weaponry. Such an upgraded capability was, however, only beneficial to Britain because it correlated with the changed perceptions of nuclear threat that were occurring in *America* at that time. The growing pressures of the nuclear militarised environment constrained America to construct new relationships, both domestically and internationally. It chose to satisfy the latter by signing the MDA of 1958. This would be with the only qualified partner then available: Britain. Only then did the transatlantic relationship genuinely become 'special'. Despite this, it was not to be unique as America would go on to sign an arrangement with France in 1961, which was then further consolidated in the 1970s.[100]

[100] Fredrik Wetterqvist, *French Security and Defence Policy* (National Defence Research Institute, Stockholm, 1990), p. 50 and also Richard Ullman, 'The Covert French Connection', *Foreign Policy*, 75 (Summer, 1989), 3 – 33.

Part One

The Birth of Militarised Fission and the Formation of

Anglo-American Nuclear Relations, February 1939 – August 1942

By August 1942, the feasibility of an atomic weapon had been accepted by many in the worldwide scientific community. This juncture between the theoretical and practical development of the fission bomb is a critical one: it was identified so at the time.[1] However, while it may be tempting to start any analysis of Anglo-American nuclear relations from this point, the early militarisation of fission must be analysed first if a complete picture of events is to be achieved.

This long process had its roots in the atomic science of the early twentieth century and was international in nature. Fission's militarisation was comprised of two key elements: consensus and structures. It was science and the scientists who took the lead in forming the first consensus – no military requirements were being fulfilled as the first atomic weapon was conceptualised. That consensus, and then the structural bodies which would support and develop the scientific findings, formed initially in Britain. Yet it would be America would emerge as the first to industrialise the new weapon - the 'Manhattan' programme would be the result.[2] The narrative of the change in this developmental leadership needs to be explored fully as it exposes the early roots of America's drive for an atomic monopoly. The existing historiography often sets out that America took over the

[1] Anderson to Churchill, 30 July 1942, PREM 3/139/8A, TNA.
[2] 'Manhattan' was the code name for America's atomic industrial development programme.

atomic lead from Britain in a climate of sharing and collaboration.[3] Baylis and Stoddard have expressed the resulting transatlantic relationship as "the wartime experience saw close Anglo-American cooperation in the Manhattan Project."[4] A fundamental building block of this view of emerging governmental cooperation between Britain and America in the war years has been the writings of Margaret Gowing. It is key to engage with Gowing's important work in order to clarify where the arguments in this thesis differ from her interpretations, while also making plain inconsistencies of narrative in the wider existing historiography.

Gowing stated that "Britain had been the midwife" of the fission bomb and that it was only due to the research work, mainly done by refugee scientists in Britain, that the new weapon was ready before the end of the Second World War.[5] Gowing later went further, when she argued that "her scientists and the refugee scientists in Britain had invented it (the Bomb)."[6] However the implication that Britain had an exclusive role in militarised fission's birth had already been qualified in Gowing's earlier work when she said that, in 1939 "internationalism still ruled in science."[7] In terms of Britain's relative lead in fission science, she also points out that America was interested in emerging uranium research from the outset, and she confirms that 100 tons of uranium residue has been shipped to America as early as 1939.[8] This was before Britain acquired such volumes of experimental material and thus America's early science activity undermines arguments made in favour of exclusive British advancement. Further, Gowing

[3] For instance see Septimus Paul, *Nuclear Rivals, Anglo-American Atomic Relations 1941 – 1952* (Ohio University State Press, 2000).
[4] John Baylis and Kristen Stoddart, *The British Nuclear Experience: The Roles of Beliefs, Culture and Identity* (Oxford: Oxford University Press, 2014), p.1.
[5] Gowing*, Independence and Deterrence, Vol 1,* p. 1. Endorsed recently by Peter Hennessy, *Cabinets and the Bomb* (The British Academy: Oxford University Press, 2007).
[6] Gowing, 'Britain, America and the Bomb', p. 121.
[7] Gowing, *Britain and Atomic Energy*, p. 33.
[8] Ibid, p. 36.

affirms that work at Cambridge University, by Hans von Halban and Lew Kowarski, on neutron absorption in spring 1940 was replicated in important respects by American scientists, who also showed that new fissionable elements could be produced.[9] Additionally, at the time of the Tizard mission in the autumn of 1940, Gowing states that the British "found that work in America was proceeding on parallel lines to that in Britain."[10] This gives cause to qualify her later remark that "at the end of 1941 the British were well ahead" of America.[11] The British enjoyed advantages in specific areas, but the scale of any lead over America will be shown to be less than has been previously assumed.

In respect of evolving Anglo-American cooperation during 1941 - 1942, Gowing herself gives a clear statement about the American position by quoting the leading governmental figures, Bush and James Conant, as saying America "wanted co-operation and collaboration but not much more. They wanted to retain independent control of their project."[12] Such a telling indicator of the true nature of early American intentions, which was to keep sole control of the emerging weapon, does not support the overall implications of Gowing's wartime study that the two governments enjoyed a "wartime special Anglo-American relationship" in the atomic sphere.[13] So perhaps an alternative explanation needs to be found about the nature of that relationship between the countries. Such an explanation can be located by unpicking and then re-calibrating the nature of the cooperation

[9] Ibid, p.59. Hans von Halban was a German physicist who had worked with Otto Frisch to show that heavy water was a moderator in the fission process. Lew Kowarski was a naturalised French scientist who was also part of Juliot-Curie's group. They fled to England bringing a valuable stock of heavy water with them..
[10] Ibid, p. 65. Sir Henry Tizard was a chemist who had been a driving force in developing radar as a practical defence technology and his mission to America is described on pages 73 – 74.
[11] Gowing, 'Britain, America and the Bomb', p. 125.
[12] Gowing, *Britain and Atomic Energy*, p. 106. James Conant was a leading American chemist who became President of Harvard University in 1933.
[13] Gowing, *Independence and Deterrence Vol .1*, p. 110.

that actually occurred: it was to be found at the level of science and resource sharing, not governmental policy.

One of Gowing's other key arguments was that the 1941 MAUD Committee report was highly influential in making the Americans move to Manhattan, as it "imparted a new sense of urgency to the American scientists and was of crucial importance in stimulating their project".[14] MAUD was the British scientific committee set up in 1940 to investigate formally the prospect of the militarisation of atomic fission. In describing it, Gowing later goes further by saying it was the MAUD report that "galvanised the Americans into action".[15] But Gowing also notes that Bush set up a National Academy Committee precisely to check the British MAUD data.[16] This hardly seems the actions of a state swept along by the research of others. America was, from the very outset, its own master in the atomic field and this needs to be factored more significantly into any interpretation of American policy. Indeed Gowing confirms that, despite what she describes as a "free exchange of information of information and ideas between the two countries" as existing in 1942, the actual exchange of letters (between Bush and Anderson in March of that year) was "cordial but the sentiments expressed were in rather general terms."[17]

This supports the findings of this thesis that, firstly, America sought to maximise access to knowledge through superficial expressions of cooperation and, secondly, that the underlying reality was actually a consistent American push towards securing an atomic monopoly. The first fruits of their increased

[14] Gowing, *Britain and Atomic Energy*, p. 85. For details of the formulation of the MAUD Committee see page 64.
[15] Gowing, 'Britain, America and the Bomb', p. 124.
[16] Gowing, *Britain and Atomic Energy*, p. 122.
[17] Ibid, pp 132-133. Lord Anderson was Lord President of the Council between 1940 – 1943.

knowledge started to drive a policy of separation form, and domination over, Britain in this field. This conscious policy was reflected by cooperation being largely at the level of science, not governments, in the early wartime period.

American authors have often taken a different, but still nationalistic, approach and perhaps unsurprisingly they emphasise their own scientists' successes, though in a more international context.[18] They also like to suggest that it was their nation which was the most advanced, both militarily and scientifically, even at the earliest of stages.[19] In this regard, David Kaiser has pointed out that "before World War II, most American physics departments required PhD candidates to pass language exams in both French and German, to ensure that students would not be cut off from vital developments in their fields".[20] This supports the view that American pre-Manhattan scientific capability was international in outlook and already actively seeking knowledge from elsewhere.

Cooperation between the powers during the war is also very prevalent in the American historiography, although some seem to rely upon 'unseen hands' as being causes of change.[21] Modern American literature is also sometimes content to conclude that "the Manhattan Project (was) begun as an Anglo-American collaboration."[22] Yet here too though, there is a contradictory tendency to view early nuclear development as a singular American achievement, one that simply

[18] Luis Alvarez, *Ernest Orlando Lawrence, A Biographical Memoir* (Washington D.C.: National Academy of Science, 1970), pp. 271-272 and Rhodes, *The Making of the Atomic Bomb,* p. 4.
[19] See Gavin Hadden, (ed.), *Manhattan District History* (Washington D.C., December 1948), p.: 2.3, (Hereafter MDH) accessed at https://www.osti.gov/opennet/manhattan_district.jsp. Also, on how American labs apparently dominated science, see Robert Service, Is Berkeley Past its Prime?, *Science*, New Series, Vol. 300, (May 16, 2003), 1063 - 1065.
[20] Kaiser, 'The Physics of Spin', 1225 – 1252.
[21] Botti, *The Long Wait,* p. 2. For 'unseen hands', see Rhodes, *The Making of the Atomic Bomb*, p. 405.
[22] Michael Gordin, Red Could at Dawn: Truman, Stalin and the End of the Atomic Monopoly (New York: Farr, Strauss and Giroux, 2009), p. 5.

"happened".[23] American historians also sometimes seem to be content to cite domestic bureaucracy as a driver without defining how this occurred.[24] In respect of this American-dominant view, Daniel Kevles dams Britain's MAUD report with faint praise by stating that it was just "encouraging", and because it just built on the analysis of Urey and Dunning's work into gaseous diffusion at Columbia University, as well as that of Lawrence on electromagnetic separation.[25] The sense is very much of American work in parallel with or, in the case of Glenn's Seaborg's discovery of Plutonium in early 1941, ahead of the rest of the world.[26] Kevles also suggests that it was Arthur Compton who stimulated Bush's October 1941 meeting with Roosevelt, and the subsequent acceleration of atomic bomb research, thus rejecting the idea of a more general search by America for British assistance. Britain plays a very limited role in his modern narrative.[27]

Kevles goes on to argue that it was once again American domestic scientific progress, and particularly work at Compton's Radiation Laboratory in Chicago, that pushed Roosevelt to initiate Manhattan in June 1942. This supports the date set out in the thesis. Finally Kevles states that, in successfully building the first fission bomb, "the United States…managed to surpass German military technology only because the grace period before Pearl Harbor had allowed the nation sufficient time to mobilize her civilian scientific resources."[28] No mention of

[23] For example see F.G. Gosling, *The Manhattan Project: Making the Atomic Bomb* (DOE/MA-0001; Washington: History Division, Department of Energy, January 1999).
[24] Rhodes, *The Making of the Bomb*, p. 367.
[25] Daniel Kevles, *The Physicists: The History of a Scientific Community in Modern America*, (New York: Alfred A. Knopf, 1978), Chapter XX1. Harold Urey was an American physical chemist and winner of the 1934 Nobel Prize in Chemistry for his work on deuterium and heavy water. John Dunning was a specialist in the properties of the neutron. Ernest Lawrence constructed the first cyclotron in 1929 at Berkeley and later developed more powerful versions.
[26] Seaborg went on to win the Nobel prize for Chemistry in 1951.
[27] Ibid, Chapter XX 1. Arthur Compton was a Nobel Laureate and Professor of Physics at Chicago.
[28] Ibid, Chapter XX 1.

cooperation with, or benefits of dealing with, Britain is seen in this American historiography.

Other writers have drawn attention to the argument that the science community as a whole should be placed centre stage, and that science became the fundamental asset of governments as nations fought the Second World War.[29] However this idea has not been explored in a way that shows how the science elite formed a consensus view by engaging with wider political and social factors. The construction of such agreed views was in fact an important part in the mechanics of the militarisation of fission. It translated the international progress of atomic science into formulae that could be applied in individual national contexts. These formulae would then be taken forward by differing structures. The differing patterns of consensus formation, and subsequent supporting structures, will support the argument of this work that Britain and America followed similar, but still unique, militarised nuclear trajectories from the outset.

Recent British historiography concerning nuclear weaponry has been dominated by the analysis of world statesmen, especially the wartime leaders Winston Churchill and Franklin Roosevelt. [30] The concentration on such individuals can mask other factors that were in play. The early stages of the development of nuclear weapons cannot simply be explained by events that centre on the influence of single actors, or on assessments by historians such Farmelo that a

[29] Jim Baggott, *Atomic, The First War of Physics* (London: Icon Books: 2009), p. 462, and also in David Edgerton, *Britain's War Machine* (Penguin, 2012), p. 270.
[30] On the important role of science see especially David Edgerton, *Warfare State, Britain 1920-1970* (Cambridge: Cambridge University Press, 2006). On the wartime leaders see Ruane, *Churchill and the Bomb, and* Farmelo, *Churchill's Bomb;* also Conrad Black, *FDR: Franklin Delano Roosevelt: Champion of Freedom* (Public Affairs, 2003) and Henry Brands, *Traitor to His Class: The Privileged Life and Radical Presidency of Franklin Delano Roosevelt* (Anchor, 2009) amongst many.

'last bus has been missed' on the journey to transatlantic nuclear partnership.[31] Rather, as Finnemore and Sikkink have argued, we must look beyond the role of individuals alone: systemic structures play an equally important role. They also point out that "the most important ideational factors are widely shared or 'intersubjective' beliefs, which are not reducible to individuals."[32] What is key to note is that *both* agency, driven by scientific thinking, and systemic structure, inherent in the wider social world, were fundamental in the dynamic of the relationship between British and American political and science elites in the early nuclear field.[33]

Some authors have additionally argued that it was the threat from Germany that drove the early emergence of the weapon, but again without placing such concerns within the dynamic of wider forces.[34] While it is true that the Nazis contributed to fear about existential threats, and the possibility of them owning the ultimate weapon heightened this concern, this must be seen as just one of the factors involved in this story, albeit a constantly nagging one.[35] Fear itself was indeed an important factor – both of Germany and of the device - but it is through the manner in which it was manifested, in both America and Britain, that a more useful insight can be achieved.

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[31] Farmelo, *Churchill's Bomb*, p. 204. See also Roosevelt to Churchill, 11 October 1941, PREM 3/139/8A/574, TNA.
[32] Martha Finnemore and Kathryn Sikkink, 'Taking Stock: The Constructivist Research Program in International Relations and Comparative Politics', *Annual Review of Political Science*, Vol. 4 (2001), 393.
[33] David Houghton, 'Reinvigorating the Study of Foreign Policy Decision Making: Toward a Constructivist Approach', *Foreign Policy Anal*ysis 3, No. 1 (2007), 24.
[34] Ruane, *Churchill and the Bomb*, p 30, Ian Clark, *Nuclear Diplomacy and the Special Relationship: Britain's Deterrent and America, 1957–1962* (Oxford: Oxford University Press, 1994), p. 22, and also Margaret Gowing, *Independence and Deterrence,,* p. 87 who put it thus: British scientists "felt the breath of their German competitors hot on their necks".
[35] See Rhodes, *The Making of the Atomic Bomb*, p. 405.

As two of the key powers involved in early nuclear affairs, although not the only ones, the relationship of Britain and America needs to be centre stage in any story of the militarisation of the new weapon. Their relationship has been described by a leading historian as one that, although close at the height of the Second World War, was still one of continuing competitiveness.[36] Both nations were swept along with this historic suspicion into a new age: an age when mutual complete destruction became conceived. How, then, did the dawn of such capability change the way they interacted? There can be no doubt that their relations would shape, and be shaped by, this new weapon of war.

[36] Reynolds, 'Rethinking Anglo-American Relations', 91.

Fission and the Frisch-Peierls Memorandum

The contributions of individuals to aspects of militarising atomic physics have been highlighted many times.[37] But the collective whole of science, and indeed its remorseless and interactive progress, has been underplayed by previous historians. Weaponised atomic science was not developed exclusively by any single country or by any single elite. It was international in its formulation.[38] As mentioned above, the concept of a 'republic of science' seems to be borne out by the level of pre-war atomic interaction between scientists.[39] A true explanation of how the most powerful weapon ever developed was brought to fruition thus requires a focus on the interaction of the development of new ideas, systems, language, existential threats and political relationships across the globe. Further, nuclear physics, in those days before it became military nuclear physics, was conducted in a fashion that saw the acquisition of knowledge as primary, and only latterly did its application become a central concern.[40] We therefore need to start with an analysis of the scientific discovery of atomic fission.

The birth of the militarisation of atomic science was clearly a science-led activity. On Friday, 10 February 1939 in Berlin, the world was introduced to a new concept. On that day, '*Die Naturwissenschaft*', Germany's leading scientific journal, published papers by Otto Hahn and Fritz Strassman which, for the first time, gave a clear statement of fission occurring in the liquid drop model of a

[37] See for instance, Sabine Lee, *Sir Rudolf Peierls* (Singapore: World Scientific Publishing, 2007), Herman Feshbach, Tetsuo Matsui and Alexandra Oleson, *Niels Bohr Physics and the World* (Routledge, 2014), Kai Bird, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer* (Vintage Books, 2006) and Gino Segre and Bettina Hoerlin, *The Pope of Physics: Enrico Fermi and the Birth of the Atomic Age* (Henry Holt, October 2016).
[38] Egerton, *Britain's War Machine*, p. 118.
[39] See Introduction page 26 about the 'republic of science'; the Sir Franz Simon example of such cooperation follows on pages 53 - 54.
[40] See Vannevar Bush's view on science in 1945, *Science: The Endless Frontier, A Report to the President* (United States Government Printing Office, Washington: 1945).

nucleus.[41] This was a breakthrough by chemists; developing the implications would pass into the hands of physicists. Centred on the Kaiser Wilhelm Institute of Chemistry (KWI), German science was at least on a par with any other nation, and would have been considerably in advance had not Jewish scientists, including Rudolf Peierls and Otto Frisch, been forced into exile by the Nazis.[42] These works also discussed the evidence for the existence of Barium, but the key phrase contained within them was '*Uranspaltung'* or 'uranium fission'. The term 'fission' had recently been coined by Frisch, who had in turn borrowed it from the process of the biological parting of cells. However this publication introduced it to the world in the form for which it is remembered: that of the precursor of the new age of nuclear warfare.[43]

This had, indeed, been a busy five weeks for fission science following as it did hard on the heels of the leading German scientists, Otto Hahn and Fritz Strassmann's first paper – "On the detection and characteristics of the alkaline earth metals formed by irradiation of uranium with neutrons" – and Otto Frisch's experimental verification of the discovery in his Copenhagen laboratory on 13 January of that year.[44] Through the exploitation of the capabilities of this newly discovered process of nuclear fission, humanity would soon move to such power

[41] Otto Hahn and Fritz Strassmann, 'Nachweis der Entstehung activer Bariumisotope aus Uran und Thorium durch Neutronenbestrahlung; Nachweis weiterer aktiver Bruchtucke bei der Uranspaltung', *Naturwissenschaften*, Volume 27, No. 6, 10 (February 1939), 89 – 95.
[42] See a discussion of the 'Frisch-Peierls Memorandum' see pp. 56 – 57.
[43] Much latter fellow scientist Lise Meitner wrote "the discovery of nuclear fission by Otto Hahn and Fritz Strassmann opened up a new era in human history", in Dietrich Hahn, (ed.), *Erinnerungen an Otto Hahn* (S. Herzel Verlag, Stuttgart, 2005).
[44] Otto Hahn and Fritz Strassmann, 'Über den Nachweis und das Verhaegen der bei der Bestrahlung des Urans mittels Neutronen entstehenden Erdalkalimetalle', *Naturwissenschaften*, Volume 27, Issue 1, 6 (January 1939); Lise Meitner and Otto Frisch, 'Disintegration of Uranium by Neutrons: A New Type of Nuclear Reaction', *Nature* 143 (1939), 239.

as “if the radiance of a thousand suns were to burst at once into the sky that would be like the splendor of the mighty one.”[45]

The world of early to mid-twentieth century nuclear science was an age of consistent international scientific advancement; one where it was possible to stand on the ‘shoulders of giants’, but whose giants were often still very much alive and able to exchange views. The work of Albert Einstein, through his famous $E=MC^2$ equation aiding the understanding of the nature of binding energies within nuclei, was a key building block.[46] The same status applies to the work of Ernest Rutherford, who first undertook the fractionalisation of the atom. Rutherford had actually won a Nobel Prize for chemistry in 1908, but it was his legacy in nuclear physics, particularly stimulated by his role as head of the Cavendish Laboratory in Cambridge, which was keenly felt in Britain.[47] It was under Rutherford’s leadership the first controlled atomic separation was conducted at the Cavendish in 1932 by Cockcroft and Walton.[48] Also at the Cavendish, James Chadwick, the discoverer of the neutron, drove knowledge forward. However the work of Enrico Fermi in Italy, on bombarding uranium to induce radioactivity, was as significant as that of Lawrence’s invention of the cyclotron at Berkeley and that of Frederic Juliot in Paris on the release of neutrons during fission.[49] Set out below are some

[45] Bhagavad Gita (XI,12): quote attributed to J. Robert Oppenheimer after the Trinity nuclear test of 16 July 1945.
[46] Indeed there are those who believe: “Einstein’s politics played a more decisive role in the story of the atomic bomb than his physics”: see Markus Pössel, From $E=mc^2$ to the Atomic Bomb, *Einstein Online*, Vol. 04 (2010), 1004.
[47] https://www.physicsoftheuniverse.com/scientists_rutherford.html
[48] Ernest Rutherford’s ‘splitting’ of the atom in 1917 while at Manchester University was, in fact, a nuclear reaction between nitrogen and alpha particles and led to the discovery of the proton. He moved to Cambridge in 1919 and created a world leading physics department at the Cavendish Laboratory. Sir John Cockcroft went on to be a key member of the British MAUD committee and won the Nobel Prize for physics in 1951 with Ernest Walton. The latter returned to Ireland in 1934.
[49] Fermi was awarded the Nobel Prize for Physics in 1938 - see Dan Cooper, *Enrico Fermi: And the Revolutions in Modern Physics* (New York: Oxford University Press, 1999), p. 102. See the leading French atomic physicsts Irene Joliot-Curie and Frederic Juliot’s earlier paper in 1932 – ‘Émission de protons de grande vitesse par les substances hydrogénées sous l'influence des rayons γ très pénétrants’ in *Comptes Rendus,* 194 (1932), 273.

of the detailed interactions that occurred between these scientists, as revealed by their correspondence, and which underlines the internationality of pre-war atomic science.

Initially there was no common consensus about the possibility of nuclear power resulting in a weapon; rather there was just a growing concern about the implications of what might be possible, especially amongst continental academics that were aware of the rise of Nazism.[50] Work proceeded on the basis of the skills of the individuals and organisations engaged, typically in university laboratories. No states were involved. Views were shared across oceans. In the case of the Niels Bohr and Arthur Rosenfeld's visit to Princeton in early 1939, for instance, their word of mouth even preceded news of the official publication of the Frisch and Meitner paper itself.[51] However no masterplan for atomic weaponry existed until after the components were in place – a consensus on the science and the structures to support it. It is thus a complete misunderstanding that the atomic bomb was created by the work of the 'Manhattan' project alone from 1942 onwards, when in fact this was the second phase of a line of development that had been years in the making.[52] In fact, the general awareness of the threat and potential of weaponised atomic power can be traced back to at least the fiction of H.G Wells and was amplified by such later writers as J. B. Priestley.[53] During the

[50] See Teller's response to Leo Szilard's question of February 1939 – "You know what that (Bohr's paper on fission) means?"..."Hitler's success could depend upon it" quoted in Edward Teller, *The Legacy of Hiroshima* (Doubleday: University of Michigan, 1962), p. 9.
[51] Meitner and Frisch, 'Disintegration of Uranium by Neutrons', 239. Niels Bohr was a Danish scientist who won the Nobel Prize for contributions to quantum theory and Arthur Rosenfield was an American physicist.
[52] See Rosemary Mariner and G. Kurt Piehler, *The Atomic Bomb and American Society* (University of Tennessee Press, Knoxville, 2007), p. IX. Also the Manhattan-centricity of early American views were based on the Smyth Report, 1946, together with the biography of Leslie Groves, *Now It Can Be Told: The Story of the Manhattan Project* (New York: Harper, 1962).
[53] H.G.Wells' 1913 book *The World Set Free* has been seen as an initial influence on common perceptions of nuclear power and also on the thoughts of political decision makers. See Farmelo, *Churchill's Bomb*, pp 15-20. J.B Priestley wrote *The Doomsday Men* in 1938 against the background of a world moving towards the existential threat of another world war. See J.B. Priestley, *The Doomsday Men* (Valancourt Books, 2014).

1930's it was certainly possible to earn a fee by writing about Armageddon as nuclear science matured.[54]

The distribution of views amongst academics themselves on this subject was also diffuse. It ranged from those who were alert to the development of fission as a potential weapon, and were also concerned about its ownership, to those who downplayed the threat. In the former category was a Hungarian scientist Leo Szilard, who personified the very internationalisation of science during the early twentieth century, but who also fought a long campaign to keep the atomic genie in its bottle. Szilard first studied and worked at the University of Berlin before going on to London, via Vienna, in 1934, where he had a flash of insight about chain reactions. His travels finally took him on to America, first to Columbia University and eventually Chicago. The sceptics included Rutherford who described the chances of a fission weapon as "moonshine."[55] Later Bohr was amongst many when he stated, in April 1939, that it might be possible to manufacture a bomb based on pure U^{235}, but that the separation needed to achieve the amounts needed "appeared profoundly impractical".[56] These sceptical views continued, even amongst the science elite itself, well into the Second World War.[57]

Given this lack of immediate consensus amongst scientists on the atomic threat, any form of 'advocacy coalition' was slow to emerge. The trigger for the gradual acceleration of such consensus appears to have originated in Paris in the spring

[54] See Winston Churchill, *Shall We All Commit Suicide* (New York: Eilert Printing Company, 1924), and his 1931 piece, 'Fifty Years Hence', *Strand Magazine.*
[55] Farmelo, C*hurchill's Bomb*, p. 75.
[56] Quoted in Baggott, *Atomic. The First War of Physics,* p. 15.
[57] See Letter of Introduction for Enrico Fermi to carry to the Dept. of U.S. Navy from George Pegram, Professor of Physics at Columbia University, March 1940 in *MPHPA (*2005) accessed at the Atomic Heritage Foundation website: *https://www.atomicheritage.org/article/mphpa-website-update.*

of 1939. The publication of experimental results from Juliot and colleagues stimulated activity in several nations.[58] Following this continental lead, in England it was G. P. Thomson who was encouraged to turn his attention to research in this area because, as he later stated, "at the back of my thoughts there lay the possibility of a weapon."[59] Building on the breakthroughs and research that had been widely undertaken in the years before, mid-1939 started to see a multiplicity of such forward-looking work. The consequence was the start of a move towards scientific consensus, initially expressed in Britain.[60] But while agreement on the theoretical possibility of a weapon gradually became more widespread, these same groups also had not yet confirmed that it was practical.

An example of these long term and international contacts between scientists can be seen in the correspondence of Sir Francis / Franz Simon.[61] Such contacts shaped the knowledge and thinking of scientists and would result in the first true scientific consensus around militarised fission through the use of exact and irrefutable language. In 1932 Simon visited Lawrence in California and was impressed by his advanced technology. He also met Einstein in Pasadena in January of that year. This networking flourished throughout the early 1930's and Lawrence wrote from Berkeley noting Simon's move to Britain and apologising for the gap in their correspondence.[62] The exchange continued throughout 1935

[58] Hans Von Halban, Frederic Joliot and Lew Kowarski, 'Liberation of Neutrons in the Nuclear Explosion of Uranium', *Nature,* 143 (18 March 1939), 470-471. This showed 3.5 neurons released per fission.
[59] Sir George Paget Thomson, a Nobel Prize winner in 1937 for his work on electron diffraction. Quoted in Ronald Clark, *Einstein* (Avon: London, 1971), p. 58, and Rhodes, *The Making of the Atomic Bomb*, p. 297.
[60] See A M Tyndall, 'The possibility of Producing an Atomic Bomb', AB 1/9 (summarised in AB 1/37, 3 May 1939, TNA) and Rudolf Peierls, Critical Conditions in Neutron Multiplication, *Proceedings of the Cambridge Philosophical Society*, 35 (1939), 610 - 615.
[61] Franz Simon was born in Berlin, served with distinction in the First World War and worked at Los Alamos in the latter part of the war before returning to a Chair at Oxford in 1945.
[62] Lawrence to Simon, 9 January 1934, Simon Papers, FS/7/3, The Royal Society, (hereafter R.S.).

and in 1937, now with Lawrence heading the innovative Radiation Laboratory at Berkeley, from where he wrote stating that the new cyclotron, "weighing about 200 tons", would be operational in a year.[63] The Berkeley cyclotron was an excellent example of how leading atomic research was already embedded in America well before the 'Manhattan' period, as Simon recognised. In a letter to Lawrence in 1938, Simon also demonstrated the political awareness that many scientists exhibited when he expressed his hope that America would soon join Britain to resist the German menace and that a Churchill government would be imminent.[64] Also in this same letter Simon showed that at least one non-politician was shrewd enough to realise that the Americans were unlikely to join such a war, largely because of the absence of the existential threats faced by Britain.[65]

In a specific example of the foreign 'émigré network' that contributed greatly to atomic development in Britain before the war, Simon was a longstanding friend of the leading German physicist Rudi Peierls. He even received a postcard from the seaside from Peierls in August 1932 and again from Cornwall in summer 1938. These friendships in scientific circles often endured across decades as when, in 1953, Simon appears to have offered Peierls a loan that the latter turned down. Simon was also friendly with Szilard throughout the whole period of the 1930s to 1950s and their association always featured a mix of active scientific suggestions and friendly advice.[66] Additionally Simon was in regular touch with Max Born, by then safely based in Edinburgh, and in late 1939 they agreed that

[63] Lawrence to Simon, 30 November 1937, Simon Papers, FS/7/3, R.S.
[64] Simon to Lawrence, 22 April 1938, Simon Papers, FS/7/3, R.S. - "people hope that they will soon have a government Churchill-Eden".
[65] Ibid.
[66] Simon to Szilard, 5 September 1934, FS/7/3, Simon Papers, R.S. and Szilard to Simon, 25 July 1956, FS/7/3, Simon Papers, R.S.

they wished scientists could be more productive for the forthcoming war needs.[67] The scientific roots of militarised fission were thus extremely broad-based. In contrast to views of either Britain or America being the sole 'midwife' of militarised fission, the developments in many countries were important.

In America, as implied by Simon's correspondence, much leading science research was undertaken during the 1930s. It was now the home of Einstein, Fermi and Szilard. It is important to appreciate that the Americans were not waiting for any particular British lead in scientific matters. Instead, America was following its own, but strikingly similar, journey to other nations at this time but without the initial pressure of existential threats. It would be the latter which would temporarily give the British atomic programme initial momentum. In addition to the work being conducted by Lawrence at Berkeley, George Pegram at Columbia and Edward Teller at George Washington University, along with a cluster of emigres such as Bohr and Rosenfeld, joined John Wheeler at Princeton in 1939 to create a further centre of excellence for physics in America. Teller was to become a key member of the Los Alamos team that later made significant contributions to the design of the first fusion weapon, while Pegram did world leading research into the properties of neutrons. Wheeler's work on early nuclear fission, especially the liquid drop model, had also made him a leading figure in world physics. However, despite this great strength in American science itself, the formal links between science and the political elite in America were very weak early in 1939.

[67] Max Born was another German mathematician and physicist forced from Germany by the Nazis. Klaus Fuchs was one of Born's pupils. Born to Simon, 14 December 1939, FS/7/1/7/127, Simon Papers, R.S.

In July 1939, Szilard took his latest experimental information about chain reactions, using graphite as a moderator, to Einstein who was holidaying in New England.[68] They discussed the need to alert the American government about this development in atomic science and this time Einstein's words reached the State Department via a letter. The result was swift. On 19 July Szilard heard that Alexander Sachs wanted to discuss matters. As an economist and banker on the fringes of politics, Sachs had an awareness that straddled differing elites. Onward transmission of these thoughts to the President was delayed by world events. Thus Sachs only saw Roosevelt on 11 October 1939.

This meeting supports the argument that language was at the heart of the conceptualisation of the fission bomb. Firstly, in his address to the President, Sachs did not prioritise the weapon itself and thus did not imbue it with a clear security-threat rationale. In fact his report mentioned a bomb only third after power and medical applications. Given this lack of clarity, his first meeting made no impression on Roosevelt and he left empty handed.[69] The next day he returned and tried to overcome the ideational difficulty that Sachs himself expressed as "no scientist could sell it (the bomb idea) to him (Roosevelt)."[70] This is a further contemporary endorsement of the need to establish clear language before understanding can exist. Sachs went on to read the last paragraph of Francis Ashton's 1936 lecture 'Forty Years of Atomic Theory' – "one day man will release and control its almost infinite power. We cannot prevent him from doing so and can only hope that he will not use it exclusively in blowing up his next door

[68] Spencer Weart and Gertrude Szilard, (eds.), *Leo Szilard: His Version of the Facts* (MIT Press: Cambridge, 1978).
[69] See Baggott, *Atomic*, p. 41.
[70] Geoffrey Hellman, 'The Contemporaneous Memoranda of Dr. Sachs', *New Yorker* (01 December 1945), p.70.

neighbour", to Roosevelt.[71] The President made the leap for himself and stated: "Alex what you are after is to see that the Nazis don't blow us up". After receiving an affirmative response from Sachs, he turned to his aide, General Watson, and ordered action.[72] The language issue had been temporarily overcome.

Watson proposed a largely scientific committee, but one that also involved military representatives. Lyman Briggs was appointed as the Chairman by Roosevelt. Briggs was a biologist with a background at the National Bureau of Standards. The first meeting of the 'Advisory Committee on Uranium', was held on 21 October 1939 with Sachs, Briggs, Szilard and Teller in attendance, together with the U.S. Army and Navy. For some historians this marks the start of the American nuclear bomb programme.[73] However it is clear from the evidence that there was still a long way to go before such a programme actually commenced. American structures were in their infancy and no scientific consensus on the viability of militarised fission was yet available. Also the contemporary inability to grasp the scale of investment required, and then express matters in ways that others could understand, was plain. To achieve the latter, constructivist thinking points out the need to create exactly such collective knowledge which goes beyond the sum of individual thoughts and includes the Weberian concept of 'verstehen' (or understanding).[74] Stephen Toulmin has expressed this as follows: "each of us thinks our own thoughts, our concepts we share with our fellow man."[75] The creation of these new, socially endorsed, concepts is exactly what

[71] Rhodes, *The Making of the Atomic Bomb*, p.314.
[72] Robert Jungk, *Brighter than a Thousand Suns: The Story of the Men Who Made The Bomb*, translated [from the German] by James Cleugh, (New York, Grove Press, 1958), pp.109 – 111.
[73] Farmelo, *Churchill's Bomb,* p.130, "the American nuclear bomb project was now under way."
[74] Emmanuel Adler, 'Seizing the Middle Ground: Constructivism in World Politics', *European Journal of International Relations*, 3/3 (1997), 326.
[75] Stephen Toulmin, *Human Understanding* (Oxford: Clarendon Press, 1972), p.35.

was required and this would eventually be provided first by the scientific consensus of the MAUD Committee in Britain.

Nevertheless, in some ways America was again ahead here – the military elite was involved for the first time in atomic affairs, for instance – but they lacked the scientific and linguistic maturity necessary to conceptualise a nuclear bomb. The fact that the report from Uranium Committee to the President, submitted on 1 November 1939, which simply recommended more research, did not move things forward fits the pattern that might be expected. American science was not yet sufficiently in agreement about the potential reality of militarised fission. The report thus took its place on the shelf.

Earlier we saw how the German scientists, Hahn and Strassmann, led the way in fission in 1939 and, despite the loss of its emigres, Germany continued to have a well-established and highly respected science community as the Second World War broke out. This community continued to interact with the wider science world in common with the other science elites that we have encountered. Juliot's results, showing 3.5 neutrons released per fission, had stimulated Thomson in Britain and the same French report had similar resonances in Germany.[76] As in the other two emerging nuclear systems of Britain and America, the links between relevant German elites in 1939 were however initially weak and informal. Consequently when Paul Harteck wrote to Kurt Diebner at the Wehrmacht's Ordnance Department about this French breakthrough, the result was that a conference was called in Berlin on 29 April 1939.[77] This conference simply led to a ban on German uranium exports.

[76] Juliot, von Halban and Kowarski, *Nature* (22 April, 1939).
[77] Paul Harteck was director of the physical chemistry department at the University of Hamburg and an advisor to the *Heereswaffenamt* (HWA, Army Ordnance Office). Kurt Diebner organised

Early German efforts at structure were also interrupted by the start of the war. The initial group of fission physicists who looked to take this work forward were known informally as the first 'Uranverien' (Uranium Club) and more formally as '*Arbeitsgemeinschaft für Kernphysik'*. The group's work was discontinued in August 1939 when the three principle members were called to military training.[78] This was an ironic inversion of existentialist effects on the atomic process. As Germany existentially threatened others, it impacted on its own scientific flow. Later that year, in December 1939, Werner Heisenberg, one of the pioneers of quantum mechanics and who received the Nobel Prize for this work in 1932, sent a report to the German War Office that summarised his view on the possibility of fast neutron fission.[79] It supported the concept and showed, once again, the parallel state of international science at this stage. Written a few months *later*, the 'Frisch-Peierls Memorandum' would give this theory a realistic basis around which a consensus, then structures could form.[80] In Germany its technical path continued to focus on heavy water as a moderator, and not ideas of enriching uranium isotopes on which certain British émigré scientists would work.[81] This therefore retarded the possibility of any consensus on the potential for militarised fission in that country.

Gowing agrees that even Britain was nowhere near undertaking serious bomb development in the nuclear field as war broke out – "scepticism was universal

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the second *Uranverein* which had its first meeting on 16 September 1939. Diebner became a Reich Planning Officer

[78] Klaus Hentschel and Ann Hentschel, (eds.), *Physics and National Socialism: An Anthology of Primary Sources* (Birkhäuser, 1996), pp.363–364 and Appendix F; see the entries for Esau, Harteck and Joos. See also the entry for the KWIP in Appendix A and the entry for the HWA in Appendix B.

[79] David Irving, *The Virus House* (William Kimber, 1967), p. 48.

[80] See p. 60 for details of the 'Frisch-Peierls Memorandum'.

[81] Indeed, the Norwegian Norsk Hydro heavy water plant became a prime target for the German invasion in May 1940.

and profound", she confirms.[82] Indeed, nothing was truly produced scientifically until von Halban and Juliot's paper from Nature was brought to the attention of Thomson in December 1939, which caused his team to initially conclude: "it seems we are working with a much too low hydrogen concentration."[83] By the 8th, Thomson's team realised that it is not the actual amount of hydrogen that was key but the ability to estimate roughly what size of bombarded sphere would become unstable during fission. This could be determined only when the number of neutrons, that could be expected to be released after a collision, was established. By 27 January 1940, colleagues were writing to Thomson with the news that "the overall ratio is about 3.5 of which 1.8 is due to thermal neutrons. This was also what was found in other experiments by the French."[84] So the evidence for Britain's relationship with the 'giants' of other countries is plain to see in this interchange. Britain, alone, was not responsible for the conceptualisation of the atomic bomb although it was to be its crucible.

In 1940 this crucible was lit up by a flash of inspiration from two emigres now working in Birmingham. It was then fanned into life by a structured assessment process that, while being the first, was not in fact unique among the leading nations as will be seen. The problem that Frisch and Peierls faced was one that had caused the scientific community worldwide to previously play down the practicality of a nuclear weapon. To get the process of fissioning in uranium underway, it was previously assumed that U^{238} would be required in very large quantities. It was the idea that an U^{235} isotope might be produced through the enrichment process of Clusius separation, that stimulated the pair in March 1940

[82] Gowing, *Britain and Atomic Energy*, p. 37.
[83] Von Halban, Joliot and Kowarski, *Liberation of Neutrons in the Nuclear Explosion of Uranium*,1939. Michaels to Thomson, 5 Dec 1939, TMSN 1, Thomson Papers, CCA.
[84] Von Halban, Juliot and Kowarski*, Liberation of Neutrons*,1939. Michaels to Thomson, 27 January 1940, TMSN 1, Thomson Papers, CCA.

to consider theoretically what cross-section dimension of a sphere would be required to facilitate a U^{235} nucleus being hit (as opposed to the more stable U^{238}), and thus start the necessary fission chain reaction. Gowing says that Frisch and Peierls simply asked the right questions around U^{235}, and that these questions were not asked "for many months" in America.[85] So Gowing confirms here that the difference between Britain and America, on this specific point, existed but was not in fact substantial. This same question was, however, not asked in Germany.

After their calculations proved that enrichment moved the chances of fission by an order of magnitude, from 10^{-23} to 10^{-24}, Frisch and Peierls were left with an astounding outcome. The amount of pure U^{235} isotope that would be required to create a chain reaction, and unleash an atomic weapon, would only be a few pounds in weight and the size of an orange.[86] This was a key breakthrough in the science of military fission. Frisch asked whether they should let someone know and they agreed to report their findings to their boss, Marcus Oliphant.[87] At Oliphant's suggestion, the 'fag packet' calculation done in a moment of inspiration in the West Midlands was worked on further, and the 'Frisch-Peierls Memorandum' (actually two documents – one more technical than the other) was produced. It was striking in its clarity and prediction – "as a weapon, a super-bomb would be practically irresistible", it categorically stated.[88]

Oliphant then took the Memorandum(s) to Tizard, the chairman of the Committee for the Scientific Survey of Air Warfare (C.S.S.A.W.) whom Oliphant knew through

[85] Gowing, *Britain and Atomic Energy,* p. 42.
[86] Oral history interview in the Centre for the History of Physics, New York p 39, quoted in Rhodes, *The Making of the Atomic Bomb*, p. 324.
[87] Sir Marcus Oliphant was an Australian physicist who had also worked under Rutherford at the Cavendish Laboratory in Cambridge. He was a member of the MAUD Committee.
[88] http://www.atomicarchive.com/Docs/Begin/FrischPeierls2.shtml, Point 1, retrieved 03 August 2016.

his previous work on radar. Following this submission, some have stated that the 'Frisch-Peierls Memorandum' created the basis of an immediate plan that made the government fully cognisant of the atomic dawn.[89] The reality would be more prosaic – a new committee was formulated to establish the facts in more detail. It was still a significant moment in Britain, following on from the European discoveries of 1939, but only one such in the global development of militarised fission. The 'Frisch-Peierls Memorandum' has been described as a document that changed the world.[90] If that were true it would be reasonable to expect, as suggested by Gowing above, for it to significantly affect the process of militarising fission in multiple countries. But, as we will now see, that clear cut impact did not happen in America. America remained on its own path.

[89] Farmelo, *Churchill's Bomb*, p. 136.
[90] See Jeremy Bernstein, 'A Memorandum that Changed the World', *American Journal of Physics* Vol. 79 5 (2011), 440 - 446 and Lorna Arnold, 'A History of Nuclear Weapons: the Frisch-Peierls Memorandum', *Cold War History*, Vol. 3 No.3 (April, 2003), 111 – 126. Also recently in Farmelo, *Churchill's Bomb* – "not for nothing has the Frisch-Peierls document been called 'a memorandum that changed the world'", p. 136.

Emerging Knowledge and Anglo-American Differences

America's science did not concurrently make the connective leap in the science of atomic cross-sections as had been made by the émigré scientists in Britain. However it was not far behind Britain because, as Gowing herself points out, by 1940, "all the crucial pieces of the scientific picture of fission had now been identified, and discoveries were made almost simultaneously in several countries."[91]

A report by A.V. Hill, written in May while in Washington D.C., observed that in respect of fission science, the Americans were, apparently, not seeing any signs of "war usage emerging".[92] Hill also went on to say that "a large number of American physicists are working on or interested in the subject….they feel that it is much better that they should be pressing on with this than that our people should be wasting their time on what is scientifically very interesting, but for the present practical needs probably a wild goose chase".[93] This passage almost indicates that Hill was already being deliberately misled.[94] Gowing suggests that this exchange was a friendly piece of advice from those "well disposed" towards Britain to avoid the complexities of uranium research.[95] On balance it should more accurately be seen as the very first stirrings of American atomic awareness, exhibited even at those earliest moments when the military power of the atom was being examined.

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[91] Margaret Gowing, 'James Chadwick and the Atomic Bomb', *Notes and Records of the Royal Society of London*, Vol. 47, No. 1 (Jan., 1993), 79 – 92.
[92] Archibald Hill was a physiologist who won the Nobel Prize in 1922. He was the independent M.P. for Cambridge University between 1940 -1945, hence his ability to bridge differing elites. A. V. Hill, "Uranium – "235", 16 May 1940, AB 1/9, TNA.
[93] Ibid.
[94] See Farmelo, *Churchill's Bomb*, pp. 224 - 226, "Vannevar Bush and James Conant had been stringing the British along for months".
[95] Gowing, *Britain and Atomic Energy*, p. 44.

The insight produced by Frisch and Peierls led to the creation in Britain of the MAUD Committee of April 1940 - July 1941. The unusual name is explained in a letter to Chadwick on 20 June 1940, when Thomson describes the act of naming his secret committee in the following way - ”in order to avoid having to send all notices of the meetings in secret, it has been decided to give a non-committal name to the Sub-Committee, and this be M.A.U.D..”[96] It was as a sub-committee of the Tizard’s S.S.A.W. Committee that MAUD was originally formed, and it was specifically set up to consider the possibility of a fission bomb given the recent scientific advances. The MAUD Committee eventually comprised a list of practical, highly talented scientists - Thomson, Chairman, together with Oliphant, Blackett, Chadwick, Moon and Cockcroft. The quality of its members meant that an advocacy coalition could be generated around its conclusions.

The first informal MAUD session was on 10 April 1940 but the group acquired more autonomy in June 1940 when it was moved under the Ministry of Aircraft Production. In the meeting of 19 June 1940 matters such as concerns over the whereabouts of the Belgium government’s uranium stocks were discussed, a fact which directly related to the awful news emanating from the continent. This shows the directness of the link between the Committee’s debates and existent threats to Britain at this time: minds were being sharply focused. The Committee discussed the location of future atomic work which it is agreed should rest with ICI.[97] The difference in approach between the British and the Americans is very pronounced during this militarising phase of the fission bomb. In Britain it was to the commercial world that the authorities first turned, but in America the Army and national organisations were always the lead bodies. This led to continued

[96] Thomson to Chadwick, 20 June 1940, CHAD I/19/7, CCA.
[97] ICI was formed in December 1926 from the merger of four companies: Brunner Mond, Nobel Explosives, the United Alkali Company, and British Dyestuffs Corporation.

suspicion about motives, from both sides, as we shall see in Part Two. The need for American support was also clearly agreed even at this early stage. Here scientists were debating with other scientists and prior to the realpolitik that would be introduced later by Frederick Lindemann and others.[98] At the level of early pure science, of the 'republic', the borders of Anglo-American nuclear systems were still fluid: however the emerging plausibility of a fission weapon would soon firm up such boundaries.

Gowing also supports the view that fission development, sometimes seen as a great British achievement, was often founded on the work of the scientists of other nationalities when she highlights Halban and Kowarski's move to England, in June 1940 as France fell. The two men had been members of Joliot Curie's team which had been in the forefront of work in France designed to achieve chain reactions by bombarding unseparated uranium with neutrons slowed down by a moderator. The MAUD Committee settled them in at the Cavendish Laboratory. Without the arrival in Britain of the two French scientists and the materials that they brought with them, Gowing states that the British would not have achieved their head start at the end of World War Two in building slow-neutron reactors to produce both plutonium for bombs and also nuclear power.[99]

The minutes of the MAUD Committee are excellent evidence of how the theory of a Bomb were, during 1940 - 1941, transformed into the clear language of reality. So many matters that would become key in the coming years had early echoes here. Defence against the weapon, the American relationship and the sheer costs of development, were all raised over the coming twelve months in

[98] Frederick Lindemann had a European upbringing before settling at Oxford where he was appointed Director of the Clarendon Laboratory in 1919. He came into Churchill's orbit during the 1930's.
[99] Gowing, 'James Chadwick and the Atomic Bomb', 79 – 92.

this Committee. It was as a result of this growing maturity of thought, and emerging consensus, that the MAUD process converted the early science of the atom into the first articulated concept of militarised fission. Militarisation was, in fact, already in scientists' minds as shown as early as Oliphant's letter of June 1940, which suggested the idea that the Bomb might hypothetically be used as a revenge weapon should an invasion occur.[100]

In June 1940, and a full year before the MAUD report was actually published, Simon sent another of his letters to scientific colleagues, in this case Max Born. Born was another German émigré, then based at Edinburgh University, who became an expert in probability density functions, for which he won a Nobel Prize in 1954.This letter reflects the emerging view of feasibility of a fission weapon. It should be given added weight because it was written by someone with relevant contemporary knowledge and an international breadth of experience to allow him to make such a judgement at this time. It is thus worth quoting extensively, prior to drawing several interesting conclusions from its words -

> "It will interest you to hear – if you have not heard already – that the uranium bomb seems to become a practical proposition….Frisch and Peierls have calculated that a mass of a few kilograms of U235 would blow up and that the times would be quick enough to ensure a real "detonation"…..I have tried hard since the beginning of the war to persuade Lindemann to let me go on with this matter on a biggish scale in the Clarendon….but I had no success, however, as L. concentrated all our efforts on Admiralty work now carried out in our lab. I shall now try again

[100] Oliphant to Chadwick, 22 June 1940, CHAD I/19/3, CCA.

> after the U bomb seems so much nearer realisation and after having the support of the Birmingham people.
>
> I am afraid, however, that even if a man with a vision like L. would support the scheme that it will not be possible to get the necessary support from the industrialists and all the other slow thinking people. And that in Germany people will not be so handicapped and that they will realise the scheme before us. There is of course the hope that the Americans will get on quickly and that they will put it at our disposal. The whole thing looks rather fantastic to the layman, of course, and the lack of vision of which you speak, is the greatest disadvantage of the class ruling this country.[101]

This remarkably frank document, sent simply through the Royal Mail, makes it clear that it is the lack of engagement of other key groups that would hamper the move from theory to practice, the lack of vision, as Simon expressed it. It supports the view that, without such an advocacy coalition coming together to create consensus, as Simon (and later Lawrence in America) appreciated, the first step towards the genesis of the fission weapon could not occur. This letter also shows the contemporary realisation that industrialisation would be a further phase, and this supports the organisation of the first two parts of this thesis. The letter further highlights the key role that would be played by intermediaries such as Lindemann and Bush in creating effective coalitions around the issue. Additionally the timing of this letter reflects the juxtaposition of the developing science of the new bomb with the concerns generated by the growing wartime storm washing against the shores of the British Isles. In fact 4 June 1940 was also the last day of Operation Dynamo, the evacuation of Dunkirk, and the awareness of the seriousness of

[101] Simon to Born, 4 June 1940, FS/7/1/7/51, Simon Papers, R.S.

such events would have weighed heavily in the thoughts of émigrés such as Franz Simon. The frankness of his words may well have reflected the concerning situation facing Britain in 1940 - the holder of the Iron Cross ironically now may have feared the military success of his own country.

This scientific networking continued in August 1940 when Born advised Simon that Peierls had now employed Fuchs on the confidential work.[102] Karl Fuchs was a German theoretical physicist whose expertise was in the science of implosion. He worked on the British Tube Alloys project, at Los Alamos during Manhattan and at Harwell in the 1940s; he confessed to being a Soviet spy in 1950.[103] Simon seems to have appreciated more fully the sensitive nature of his work by the time he wrote again to Born in September.[104] The pace of theoretical work on the fission bomb had clearly picked up but the correspondence between these respected scientists continued, if not quite as frankly as before. Born then asked about the progress of Simon's work and, in effect, Born received an extraordinary commentary on the continuing pace of development of MAUD affairs. This continued into April 1941 when they discussed the likelihood of America joining war and assessed the chances as low, thinking the Russians may be a better bet.[105] Again, this seems remarkably aligned to wartime events, as Operation Barbarossa was just two months away. Simon replied promptly on 26 April 1941 saying that matters were in a state of flux but that "things are certainly progressing with us."[106]

[102] Born to Simon, 2 August 1941, FS/7/1/7/51, Simon Papers, R.S.
[103] A discussion of the effects of Fuchs spying activities on Anglo-American nuclear relations is on p. 264.
[104] Simon to Born, 4 Sept 1940, FS/7/1/7/51, Simon Papers, R.S.
[105] Born to Simon, 22 April 1941, FS/7/1/7/51, Simon Papers, R.S.
[106] Simon to Born, 26 April 1941, FS/7/1/7/51, Simon Papers, R.S.

Franz Simon's correspondence is thus a microcosm of the thoughts and actions of the atomic scientific 'republic' in this period – international, aware of the profundity of his subject and concerned to handle what many saw as the huge risks involved. It gives valuable evidence of the fact, when a consensus of thinking about fission weaponry happened first in Britain, it was still not uniquely conceived there. Britain's role can thus be explained by its own scientific heritage, its location as a place of refuge for emigres fleeing Nazi persecution but also because of its place as a part of the global science community. These were unique components but they were then given further impetus by the wartime existential pressures faced by Britain.

These existential forces also created financial concerns and, as the Second World War unfolded, the British government discussed its financial weakness and concluded that things looked grim.[107] In this respect, as would be the case later with nuclear security, America was seen as a potential saviour and much effort went into establishing effective supply arrangements.[108] In a Memorandum to the Cabinet on 16 June 1940, Arthur Greenwood, Minister without Portfolio in Churchill's wartime government, made it abundantly clear that, over and above military assistance, the best way that America could help Britain was in the removal of the ban on the grant of loans and credit. He urged that "in order to make such a change in policy we should be prepared to make any reasonable political concession" to achieve this end.[109] This Memorandum also mentions that the Americans might need to be prepared to make far reaching structural changes in their industrial base in order to gear up to help Britain, and that Americans may

[107] See CAB 66/5, Memo 45 – 'Our National Resources in relation to the War Effort', 8 February 1940, p 2, Point 7: discussing the financial picture, based on an earlier Memo by Lord Stamp (WP (40) 35), TNA.
[108] CAB 66/7, Memo 168 – 'British Strategy in a Certain Eventuality', 25 May 1940, p. 1, TNA.
[109] CAB 66/8, Memo 209, 16 June 1940, p 16, Point 9, TNA.

have to go without key items. Such an altruistic change of policy by America was highly unlikely.

Greenwood, only a week later, repeated his support for ”the amendment of the Johnson Act: to make it possible for such to secure credits”, as well urging that America put a complete block on all exports to Germany, Italy and to block the financial assets of those powers.[110] The Chancellor of the Exchequer, Kingsley Wood, agreed with this position completely and argued “the point that I would like to emphasise particularly is the vital importance of the grant of credits by the United States.”[111] However, in deference to the dominant position of America, the subsequent Telegram 1326 sent on 30 June 1940 to the British Ambassador in Washington had no specific request to amend the Johnson Act, just a reference to concerns about when the cash ran out and the difficulty of entering into long term contracts.[112] Britain was thus unwilling, or unable, to express a more forceful view. This was despite, as David Edgerton has convincingly shown, Britain was actually stronger, especially in dollar terms, at the start of the war than had previously been stated.[113] Certainly Britain used its currency reserves extensively at this time. However the concerns expressed by senior figures above, and following, reveal at least a perception of serious financial weakness vis a vis America. Sometimes perceptions can be as influential as the underlying realities.

This sense of financial angst was amplified in August when Wood revealed that British reserves had fallen to just £445m in total and that a continuance of the

[110] The Johnson Act of 1934 (U.S. Foreign Securities Act, Ch. 112, 48 Stat. 574, 18 U.S.C. § 955, 1934-04-13) prohibited loans to foreign nations who had not repaid the debt from World War One. This particularly affected Britain. It is still part of American law. CAB 66/8, Memo 219 (Revised), 25 June 1940, p. 2, Point 3, TNA.
[111] CAB 66/8, Memo 218, 24 June 1940, p. 1, TNA.
[112] CAB 66/8, Telegram 1326, 30 June 1940, TNA.
[113] Edgerton, *Britain’s War Machine*, pp. 79 – 80.

expenditure of recent weeks would see Britain bankrupt by Christmas.[114] The lack of the scale of the funds that Britain had available will be examined in more detail in Part Two in respect of its (in)ability to industrialise the Bomb. However, Wood, in common with the political elite's deeply suspicious and entrenched view of American motives, continued that "it is most important, in order to avoid complete financial dependence that we keep some in reserve even after American help has crystallised".[115] This was despite Wood being seriously perturbed at the rate at which Britain's gold and exchange resources were disappearing. Thus, even at this darkest of financial hours, Britain felt that hitching its future to the American cart completely would be the very last option.

It is clear that Britain understood that very little largesse could be expected from 'across the pond'. Again, when referencing his discussions with American Secretary of the Treasury Henry Morgenthau, Wood reflected the view that "financial help will be forthcoming, however the election goes, appears to be the view of our representatives in America…it appears prima facie unlikely that American help, will be given…without conditions and without limit".[116] These early political and financial concerns about America were reflected at an intelligence level in the MAUD meeting of 24 July 1940. This meeting was made aware that the flows of information with America, something that as we have seen was a staple of pre-fission academic life, might now start to become harder. In a letter from Merle A. Tuve at the Department of Terrestrial Magnetism, Washington, it

[114] By way of context, the cost of developing the Bomb in America, of 'Manhattan', has been put at between $1.5 and $2 *billion* dollars in Richard Hewlett and Francis Duncan, *Atomic Shield, 1947–1952. A History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1969), pp. 723 - 724 and the same figures are repeated more recently in Stephen Swartz, *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940* (Brookings Institute, 1998). CAB 66/11, Memo 324, 21 August 1940, p 2, TNA.

[115] Details of the history of mistrust in Anglo-American relations is set out in the Introduction.

[116] CAB 66/11, Memo 324, 21 August 1940, p 4, Point 13, TNA.

was explained that flows would become limited as the matter now "concerned others" – code for the creeping growth of secrecy at the governmental level in America. The July 1940 meeting was the first time that this factor was officially noticed and underscores the American policy of control from the earliest of times.[117] We see here an early indication of America's wish to create, and then keep secure, nuclear secrets. This pre-figured the actions of the McMahon Act by several years.[118]

This desire to have complete control at the official, rather than scientific, level was soon to be accelerated by the emerging potential of the fission weapon. The acceleration would be led by Vannevar Bush. Initially stimulated by the existential threat created by the outbreak of war, Bush gathered together the views of key science figures and then created a proposal about the need for an independent scientific development authority.[119] Far more driven than Briggs, he soon made contact with Harry Hopkins, Roosevelt's confidant. They spoke "the same language", as he himself put it, and this opened the door to a meeting for Bush with Roosevelt in June 1940.[120] The National Defence Research Council (NDRC) subsequently received Presidential approval, based on a single effective document - one similar to those soon to be produced by Lindemann in Britain.[121] The story of the 'genesis' of the fission bomb in America would be the story of America's rapidly emerging capability to see the atomic weapon for the huge military asset that it would become. Its reaction would be simple – to avoid sharing any critical data that might assist others in any way in the atomic field.

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[117] MAUD Committee Minutes, 24 July 1940, CHAD I/12/2, CCA.
[118] The argument that it was the McMahon Act that largely caused a rift in post-war Anglo-American relations will be disputed in detail in Part Two.
[119] Rhodes, *The Making of the Atomic Bomb*, p 337.
[120] Vannevar Bush, *Pieces of the Action* (William Morrow, 1970), p.35.
[121] Bush, *Pieces of the Action*, p. 36.

The immediate desire to acquire knowledge about fission was demonstrated by Bush when he contacted an overseas scientist, in fact a Frenchman, Juliot in June 1940, with the aim of securing cooperation on uranium.[122] Bush was acutely aware that key knowledge existed elsewhere and was looking to draw it towards him. This initial, non-British, foray was intensified by many other approaches being made across the Atlantic including, it will be argued here, the 11 October 1941 communication from Roosevelt to Churchill.[123] There was, even at this earliest of stages, a distinction between specifically scientific matters in which communication with others was possible, perhaps even necessary if key data was to be extracted, and matters of governmental policy. Sharing of critical industrial nuclear knowledge, and thus true 'cooperation', would never be on America's official policy agenda.[124]

In fact, advanced scientific knowledge was about to make its way to America's very front door without it even having to be requested. The British mission to America headed by Henry Tizard was approved by Churchill against the backdrop of a potential Nazi invasion of Britain, and with the aim of securing support in exchange for technology. The impact of existential threats as a factor in defining its nuclear strategy can be witnessed here. That a nation, an imperial power with global reach, shipped its most prized secrets to a rival shows this starkly. Churchill was not keen initially – "are we going to throw our secrets into the

[122] 'Notes of a meeting at the University of Liverpool', 30 June 1940, TMSN 3, CCA.
[123] See the Memo from Columbia University, via Briggs, to Thomson, 18 September 1941, CHAD I/12/3, CCA. For the Roosevelt - Churchill October 1941 communication, see p. 99.
[124] Bush to Conant, 9 October 1941, Bush-Conant file, f.4, Office of Scientific Research and Development, Record Group 227, U.S. National Archives (afterwards Bush-Conant File).

American lap, and see what they give us in exchange? If so, I am against it", he railed; but he ultimately agreed.[125]

Many great innovations were conveyed in a trunk by Tizard and his team.[126] The 'Frisch-Peierls Memorandum' was amongst those secrets brought over but it received a lower level of attention compared to the cavity magnetron. This detection device was based on a valve, created by John Randall and Harry Boot in 1940 at the University of Birmingham, which produced multi-kilowatt pulses at 10 cm wavelength. This made the emerging science of radar a far more practical proposition as smaller sets now needed could be installed in aircraft. This, as the Americans soon appreciated, was a precious piece of treasure being offered (and for free). In return Britain was interested in learning more about the Norden Bombsight. This also represented a significant scientific advance as its accuracy was based on constantly reassessing current conditions which recalibrated the required target point accordingly. In the circumstances of two powers acting as allies, such a fair exchange might have been expected. However Britain and America were not allies at this point, not even nominally, and the answer was: 'no'.[127] This was a concrete reflection of the poor political and economic relations between Britain and America as discussed earlier. And such prickliness would also immediately be applied to the atomic bomb as soon as its capability became clear to America. Tizard met Bush on 31 August 1940 and a series of sessions were agreed with the component parts of the NDRC. The first session saw suspicion and caution exhibited by both sides. Eventually it was the cavity

[125] Churchill to Ismay, 17 July 1940, PREM 3/475/1, TNA. See David Stafford, *Churchill and Secret Service* (Thistle Publishing, 2013) for a history of Churchill's views on secrecy.
[126] For a generalised description of the Mission and the contents conveyed to America, see Stephen Phelps, *The Tizard Mission: The Top-Secret Operation That Changed the Course of World War II* (West Holme, 2010).
[127] See David Zimmerman, *Top Secret Exchange: the Tizard Mission and the Scientific War* (McGill-Queen's Press, 1996), p. 99.

magnetron which broke the ice, and conversations over many of the innovation areas commenced at a technical level, although the fission bomb was not one of them.

The Americans did send one scientific report to the British at this time. This was the Fisk-Shockley Report of August 1940 written by Bell Labs.[128] However it was essentially focused on development in domestic energy, the so-called 'boiler' techniques, and not military applications of atomic power. Referenced in the work of Margaret Gowing, its rarity in being something shared by America during the war only serves to highlight the absence of any true cooperation between the powers. Information essentially flowed in one direction only – westwards.[129]

In the August of 1940, the MAUD Committee was debating the ability of Britain to defend itself against a German atomic strike. This was the start of the realisation of the huge pressures that the new weapon would create. This is also why the study of Anglo-American nuclear relations needs to begin at the earliest of moments. The seeds of the formation of systemic threats, which drove the requirement for the agreement of 1958, began here. The possible use of detectors was also discussed by Patrick Blackett, the future 1948 physics Nobel laureate whose left wing views would be influential post-war, and the innocence of those times, before the proof of Armageddon became plain, was all too obvious.[130] The lack of any possible defence against the fission bomb would gradually become understood.

[128] J. Fisk and W. Stockley, 'A Study of Uranium as a Source of Power', July-September 1940, RG227, ORSD/S1, Bush-Conant Files, microfilm M-1392, roll 11, folder 170, NA.
[129] Gowing, *Britain and Atomic Energy*, p. 71.
[130] MAUD Committee Minutes, 7 August 1940, CHAD I/12/2, CCA.

During this meeting another debate on the nature of an appropriate relationship with America was conducted. Some such as Cockcroft, who in fact accompanied Tizard on his mission to America, were concerned that only governmentally accredited American people should be involved.[131] The heavy hand of state control would soon descend and neither nation's people would have a full understanding of atomic development although the exchanges, 'cooperation', at the science level would still continue during the war. It was leading scientific figures, including members of the MAUD committee, who were able to continue a collaborative relationship with America during the war, while the political elites did not engage in the same, complete manner. In America figures such as Bush, far from being cooperative, will be seen to pursue a policy of separatism in Anglo-American governmental nuclear affairs.

By September 1940, the MAUD Committee suggested that Canada would be the best place for future development work to occur. This was as a halfway house between the safety of American shores and the protective links of the Dominions. A huge array of isotope production methods were also being examined by British scientists in the autumn of that year including Thermal Diffusion Method, Evaporation Method, Diffusion through Fine Holes, The Centrifuge and Velocity Selector, while ICI continued to be heavily involved as a possible producer of hexafluoride.[132] The range of investigation into isotope production techniques was significant as it reflected uncertainty over the optimum future industrial production method for U^{235}. When it launched in 1942, the 'Manhattan' programme would mirror this earlier British methodology by investigating all possible production options.

[131] MAUD Committee Minutes, 7 August 1940, CHAD I/12/2, CCA.
[132] MAUD Committee Minutes, 17 September 1940, CHAD I/12/2, CCA.

At this same time, the Cabinet was itself having difficulty deciding exactly to what degree its innovative ideas, which of course included atomic progress, should be shared with America. In a November 1940 paper, entitled 'Disclosure of Secret Information to the United States of America', Greenwood, pointed out the dilemma that if Britain actually wanted some of its ideas enacted on it would have to risk America unilaterally taking advantage of them - "the danger is obvious: on the other hand manufacture is impossible without the further disclosure asked for."[133] This same concern over the degree to which matters should be turned over to America may well have been in the mind of figures, such as Churchill, when facing requests for 'co-operation' and further information by Roosevelt in 1941.

British concerns over secrecy, and thus control, were again discussed at Cabinet on 21 November 1940, following a memo from the Chairman of the North American Supply Committee.[134] Several aspects of such policy were discussed including operational information, manufacture data and technical devices. It was this meeting that saw the Cabinet first advised of the Tizard Mission which had already "disclosed a number of our secret devices to the United States authorities" and that Tizard had concluded "that on the whole the United States had much less to tell us than we had to tell them."[135] Churchill argued that we should say that we did trust America but "that they would appreciate that we were fighting for our lives, and that it followed that there were certain secret information which we could possibly not divulge". There was also a conclusion minuted that

[133] CAB 66 / 13, Memo 441, 13 November 1940, Point 1, TNA.
[134] CAB 65 / 10 / 293, 21 November 1940, p 103, Point 6 (4), p 103, p, 103 Point 6 and p 104, Point 6, III (D), TNA.
[135] CAB 65 / 10 / 293, 21 November 1940, p 103 Point 6, TNA. See also Edgerton, *Britain's War Machine,* p.80: "there was a clear sense that the British had more to offer the Americans than vice versa".

the Prime Minister had the authority to disclose certain items to the President directly “on the understanding that this information should only be disclosed to the President’s immediate associates”.[136] This Cabinet meeting thus touched upon two matters that would be relevant for atomic programmes. Firstly that, in general, some things might just be too important to be divulged to another state – this would have to be overcome before the 1958 Agreement could be signed. Next, in the case of the most confidential matters, that just a few persons should be involved in atomic matters in one’s own country in order to ensure total secrecy. This is exactly what happened in the case of atomic policy until 1945 (on both sides of the Atlantic). The existential factor as an explicit and exceptional motivation for a policy of sharing atomic secrets by Britain is also seen here.

During the ‘Destroyers for Bases’ debate, British financial concerns were joined by geopolitical and cultural difficulties. On 27 December 1940, the Secretary of State for the Colonies, George Lloyd, wrote a hard hitting memo highlighting concerns about allowing the Americans free use of the bases that they had requested, not only from a loss of British sovereignty perspective, but also because of “the fear that the American treatment of the negro and coloured population will follow the lines notorious in the Southern United States.”[137] A wider concern about America leveraging this dire situation for its long term economic hegemony was raised as it was feared America was already dominating the area.[138] The brusque methods of the American Economic Mission to the Caribbean had caused offence which suggests the start of cultural clashes that would be seen time and again during the early history of the atomic bomb. This memo also refers to Attlee’s response on 4 December 1940 that Britain would not

[136] Ibid, p 104, Point 6, III (D).
[137] CAB 66 / 14, Memo 485, 27 December 1940, Point 5, TNA.
[138] CAB 66 / 14, Memo 485, 27 December 1940, Point 7, TNA.

barter the sovereignty of any territory in exchange for war supplies, this after listing half a century of similar statements by successive British governments.[139] Thus economically, politically and even socially, the British government continued to see America as a very different, and potentially threatening, nation.

By 30 December 1940, the Cabinet was still discussing the claims of America for the bases in the Caribbean and in particular Trinidad and Bermuda. The Cabinet felt that they were being pushed too far and that ”while it went against the grain to make further concessions in this matter, we must be ready to do to avoid the risk of providing ammunition to the isolationist opponents of Roosevelt in Congress….this issue was of overriding importance and other matters must give way to it.”[140] The same feelings of the need to reluctantly appease America continued in the Cabinet debates over the Lend Lease programme in 1941. As the Bill came forward in America, criticism was heard that Britain was maybe unduly profiting from apparent American largesse and that this required a statement to be issued. Clearly this irked the Foreign Secretary, Antony Eden, but even he had to agree to work with J.G. Winant, American Ambassador to Britain, and Roosevelt to produce the necessary re assurance: “having regard to the extent to which we depended upon the help from the United States, there had been no alternative but to act upon these lines.”[141]

The overall relationship across the Atlantic at the time of the emergence of atomic military knowledge was thus a prickly one.

[139] CAB 66 / 14, Memo 485, 27 December 1940, TNA.
[140] CAB 65/10/311, 30 December 1940, p. 220, Point 7, TNA.
[141] CAB 65/19 / 77, 4 August 1941, p. 188, Point 9, TNA.

MAUD, America's Reaction and the Point of Transition

In the January of 1941 rumours about the imminent development of a fission bomb in America were discussed in MAUD. These were played down by Cockcroft who stated that "the (American) work appeared to be several months behind that carried out in this country."[142] Even in this contemporary view, however, any differential in development was once again only expressed in months, and the gap was closing.

This initial British advantage of the physics of cross-sectional fission did not mean that MAUD was safe from the scrutiny of British government accountants. There was pressure from Pye at the Air Ministry to conclude a report by the spring. Pye still probably spoke for the majority when he said "the likelihood of this research work finding an application in the present war appeared to be somewhat remote."[143] The Government, as represented by the Air Ministry, were mentioning sums in this meeting of £12,000 as being the scale of funds necessary to conclude the matter. The unrealistic nature of such initial estimates repeated the mistake made earlier in America, and made again later in Germany, as the process followed by states took a remarkably similar track. A different estimate, though still woefully inaccurate due to the lack of understanding of the scale of industrialisation that would be required, was given in the Technical Sub-Committee meeting of the same day.[144] In a progress report from the Clarendon Laboratory at Oxford, Simon now estimated that the cost of producing a Bomb would be £5m and take 18 months to construct. This warrants comparison with the final huge level of subsequent American expenditure on 'Manhattan'. The true

[142] MAUD Committee Minutes, 8 January 1941, CHAD I/12/2, CCA.
[143] Ibid.
[144] Ibid.

financial scale of militarising fission would only become plain as industrialisation actually happened.

By April 1941, Peierls had done further work on his and Frisch's earlier calculations, and was able to confirm the cross section of U^{235} was large enough to make a bomb of reasonable size a practical proposition, although spontaneous fission was unpredictable. The sense of a gathering pace in theoretical work was palpable now and the MAUD meetings soon turned to the key issue of future industrialisation. The debate involved those, such as Oliphant, who were fully convinced of the Bomb's potential and who saw the need to push on if the time window of development was to fall within this war. This view was supported by the Ministry of Aircraft Production representative, Lockspeiser, who said that such a "proposal was in general accordance with the government's attitude."[145] That the Americans wanted the work moved to them, rather than Canada, is perhaps not a shock and was confirmed by Cockcroft's comment that Dr Conant was looking to help with long term projects. On the other side there were those including Lord Melchett, and his colleague Dr Slade of ICI, who were keen to argue that the new weapon should stay firmly within Britain's sole control.[146] The most persuasive voice was that of Chadwick who considered that the time had not arrived at which a final decision on such moves was required. Oliphant deferred to him at this juncture, although his frustration would mount across the summer.

An interesting angle on the actions of ICI at this time is contained within the Lindemann Papers. There is a document headed "M.A.U.D." (once again the

[145] MAUD Committee Minutes, 9 April 1941, CHAD I/12/2, CCA.
[146] Alfred Mond, 1st Baron Melchett, merged four companies together in 1926 to form Imperial Chemical Industries (ICI).

initials structure was applied, this time by an external body) then “SUMMARY”, and is written on ICI headed paper. It is undated, but sits in the papers between letters from Lord Melchett dated 3 July 1941 and 8 July 1941, and appears to have been attached to the letter of the 3rd.[147] It is important to realise that Lindemann had enjoyed a long relationship with ICI. He was not always the independent academic that some might have assumed. To attest to this point, it should be noted that Lindemann was previously paid £250 p.a. as part of ICI’s ‘Research Council’, but a letter from Slade on 1 December 1939 advised that it was being dissolved but still offered Lindemann a paid consultancy on the same money.[148] Lindemann declined this generous offer in a letter dated 12 Dec 1939 as “I am now in principle a Civil servant”, but he stated his hope to be able to pick up the relationship after the war.[149] Clearly he saw himself permanently involved with the government should his friend, Winston Churchill, ever become Prime Minister.

The ICI document appears to be an assessment of how the nuclear weapon might work - “1. The proposal is to make bombs to be dropped from the air which will produce explosions by the release of nuclear energy”. It goes on to say that the practicality of building such bombs has been “approved of by a Scientific Committee of the highest standing in their report of the 2nd July….draft report of the M.A.U.D. technical Committee of 2 July”.[150] This was not, in fact, accurate, as only a recommendation of the validity of the fission weapon in general terms was produced by MAUD and a final report had not yet been issued. It further contains the estimate that the bomb would cost £5m and take 18 months before

[147] Lindemann papers, D 107, Nuffield College Archives, Oxford.
[148] Lindemann papers, D 101, Nuffield College Archives, Oxford.
[149] Ibid.
[150] Lindemann papers, D 107, Nuffield College Archives, Oxford.

‘3 bombs per month’ could be produced. This was an extraordinarily bullish and unrealistic document given that isotope separation was still a major issue. However the paper does allow us to gain an interesting contemporary view on the expected effectiveness of the new weapon – it says in points 5 and 6 that air sorties required to drop the bombs produced in the first year would be 36 (3 a month times 12) as opposed to 54,000 for the equivalent amount of TNT at a cost of £12m. One must ask, how long did ICI envisage a nuclear war lasting?

This summary also attached a calculation that shows very neatly that ICI’s assessment of the cost of each bomb would be £236,000. Again this is an interesting insight into the concept of the bomb as ‘just another weapon’ in the arsenal of a major power. It ends with the warning that - “8…..it is known that the enemy are working on similar lines…there is no defensive answer to this form of attack…(so)…the first side to perfect this scheme will gain a decisive and crushing victory”.[151] Therefore, and within just a day of the final MAUD session, ICI were sufficiently keen, able to cost up and then circulate such a ‘sales’ document to friends like Lindemann. This commercial approach contrasts once again with the approach taken in America. As will be seen in Part Two only a state would have the resources to build the first atomic bomb – Britain’s commercial route was doomed to failure.

The final regular meetings of the Technical and Policy Committees of MAUD were held on 2 July 1941. The big difference now was the attendance of Lindemann (recently ennobled as Lord Cherwell, although he will continue to be referred to as Lindemann in this work for consistency), following an epiphany in Oxford with Peierls and Simon in June. In the meeting itself, the main purpose was to discuss

[151] Ibid.

the draft final MAUD report and Lindemann took the opportunity of getting the subject in shape for its political acceptance. ICI again played their card that producing the fission bomb would be relatively straightforward so that they should be entrusted with the work, which also now featured a second, 'Boiler' domestic, stream of nuclear energy work. Lindemann, however, was clear "that only the bomb scheme should be put up at present" (to the Hankey Committee – the next phase in the sub governmental process) and that it should "avoid making suggestions which might be thought to intrude on the political and economic aspects of the project".[152]

Lindemann, the new convert, sensed that it was only a clear focus on a weapon of existential capability that would succeed in providing the clarity necessary for action. So, to gain maximum impact, the new device had to be uncoupled from other post-war considerations. Lindemann thus seems to have instinctively understood how to make the conditions perfect for his needs. The role of Lindemann in Britain, and then Bush in America and Heisenberg in Germany were remarkably similar.[153] Many have highlighted his activity in attracting support for the Bomb in Britain.[154] But, once again, it is as an individual that he is typically characterised as acting, while in fact it was the social and ideational role that was key in creating the necessary advocacy coalition.[155] This applied almost literally in Lindemann's case. His ability to precis complex subjects was widely

[152] MAUD Technical Committee Minutes, 2 July 1941, CHAD I/12/2, CCA.
[153] Werner Heisenberg was a German theoretical physicist and one of the key pioneers of quantum mechanics for which he was awarded the Nobel Prize in 1932.
[154] Including Ruane, *Churchill and the Bomb,* p. 47, and Farmelo, *Churchill's Bomb*, p. 187.
[155] See Karin Ingold and Frederic Varone, 'Treating Policy Brokers Seriously: Evidence from Climate Policy', *Journal of Public Administration Research* (19 July, 2011). See also an Unpublished PhD critique – Duane Bratt, *Clarifying the Policy Broker in the Advocacy Coalition Framework* (Mount Royal University, Canada, 2013), p.1, accessed at - http://www.icpublicpolicy.org/IMG/pdf/panel_82_s1_bratt.pdf.

recognised at the time, utilising the full force of accurate language, and has been acknowledged since.

Lindemann was not an early believer in the fission bomb concept and his thinking followed a path similar to many at the time. In the 1930s Lindemann was aware of the power of the atom and prepared work for Churchill on its potential capability.[156] However he, himself, could not see a clear science-based route to unlock the atom and it was this which made him a sceptic. Lindemann was in this mind-set in August 1939 when he responded to a question from Churchill about the likelihood of the Germans having an atomic weapon. Churchill was prepared to accept Lindemann's negative view completely and thus sent the reply on to Kingsley Wood, Secretary of State for Air.[157] He was certainly convinced that the Nazis did not have the atomic bomb. This was further confirmed by an undated and unsigned statement with the handwritten words "Atomic Energy" and "1939" on it, in the Lindemann Papers, which sets out the case that the effective use of uranium by the Germans as an explosive was unlikely. It concluded "for all these reasons, the fear that this discovery has provided the Nazis with some sinister, new, secret explosive with which to destroy their enemies is clearly without foundation. Dark hints will no doubt be dropped and terrifying whispers will be assiduously circulated, but it is to be hoped that nobody will be taken in by them."[158]

The key meeting in Lindemann's own process of conversion has only latterly been given the attention it deserves. While it is true that Lindemann was shrewd and

[156] Lindemann to Churchill, 26 October 1937, Lindemann Papers, E39, Nuffield College Archives, Oxford: "the nuclear forces are gigantic".
[157] Lindemann letter, 10 August 1939, in Martin Gilbert, (ed.), *Churchill, Volume V Companion*, p.1587, and also Churchill to Wood, 13 August 1939, ibid, p.1586.
[158] Lindemann Papers, D 230, Nuffield College Archives, Oxford.

kept an eye on scientific developments, including those related to future weapons, some have ignored his crucial meeting with Simon and Peierls. Farmelo ascribes the possible change in Lindemann's position on the bomb to an article in *The Times* on 7 May 1940 but then confusingly says "he seems not to have taken any specific initiatives as a result of this article".[159] Others seem to omit this meeting altogether.[160] However it is clear that Simon, a keen believer in the weapon's possibilities as we have seen earlier, asked Peierls to Oxford in June 1940 and arranged a meeting with Lindemann. This was not the first time that Simon had 'worked on' Lindemann to try to change his mind. In a letter to Lindemann dated 7 May 1940, for instance, Simon had already tried to sell the ideas of setting up a High Tension Laboratory as a place to do isotope work, following the work being done by Dunning at Columbia University, and stating that he would love to get involved.[161] Once again this also underscores the parallel science development in Britain and America. However he did not have the precise and novel information that Peierls was able to bring to the discussion. The Oxford exchange has been documented as follows – "I do not know him sufficiently well', Peierls later wrote of Lindemann, "to translate his grunts correctly but he seemed convinced ... that the whole thing ought to be taken seriously."[162]

This conversion cannot be overrated as it was the first occasion when the Bomb could truly be said to be in the hands of a person capable of creating the necessary advocacy through language and have access to the relevant decision maker(s). For the first time someone with political influence actually understood

[159] Farmelo, *Churchill's Bomb*, p.151.
[160] No mention is made at all of this meeting by Richard Rhodes, for instance.
[161] Simon to Lindemann, 7 May 1940, D 230, Lindemann Papers, Nuffield College Oxford.
[162] Ruane, *Churchill and the Bomb*, p. 47.

what was on offer. Here is clear evidence that science did lead the way at the creation phase of new weaponry. Indeed, it was a scientist who would need to 'translate' the findings of pure science into a message comprehensible to government. The atomic bomb had just entered the realm of believable security risk and the advocacy coalition now had its effective proponent, one with the ear of the most powerful figure in the land – Winston Churchill.

It would still take the editing and prose language talents of Chadwick to produce the MAUD report, agreed on 15 July, in its final effective form.[163] This would be an important step on the journey to militarised fission in Britain as the language of a weapon was first and effectively codified here. When such respected scientists started to use phrases as "an explosion of unprecedented violence" and "we feel that the present evidence is sufficient to justify the scheme being strongly pressed", the words had significantly enhanced potential.[164] A scientific consensus had been reached. It had happened in Britain first, but was neither exclusively a British product nor would it be contained within one nation. The words of Professor Walter Haworth, Head of Chemistry at Birmingham University, at the 03 July 1941 policy meeting were very apposite: the proceedings of this Committee had just moved the fission weapon in Britain from "genesis to revelation", he said.[165] Britain was indeed leading the way in the fission field at this point with its science coalesced around an effective structure.

However, as indicated by Franz Simon above, equally important work on atomic science had continued to occur at the domestic level in America in the early part of 1941, especially at Berkeley, where Seaborg chemically identified the

[163] To read the actual Reports (one report was on 'Use of Uranium for a Bomb' and the other was on 'Use of Uranium as a Source of Power') see http://fissilematerials.org/library/maud.pdf.
[164] See http://fissilematerials.org/library/maud.pdf, Points 2 and 6.
[165] MAUD Policy Committee Minute 3 July 1941, CHAD I/12/2, CCA.

existence of element 94 on February 23, 1941 and named it as Plutonium. He also showed that this element was also fissionable with slow neutrons.[166] By mid-May this work had progressed to give the conclusion that, at least in laboratory conditions, plutonium was over 100 times more likely to produce fissionable material than uranium, and thus provided another source of fuel for nuclear weapons.[167] America was working at its own pace but was making significant domestic progress towards the Bomb. However, as we have seen, a sufficiently effective advocacy group was necessary before there could be the consensus that could successfully articulate a concept of fission militarisation.

It was Lawrence who first realised that a connection across elites was required and he became a key advocate for enlarged support. He thus met with Bush on 19 March 1941 in New York to try to create enhanced connectivity with governmental figures. At that time, Bush was far more concerned with protecting his own structures and pushed Lawrence to adhere to the processes he had set up.[168] Nonetheless this agitation was this spark that led to the establishment of an American committee which paralleled MAUD. Set up by Bush, the National Academy of Science Committee included Lawrence himself together with William Coolidge and Arthur Compton and discussed the military aspects of uranium, including producing a report, in just a few weeks in May 1941. Arthur Compton was a Nobel Laureate and Professor of Physics at Chicago, and William Coolidge was a prominent and well-regarded American engineer who made significant contributions to x-ray technology - at last a qualified quorum was being assembled. One should note that the report produced, at least as it acted as a

[166] Glenn Seaborg, *Early History of Heavy Isotope Production at Berkeley* (Lawrence Berkeley Laboratory, 1976), p. 25.
[167] Seaborg, *Early History of Heavy Isotope Production at Berkeley*, p. 42.
[168] Bush to Jewett, 7 June 1941, Bush-Conant File, f.4.

scientific catalyst in America, was actually available slightly *before* the MAUD report itself. The difference was that it not contain the necessary definitive language needed to create wider agreement, and indeed it specifically stated that "it would seem to us unlikely that the use of nuclear fission can become of military importance within two years."[169]

On 28 June, 1941, and at Bush's advice, Roosevelt established the Office of Scientific Research and Development (OSRD) of which Bush became its first Director. Conant succeeded him as chairman of the NDRC, which was merged under the OSRD.[170] The OSRD was funded by Congress and this gave it a more secure platform than the earlier American atomic development bodies. Bush was aiming to control all science for the purposes of war and the fission bomb was a part, but not yet the central part, of its makeup.[171] Scholars have sometimes blamed the relative lack of pace in America on simple 'bureaucracy', but the absence of Panzers 60 miles from their capital city may also have had something to do with any differences in approach, and in urgency.[172]

In July, Bush received an unofficial draft of the MAUD report from Charles Lauritsen who, while in London, had been a guest at the 2 July 1941 meeting.[173] Bush discussed it with others in Washington but "apparently decided to wait for the official transmission of the final MAUD report."[174] It confirms that the moniker

[169] 'National Academy of Science First Report into Uranium', 17 May 1941, Bush-Conant file, f.3.
[170] http://www.presidency.ucsb.edu/ws/index.php?pid=16137.
[171] For a view on how Bush saw the ultimate structure necessary to optimise weapons' science see *' Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945* (United States Government Printing Office, Washington, 1945)
[172] Rhodes, *The Making of the Bomb*, p. 367.
[173] Lauritsen was a respected Professor of physics at Caltech, recognised for his work on radiation detection.
[174] Rhodes, *The Making of the Atomic Bomb*, p. 369.

the ‘memorandum that shook the world’ is not in fact applicable, and also that MAUD was not immediately seen as critical in America, as argued by Gowing.

The British atomic debate itself now focused increasingly on transatlantic matters. Thomson’s view had now changed and he was of the opinion that the production needed to be in America. Writing to Dr Darwin, at the Central Scientific Office in Washington in July 1941, he gave him early warning of the impending challenge that nuclear issues would present to the transatlantic relationship.[175] Darwin clearly took this warning to heart and that the transatlantic pathway was likely to become central. He therefore wrote to Hankey in August saying he had been attempting, unsuccessfully, to persuade Bush and Conant that the fission bomb should be a joint project.[176] He would not be the last Briton to try.

Even while Churchill was undertaking his first meeting with Roosevelt at Placentia Bay, on the 8 - 11 of August 1941, Anglo-American differences over world views continued to be very visible at home. Kingsley Wood was recorded as saying that Dean Acheson had stated that Lend-Lease was incompatible with Imperial Preference.[177] The Chancellor further supported Leo Amery’s view that imperial preference came first. The threat to British dominance after the war was also in ministers’ minds, and Eden minuted “that the greatest danger of all was the American desire to stop this country maintaining exchange control after the war.”[178] Great power rivalry was clear here. Such were the sensitivities at this

[175] Thomson to Darwin, 8 July 1941, TMSN, CCA.
[176] Darwin to Hankey, 2 August 1941, CAB 104/227, TNA.
[177] Dean Acheson was Assistant Secretary of State in 1941 and he implemented much of American economic policy with Britain. CAB 65/19 / 81, 12 August 1941, p. 205, Point 1, TNA.
[178] CAB 65/19 / 81, 12 August 1941, p. 205, Point 1, TNA.

time that a meeting of Dominion Prime Ministers was to be called a 'Consultation' to avoid the term 'Imperial Conference'.[179]

Churchill did, at least, form a first-hand opinion of the American President at Placentia Bay and for him it was the personal relations that he had established with Roosevelt that was the key outcome. He stated these relations to now be "warm".[180] The Prime Minister needed to create such a favourable perception as Britain's survival depended on it. Nevertheless American domestic isolationism was still a powerful political force 'back home'. Lord Beaverbrook, the Minister of Supply and Lord Halifax, former Foreign Secretary under Chamberlain and now British Ambassador in Washington, both gave feedback on their view of American public opinion to the Cabinet following visits and both had the same conclusion – "public opinion was rather static and that, failing some new development, the position in respect of supplies from the United States to this country might not develop favourably" and that when discussions were held about how to improve America's involvement with Britain "no conclusion was reached".[181] In these minutes there was a realisation that Roosevelt was merely reflecting American public opinion which was not favourable to joining a distant European war. Thus the powers are once more shown to be on differing trajectories – potentially towards very different fates. Churchill would also have noted that Roosevelt was in fact the most cunning of politicians who had, even on his return to America, made plain that America was not about to acquiesce to Churchill's principal demand and enter the war.[182]

[179] CAB 65/19 / 82, 14 August 1941, p. 213, Point 4, TNA.
[180] See Martin Gilbert, *Finest Hour* (Heinemann: 1983), pp 1160 - 1168.
[181] As Ambassador to the United States between 1941 and 1946, Halifax's role was often overshadowed by Churchill's personal relations with Roosevelt. CAB 65/19 / 86, 25 August 1941, p 236, Point 3, TNA.
[182] 'President Debarks', *New York Times*, 17 August 1941, p.1.

On the day that the Science Committee, chaired by Lord Hankey, officially received the MAUD report, 27 August 1941, Lindemann wrote directly to Churchill and continued the path of enabling atomic warfare for the first time. This was advocacy coalition building in action. Most commentators have agreed that Lindemann's involvement cut short the approval time for the fission bomb by ensuring that Churchill allowed consideration to pass quickly to the Chiefs of Staff.[183] The military duly broadened the consensus by approving the idea of the new weapon and also arguing that it should be developed in Britain.[184] Consensus and structure were now aligned in Britain. Lack of resources of the order required, together with an absence of largescale process knowledge, were to make its industrialisation in wartime Britain impossible.

As a side point, and though often quoted, the phrase in the 27 August 1941 Lindemann letter which was the most revealing was – "however much I may trust my neighbour and depend on him, I am very much averse to putting myself completely at his mercy. I would, therefore, not press the Americans to undertake this work".[185] This is important as it explains the whole nub of the nuclear dilemma, and why the relations of Britain and America needed to resolve such a concern before they could truly relate as nuclear allies. Why would one nation give away the potential power to be destroyed to another nation? This would occur only as the potential for wider nuclear confrontation deepened and came to act upon Anglo-American relations. At this stage in the Second World War (and indeed it will be argued up until 1958), the global nuclear system would not be in

[183] Churchill to Ismay, 30 August 1941, PREM 3/139/8A, TNA.
[184] Ismay to Anderson, 4 September 1941, CAB126/330, TNA.
[185] For instance see in Farmelo, *Churchill's Bomb*, p. 190; Lindemann to Churchill, 27 August 1941, CAB 126/330, TNA.

a sufficiently developed state of maturity to overcome the nationalistic temptations to keep the secrets of nuclear weaponry solely for oneself.

The watchfulness of Germany by the British science elite also continued into the autumn of 1941. Chadwick asked Simon how best to ascertain German progress and Simon suggested that Peierls and Frisch should be tasked with reviewing German periodicals to this end. Faith in the openness of science continues here – this was very different from the pre-'Manhattan' veil being brought down by Bush in behalf of the government in America. However the Birmingham pair could not find any evidence of advancement and surmised that Germany may be at a similar, research, state to Britain[186] Once again the German factor was important but not dominant.

Hankey's review of the MAUD report, issued in September 1941, supported its prosecution and Britain's nuclear programme now moved swiftly on, from Pye at the Ministry of Aircraft Production, to the control of Anderson. It was to be located in the Department of Scientific and Industrial Research, but with Canada now as the recommended (compromise) industrial base. The Canadian option was also initially supported by Thomson - "I am firmly convinced of the importance of the bomb and the desirability of locating the factory in Canada. Conant, who is also a sensible person, favours this view."[187] Perhaps it should not be surprising, given the argument being made here that America was seeking to draw atomic knowledge towards itself, that North America would consistently be a location favoured by the latter for the British programme. Wallace Akers of ICI was nominated to be the operational lead on what was, in effect, the start of the next

[186] Peierls to Chadwick, 23 September 1941, CHAD I/19/6, CCA. This followed Chadwick's letter to him of 17 September asking how best to achieve this knowledge.
[187] Thomson to Appleton, 28 November 1941, TMSN 6, CCA.

phase of the development of the fission weapon.[188] Akers selected the name 'Tube Alloys'. Clearly the aim was now true secrecy in Britain and without an initial or an anagram in sight.[189] The commercial path was effectively ended by Anderson who stated that all atomic work would be under the control of the government directly.[190] The continuing history of 'Tube Alloys' in Britain is one of the failed industrialisation of the Bomb. It will be examined in detail in Section Two.

The second occasion at which the news of Britain's progress in fission militarization was personally brought to America was Marcus Oliphant's visit. He was always outspoken in nature and he flew to America in late August 1941 in an unheated bomber, ostensibly to discuss the radar programme, but with the real intention of establishing why America was ignoring the MAUD Committee's views.[191] He attended the NDRC and described it thus - the Committee was under "the rather ineffective chairmanship of Briggs", he said, and "it discussed in detail the many different ways of separation". He went on, scientists who did the work "like Fermi and Urey and Dunning were either left off the Committee or deprived by the inertia of the Chair of all ability to hustle things."[192] Without the appropriate stimulation, no wider advocacy coalition could happen.

In Oliphant's meeting with the American Uranium Committee there is another compelling piece of evidence about how language can shift thinking. In that

[188] Wallace Akers was a British chemist and industrialist. Akers' commercial background made it hard to effectively liaise with America as they saw ICI as a potential post war atomic rival.
[189] Anderson and Akers came up with the name Tube Alloys. It was deliberately chosen to be meaningless, "with a specious air of probability about it" quoted from Gowing, *Britain and Atomic Energy,* p.109.
[190] Pye to Thomson, 10 October 1941, TMSN 6, CCA. See Clark, *Greatest Power*, pp.129 - 130.
[191] "Mark (Oliphant) is getting very notorious for outspoken and quite unjustified statements", Cockcroft private letter to his wife, February 1941, quoted in Farmelo, *Churchill's Bomb*, p.196.
[192] 'Uranium Fission: Report of a Meeting of the N.D.R.C.', MAUD Committee, August 1941', and 'Conversations with American scientists', 12 September 1941 both in TMSN 3, CCA.

meeting Oliphant's unambiguous use of the word "bomb" sent shockwaves through certain members of the American elite.[193] For proponents of the Advocacy Coalition Framework model, the approach that theorizes linking advocating actors and policy sub systems as the most efficient way to study policy change, building nuclear weapons cannot be understood without reference to a long term period of review, possibly decades, although this is now being challenged.[194] In the case of the implications of fission, the period between its discovery and its policy impact was much shorter, barely 2 years. However this must be balanced by the gradual development of nuclear physics as a discipline, which was a full half century in the making. As an overlaying factor, the impact of existential threat, exemplified here by Oliphant's use of the phrase 'bomb', has also not yet been studied in the context of the formation of such advocacy coalitions.[195]

When Oliphant next wrote to Thomson, he again talked of how the atomic information that had been given by Britain, and he believed should have galvanised and sparked American thinking far earlier, was in fact parked in a safe by Briggs and not shared. In reality it had simply been concentrated in the key decision makers' hands. In meetings with Bush and Conant, Oliphant got then no reaction to his pleas for action and sharing and he simply experienced a stonewall at this, governmental, level.[196] Rotter argues that Conant had in fact, since as early as June 1941, been clear about the future power of an atomic weapon when

[193] Nuel Davis, *Lawrence and Oppenheimer* (Simon and Schuster, 1968), p.112.
[194] For example see Christopher Weible, Paul Sabatier, Hank Jenkins-Smith, Daniel Hohrstedt, Adam Henry and Paul deLeon, 'A Quarter Century of the Advocacy Coalition Framework', *The Policy Studies Journal*, Vol. 39, No. 3 (2011), 354.
[195] The concept of 'external shock' see https://paulcairney.wordpress.com/2013/10/30/policy-concepts-in-1000-words-the-advocacy-coalition-framework/. ACF has been referenced in a policy defence concept by Tom Dyson, The Politics of German Defence and Security (Berghahn: Oxford, 2008).
[196] Oliphant to Thomson, 9 August 1941, CHAD I/12/3, CCA.

his Harvard colleague, physical chemistry Professor George Kistiakowsky, had convinced him of it.[197] Rotter states that Conant was “uncomfortably evasive” when he again met Oliphant in early September 1941, and that Bush was also very coy about what he and Conant knew about fast neutrons.[198] This again suggests that America’s move to secrecy and pursuit of the atomic monopoly was rooted in these very earliest of days.

The sense that it was Bush and Conant who now totally controlled American governmental atomic affairs is also clear from several other items of correspondence of the time. In a letter from Thomson, the MAUD Chairman’s view was that “Bush and Conant are very strict about secrecy and it was arranged that the rest of the committee (NDRC) should not be informed that we were so keenly interested in the bomb side of the work”.[199] In a letter in October, he further confirmed his view that Bush and Conant were the directing forces and, in a similar way to what would happen in Britain, control would pass to the smallest of elites as they ”keep matters a good deal in their own hands”.[200] This British awareness of the key players resulted in the MAUD report being shown only to these two individuals. Such an exercise in control supports a conclusion that, at the policy level as distinct to that of science, America was starting to embrace the potential importance of fission weaponry as a source of potential military power. Because of such power considerations, secrecy would grow and Britain would increasingly be held at arm’s length at the governmental level. This distancing was thus under way well before the McMahon Act. This also explains the lack of any actions that might have been expected to flow from the later agreements

[197] Rotter, *Hiroshima*, p. 93.
[198] Ibid, p.96.
[199] Thomson to Pye, 23 September 1941, TMSN 6, CCA.
[200] Thomson to Pye, 7 October 1941, TMSN 6, CCA.

between Roosevelt and Churchill. America did not cooperate meaningfully at the governmental level with Britain during the war years because of its pursuit of sole atomic control.

Oliphant travelled on to Berkeley in later September 1941 and continued to hold scientist to scientist conversations with Lawrence. He made the remarkable comment that "Lawrence says that he was happy about the MAUD Committee and that he only came to know of its existence by accident."[201] It seems amazing, but evidential of the argument being made here concerning the duality of Anglo-American nuclear wartime relations, that such a major figure in American science was not made aware of work that supported his long time drive for atomic weaponry. Oliphant went on "he had talks with Bush, Conant, Briggs and others, and finally Bush has set up a committee of the National Academy of Sciences….the Committee recommended, after hearing all the evidence, that the uranium work continue under greater priority".[202]

Oliphant's report was also a first reference to the inter-service rivalry that would colour the post-war American history of atomic weaponry.[203] His observations showed that the key weakness of atomic development in America in its earliest stages was tardiness in forging a coherent advocacy coalition across military, scientific and political groupings. Ironically, it would be the effective and largescale melding together of these groups within America, in the later 1950s, that provided a model for the creation of alliances with other external entities, including Britain. Oliphant however revealed that the core science was finally being developed. The language of militarised fission was finally being in America

[201] 'Notes on a conversation with E.O. Lawrence in Berkeley, 23rd – 24th September 1941', 25 September 1941, TMSN 3, CCA.
[202] Ibid.
[203] Ibid.

in the autumn of 1941. This was despite, in his view, and which again supports the argument that America's culture of atomic control initiated well before 1946, "the excessive secrecy, which cut off from the work every man of real calibre in nuclear physics."[204]

By early October 1941, Conant had officially received the full MAUD report from Thomson. The latter was asked not to mention, even to the Briggs Committee, the state of British development: "this was mainly at Bush's request."[205] The desire to retain knowledge in Bush's own hands is thus clear, while continuing to keep lines of information procurement open with the British. Yet again though, the correspondence does not point to anything being offered in return. Gowing concedes that America would have reached the same technical conclusions "before long", but argues that it was the MAUD report that made the "decisive" contribution to the American effort.[206] Somewhat contradictorily, Gowing then links Bush's next action to the American receipt of the MAUD Report. This was to despatch Pegram and Urey to Britain to investigate what was happening. This in fact suggests that Bush was not convinced by the report alone, in contrast to Gowing's assertions. Bush clearly needed domestic reassurance as to its validity.

With the suggestion that further American research might be needed post-MAUD, Bush went to see the President on 9 October 1941. Bush summarized the British findings, discussed potential costs and duration of a Bomb project, and emphasized the uncertainty of the situation. However, this was not a meeting that approved 'Manhattan' in America. The lack of militarising logic is clear from the manner in which Bush conveyed information to the President. MAUD did no more

[204] Ibid.
[205] 'Notes on Meetings and Discussions American MAUD Committee', 7 October 1941, TMSN 7, CCA.
[206] Gowing, *Britain and Atomic Energy*, p.117.

than accelerate America's own science – the two states were working largely in parallel, but without any eastbound knowledge being shared. The result was that Roosevelt instructed him to move as quickly as possible but not to go beyond research and development. A 'Top Policy Group' was founded with Bush at its head. A revised structure, which effectively sealed off scientists from decision making, was the principal outcome at this time.[207] Bush also received the President's permission to explore construction needs with the Army. He was to find out if a Bomb could be built and at what cost, but not to proceed to the production stage without further Presidential authorization. Some historians again see this moment as 'damascene', while yet at the same time admitting that it was just further research that was being prioritised.[208]

Roosevelt, as a politician who knew how to maximise a network, then asked Bush to draft a letter so that the British government could be approached 'at the top' to assist in the acquisition of this information.[209] Following that discussion, the (in)famous 11 October 1941 offer of discussions, on the prospect of jointly conducted future activity, was therefore despatched to Churchill. When correctly situated in the American chronology of fission development, it becomes far clearer that this 'offer' was part of the continuing long-term strategy by Vannevar Bush and the American government to leach out atomic knowledge.[210] There is no evidence that Bush or others actually sought a unified programme with Britain.

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[207] Bush to Jewett, 4 November 1941, Bush-Conant file, f.4. That this was not the final step can be seen in Bush's later note to Roosevelt, dated 9 March 1942, in which he reflected back that the 9 October 1941 session had essentially been one of approval of upping the pace of 'work' and research: in Bush-Conant file, f. 13. Rhodes, *Making of the Atomic Bomb*, p 379, also argues that the industrialisation of the Bomb had not yet commenced.

[208] Ruane, *Churchill and The Bomb,* p. 52.

[209] That this contact was primarily an information seeking exercise, see Ruane, *Churchill and the Bomb*, p. 52.

[210] Some authors have also seen the relationship as one of information sharing from the British side as well - See Lorna Arnold and Mark Smith Britain, *Australia and the Bomb* (Palgrave: Macmillan, 2006), p.3 – "Britain wanted exchanges of information, no more".

All his previous remarks have been seen to be to the contrary. This is in fact supported by Gowing when she refers to a letter from Bush to Darwin in late 1941, confirming that America was content with the current "administrative arrangements and funding."[211] Gowing further states that she surmises that British organisational data would fall "on unreceptive ground".[212] This hardly suggests an urgent American desire to unify fission development.

The historiography has sometimes considered Churchill's decision not to respond immediately to Roosevelt's offer as fateful.[213] Ruane, for instance, as part of his narrative that places Churchill centre stage, has argued that "historians…regard October to December 1941 as the key moment in US-UK wartime atomic relations", and expressed surprise at the tardiness of Churchill's reaction.[214] There is also a tendency here to try to explain matters once again through the failure of the other individuals involved in the various meetings – Lindemann and Anderson in particular.[215] In fact, the explanation of the 'failure' of this initiative actually rests on the policy of knowledge acquisition that America was employing. This was a probe, not a sincere invitation to join programmes. There is little evidence in the American archives to support Gowing's overall contention that "at this stage - the end of 1941 - the Americans, conscious that the British were so far ahead, wanted and proposed a joint project, jointly controlled with the British."[216] Any tardiness in Churchill's reaction resulted from a differing sense of nuclear importance in the two countries at this time. They had different objectives and had reached different stages on the fission journey. Churchill would have

[211] Gowing, *Britain and Atomic Energy*, p. 125.
[212] Ibid.
[213] Roosevelt to Churchill, 11 October 1941, CAB126/330 NA; PREM 3/139/8a, TNA.
[214] Ruane, *Churchill and the Bomb*, p.53.
[215] These two met with Frederick Hovde, the US Scientific Liaison Officer in London, on 21 November 1941, PREM 3 / 139 / 8A, TNA.
[216] Gowing, 'Britain and the Bomb', 36 – 40.

been aware of his scientists' view of America's progress as being behind Britain. The correspondence between Chadwick and Oliphant in November 1941 was indicative of this continuing perception.[217] On 10 November, Chadwick still believed that "we are some way ahead".[218] However Oliphant replied just two days later with the more accurate, but yet not accepted, assessment that: "I still feel that you, in common with many other people in this country, under-estimate seriously the extent of the American effort" and that "I shall be surprised if they do not beat us to the goal."[219]

Gowing, in her later work, argued that, in not joining programmes with America, Britain "had, in fact, missed the bus. For the Americans had launched an all-out effort to make an atomic bomb, even before the Japanese attack on Pearl Harbor in December 1941 hurled them into the war."[220] It is convenient to align the start date of Manhattan with the October exchange. This linkage is incorrect because, as we shall see in the next chapter, Manhattan did not secure formal governmental assent until June 1942. However the 'missed bus' view continues to appear in contemporary historiography.[221] In reality the Roosevelt offer was not a case of 'missing the bus' as there was not a genuine and practical offer to combine programmes. Regardless of any scientific inter-relationships that might be argued as existing, Anglo-American differences were underpinned by the complex and important geopolitical and economic factors that have been described earlier in this thesis. It was these factors that would additionally shape

[217] Sir Mark Oliphant was an Australian physicist who had studied under Rutherford at the Cavendish.
[218] Chadwick to Oliphant, 10 November 1941, CHAD I/19/3, CCA.
[219] Oliphant to Chadwick, 12 November 1941, CHAD I/19/3, CCA.
[220] Gowing, 'Britain and the Bomb', 36 – 40.
[221] See Farmelo, *Churchill's Bomb* p. 203 for a recent use of the 'missed bus' view. Also Ruane, *Churchill and the Bomb*, p.54 – "in other words, Churchill missed the bus because his advisors chained him to the bus-stop. There is something in this".

Britain's reaction to Roosevelt's approach and, with it, ongoing nuclear relations.[222] In essence, the October 1941 exchange was important because this moment of contact serves to highlight the disparate positions of Britain and America at that moment. They were on alternate trajectories with different resources, and the increasingly misaligned pace of the two programmes would mean that any unification was impossible. The October offer is actually a useful 'flash gun' moment that illuminates essential Anglo-American differences. The sources suggest that Roosevelt and Bush consistently wanted America to be in possession of as much information on what was clearly becoming seen as a route to power, but not share in return with a pre-war rival.[223] It is logical therefore that they would approach Britain at this stage of development. In the absence of a positive reply, Bush carried on regardless with his build up work and with increasing pace: for him science was the key tool in the security of his state and delay could not be tolerated.[224]

This was, nevertheless, a tipping point. It was the moment at which America's growing scale of fission development could be seen to be accelerating past a war-focused Britain. Interchange had thus far developed from the pre-war 'republic of science' between individual contributors. The connection would henceforth remain at this functional level, but would now be driven not by the purity of scientific discovery but by America's push for atomic monopoly.

[222] That a range of concerns underpinned Churchill's reaction, see Clark, *Nuclear Diplomacy,* p. 22.
[223] Roosevelt's suspicions of British Imperial intentions can be seen in Warren Kimball, *The Juggler, Franklin Roosevelt as Wartime Statesman* (Princeton University Press, 1994).
[224] *'A Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development* in Bush-Conant files, f.18. This states his view that science was the most valuable tool in the security armament of the American state.

Germany's Fission Failure and America's Move to Manhattan

In Germany during 1940 the pace had been picked up in scientific fission work and a meeting was held on 16 September 1940 to look at the possibility of a Bomb.[225] The German War Office had called the conference and afterwards fission research was consolidated under Kurt Diebner. A second conference was set for 26 September which Werner Heisenberg attended. German scientists in fact had similar qualms to Szilard concerning the magnitude of the atomic capability.[226] It was agreed that the War Office would take over the Kaiser Wilhelm Institute of Physics. This step was before MAUD had even reached its halfway point, and was a good six months before Bush's National Academy of Science Committee. Once again timings simply varied between states, while the processes remained similar.

Heisenberg and Carl von Weizsacker, a pre-war expert on nuclear fusion in stars and a predictor of the emergence of plutonium as an element, conducted experiments during 1940 and early 1941 into chain reactions and looked at the effects of moderator materials. Nevertheless work remained at an early stage. Meanwhile Paul Harteck, another physical chemist who had worked with Rutherford in Cambridge in the 1930s, was investigating isotope separation and his report to the War Office, of March 1941, once more showed the importance of language.[227] Harteck listed the fission weapon under the words 'special applications' and recommended concentrating on the production of heavy water. This hardly shouted clearly and unambiguously about a 'bomb' or an existential

[225] They principally discussed the implications of the Bohr and Wheeler paper – 'The Mechanism of Nuclear Fission', *Physical Review,* 56, 426 (1 September 1939) – which confirms just how dangerous the openness of science might have been if the Nazis had mastered fission earlier.
[226] Carl Von Weizsacker, *The Politics of Peril* (Seabury Press, 1978), p.199 - "that the discovery could not fail to radically change the political structure of the world."
[227] Irving, *Virus House*, p. 80 and p. 277.

risk. The clock was ticking in Germany but no consensus, let alone effective structures, were yet in place.[228]

A large supply of heavy water arrived in Germany in the autumn of 1941 and this opened the way for Heisenberg and von Weizsacker to successfully increase experimentation and to conclude that a chain reaction was now possible. In a journey that has some resonances with that of Simon and Peierls visit to Lindemann in Oxford just a few months before, Heisenberg decided to consult a figure who would carry weight and potentially boost the emerging advocacy consensus in Germany. He thus visited Niels Bohr in Copenhagen in October 1941. What they actually discussed is much debated, but Bohr was no man to help the Nazi war effort regardless of Heisenberg's actual motives.[229] This left Heisenberg to have to attempt the role advocacy creation on his own, and without the delivery of a MAUD or even a Compton-style report.

As the first winter descended on the new Russian front, and the casualties mounted in early 1942, Germany came under existential pressure of its own. Decisions needed to be taken about the potential for the new weapon. There followed a series of meetings and conferences that would be Germany's final genuine chance to take definitive steps on the fission bomb journey. The uranium programme was initially downgraded to sit in the Ministry of Education, instead of the War Office which had been its erstwhile home. While there, a further conference was organised in February 1942 with Germany's leading physicists

[228] See Baggott, *Atomic*, p. 38.
[229] See Rhodes, *The Making of the Atomic Bomb*, pp 383-385.This meeting is also the subject of an award winning play – 'Copenhagen' (1998) by Michael Frayn. The play simply stimulated further historical debate on the purpose of Heisenberg's visit. For a wider discussion of the relationship of Heisenberg and Bohr see his wife's account in Elizabeth Heisenberg, *Inner Exile* (Birkhauser, 1984). For a different view, effectively saying that Bohr felt the Germans were fishing for information, see Robert Oppenheimer, *Nils Bohr and His Times*, Three lectures, Oppenheimer Papers, MSS35188, Library of Congress, III, p. 7.

due to speak but this was badly organised. However, when a second event was held on 4 June 1942 at Harnack House in Berlin, it was attended by Albert Speer and Heisenberg.[230]

Language, as before, was key and this time Heisenberg emphasised the military aspect of fission. In an echo of Oliphant in America a year before, he used the word 'bomb'.[231] Speer was consequently sufficiently influenced to ask, like Pye before him, for approximations of costs and effort. Again, as before, the scientists were only able to offer research-style funding needs. This did not assure Speer of the fission bomb's credibility as an immediate weapon, especially as he was under greater wartime pressure than ever.[232] This failure to convince a potential key voice like Speer was critical. When Speer later spoke about atomic weapons with Hitler it was not in the role of a convinced advocate but as a sceptic. A negative decision was almost assured, despite reputable scientists having made the case and the structures having allowed successful experiments to be organised and funded. Andrew Rotter argues that the German bomb project foundered on two further problems – divisions and jealousies within the German science community, and a lack of coordination between the laboratories involved. Rotter believes that Heisenberg never grasped the science of fission sufficiently well to understand the relatively small amount of U^{235} that would be required, or that it was pure graphite that was needed as a moderator. This may in part be explained because the wartime German scientists were no longer an accepted part of the 'republic of science'.[233] However, as Speer ultimately put it, in the

[230] Albert Speer was an architect and operated at the highest levels of the Nazi party. From February 1942 he was Reich Minister of Armaments and War Production and in a position to carry forward any atomic proposal directly to Hitler. Rhodes, *The Making of the Atomic Bomb*, p. 404.
[231] Irving, *Virus House*, p. 108.
[232] Albert Speer, *Inside the Third Reich* (Macmillan: London, 1969), p. 226 – "I had been given the impression that the atom bomb could no longer have any bearing on the course of the war".
[233] Rotter, *Hiroshima*, p. 81.

summer of 1942 and in the absence of a believable and accurately expressed proposition, as expressed in the MAUD report in Britain, “we scuttled the project to develop an atomic bomb.”[234] By mid-1942, precisely as ‘Manhattan’ was emerging into life, conceptualisation had failed in Nazi Germany. Heisenberg’s subsequent relocation, and the interruption to uranium work following general allied military actions, further delayed progress and rendered a Nazi atomic bomb impossible even in the later wartime years.

Progress in atomic development was thus all a matter of relative timing. Franz Simon’s later correspondence with Niels Bohr gives an interesting perspective on chronology, the Nazis and the atomic Bomb. In a letter written in summer 1945, but looking back to the build-up phase of the weapon, Simon gave a startling and vivid view on the rise of Nazism -

> If there had been no Nazism in Germany and consequently no war now, then with their able scientists working in a pre-Nazi Germany favourable to Science, and with their highly efficient industrial organisation, there is no reason to think that they would not have developed this project in the same time as say workers in America, England and perhaps Russia and France, if not earlier. In this way, one might say that the outbreak of Nazism in Germany has ultimately proved a benefit: a benefit to the world, although the price was so heavy. [235]

If they had come to power just 5 years later Simon’s inference is the Nazis may have been able to ride a scientific wave towards an atomically driven victory.

[234] Speer, *Inside the Third Reich,* p. 227.
[235] Simon to Bohr, 8 August 1945, FS/7/1/7/127, Simon Papers, R.S.

Germany's nuclear experience is a lesson that fission knowledge was a commodity distributed across all the scientifically advanced nations. It is thus a mistake to ever see Anglo-American nuclear relations in isolation. They were, and still are, a part of the wider nuclear socialised world.

In the absence of knowledge of the above events, what was Britain's true feeling over the potential for German atomic weapons at this crucial time? The contemporary evidence suggests that, while the enemy needed to be observed closely, the messages back indicated, correctly, that no significant threat actually existed and that at least as much debate was over what sorts of information should be shared with the Americans.[236] A report by the Ministry of Economic Warfare's Enemy and Occupied Territories Department in February 1941 summed up the position very neatly concerning atomic affairs. It stated that "as a result of scientific researches which were in progress before the war but have lately been intensified, the importance of radioactive materials in relation to war uses has enormously increased", but it concluded that "at the moment, therefore, Germany's stock of uranium may be considered to be small….uranium must, therefore be regarded as a German deficiency, disregarding altogether any use for war purposes."[237]

It is important to appreciate that the fear of Germany was a nagging ever-present and this was used by interested parties as an excuse to push ahead, regardless of the development reality in that country. In July 1941, for example, Thomson

[236] Much of the minutes of Joint Intelligence Sub Committee, CAB 21/2651, between 1935 and May 1940 are taken up with debates over internal structures. Debates in the summer of 1941 had moved onto the possibility of allowing operational intelligence sharing with the Americans. The verdict largely was: "recent experience in London is that time is not yet ready for this move" in Telegram from Chiefs of Staff for Joint Staff Mission, CAB (41) 84/32/17, Gleam No. 77, 7 May 1941, TNA.

[237] 'Radioactive Elements: The Enemy Position', 11 February 1941, L1/329/Z, TNA.

wrote to Lindemann making exactly the point that German activity with separation techniques was a signal to accelerate progress. Thomson would have known that isotope separation, unless on the largest of scales, was merely a step in the process and not anywhere near a substantial indicator of threat. The British scientist also expressed the concern that the Germans might be working on isotope separation, rather than just heavy water, and if true "it makes the whole thing much more urgent and would be a strong argument for large scale work."[238] He also attached a note from A.V. Hill based on a conversation with John von Neumann, a Hungarian polymath with expertise in explosion physics and who had moved to America in 1933, in which he agreed that the Nazis seem to be taking it seriously. 'Seriously', though, was a long way from reality, as both Thomson and Hill would have known.

Despite the emerging reality of American steps towards the creation of an increasing closed atomic organisational system, Thomson's papers also reveal that Britain was continuing, even in December 1941, to send its most recent and best research to America. This included a group of reports written by Peierls looking at a range of issues such as membranes, diffusion and the likely size of a large scale uranium diffusion plant.[239] Bush was thus able to continue to soak up all Britain could offer and this contributed to America's ability to overtake Britain in atomic matters. There is also a clear sense that once again America was not sharing material back and just milking the discoveries of others.[240] Ironically, the conclusion that London had drawn from Oliphant's earlier reports

[238] Thomson to Lindemann, 4 July 1941, Lindemann Papers, D 230, Nuffield College Archives.
[239] Webster to Wilson, 18 December 1941, TMSN 6, CCA.
[240] Bush, *A Report to the President by Vannevar Bush.*

was simply that America was not taking Britain's atomic progress seriously enough.[241]

Following an instruction from Bush to investigate the current state of American fission knowledge, Chicago Professor Arthur Compton reported back on 6 November 1941, just one month and a day before the Japanese attack on Pearl Harbor brought America into the war.[242] Compton's findings showed that America had confirmed for itself that a critical mass of between 2 and 100 kilos of U^{235} would be enough for a fission weapon. He also provided an assessment of the costs for the necessary isotope separation in sufficient quantities.[243] This American report, written shortly after MAUD, created enough of a sense of a domestic consensus for Bush to forward its findings to Roosevelt under a cover letter on 27 November. Roosevelt did not respond until 19 January, 1942 and when he did it was after the existential shock of Pearl Harbor. The President's handwritten note read "V. B. OK-returned-I think you had best keep this in your own safe, FDR".[244] However it is important to appreciate that, once again, it was still further research albeit at a greater pace, that was being approved here, not 'Manhattan' as suggested by Gowing above.

In an interesting, and potential forewarning, insight into how the President and his Executive operated, it was noted on Churchill's return from America in January 1942 that Roosevelt might say things but that it might be hard for these to be delivered. It was felt that the White House could be rather isolated and that Roosevelt had no adequate link between his desires and the ability to execute

[241] Chadwick to Thewlis, 18 October 1941, CHAD I/12/3, CCA.
[242] Arthur Compton was a physicist who won the Nobel Prize in Physics in 1927 for his discovery of the 'Compton Effect'.
[243] Report to the President of the National Academy of Sciences by the Academy Committee on Uranium, 6 November 1941, Bush-Conant files, f.18.
[244] Ibid, Bush-Conant file, f. 13.

them.[245] Perhaps this should have been taken as a warning against relying on the non-ratified agreements that would follow. That none of the inter-leader discussions or agreements would result in legislative policy or operational implementation supports the view that Anglo-American wartime nuclear relations where never truly governmental in nature.

Britain should not have been surprised by America's separate drive towards the fission bomb and its accelerating momentum. Indeed, Thomson's reports from America gave a running commentary on its rapid development just before and especially after Pearl Harbor. Thomson saw the "good workshop facilities and apparent plenty of students" that had been created when he visited Charlottesville on 24 November 1941. His meeting with Professors Urey, Pegram and also Szilard, at Columbia University on 16 December 1941, further impressed him. It was clear to him that the "Dunning group were getting on well with the design of pipes for the diffusion apparatus". He also noted that Lawrence was now getting one microgram per hour of enriched material.[246] At the Bureau of Standards meeting on 16 January 1942, he learnt that Section S-1 was no longer part of NDRC but directly under Bush.[247] In fact Bush had written to Darwin in December 1941 setting out the reorganisation of their work with an engineering section being split out from Section S-1.

The start of the move to the realities of 'Manhattan' can be clearly detected here – 6 months before it officially began. For instance, a "Program Chief" role is mentioned and "the work is now going forward at a very much accelerated pace

[245] CAB 65 / 25 / 8, 17 January 1942, Annex 1, NA.
[246] All Thomson's reports in this section are as per the dates of each meeting and in TMSN, 6 and 7, Churchill College Cambridge Archives (CCA).
[247] The S-1 Uranium Committee was a sub group of the American National Defense Research Committee that had succeeded the Briggs Advisory Committee on Uranium. See Thomson, TMSN 7, CCA.

in all of its aspects", Bush accurately confirmed. However "matters of policy and of relationships in regard to this policy between our two countries are handled on this side by a small group in which Dr Conant and I are included, but which does not include any of the group named above" (the scientists).[248] This is continuing evidence for the requirement to create distinctions in any assessment of wartime Anglo-American cooperation. There were always two levels at play – government and science. For Bush, as his comments after the war also revealed, it was all about catching up scientifically with Britain, letting them do the fighting and ensuring American national superiority, not sharing key data on the tools of power.[249]

In the meeting of the S-1 Committee that Thomson attended on 13 February 1942, Compton stated that practical and significant work was under way on fast neutron capture and scattering, and that the Columbia/Princeton work would transfer to Chicago. This same meeting also clearly showed the emerging diversity of American sites: thus although work was being done at Chicago, research work was still being conducted intensively at the Carnegie Institute, the Bureau of Standards and Minnesota University. Thomson might also have been surprised that the Americans felt that the "size of bomb: practically solved, but more calculations by the more exact methods used in Britain are required".[250] America was continuing to make its own judgements and not relying blindly on the outcome of MAUD.

At the 25 April 1942 meeting in Washington, Thomson records that Conant mentioned the distribution of reports on activity and Thomson requested that (at

[248] Bush to Darwin, 23 December 1941, TMSN 6, CCA.
[249] Bush, *Science: The Endless Frontier*, p.3.
[250] Thomson, TMSN 7, CCA.

last) Britain actually receive this valuable progress information on industrial development.[251] However the response from Conant was not encouraging - "it was explained that the matter would probably not arise for several months."[252] This is more evidence that America, having just been given free access to MAUD by Britain, was not prepared to share key industrial atomic data in return. America had already begun to understand the potential value of generating an atomic monopoly. It was not about to share information with a state whose system of world economic dominance, as we have seen, was so deeply entrenched and a threat to America's growing influence.

By May, when Hans von Halban telegraphed Appleton about the expansion of American heavy water production, he also confirmed the significant impetus behind its programme.[253] He referenced that a doubling of their plants was seriously being considered. Halban also reported what might have been seen subliminally before – that America was ready to take the project forward and wanted to do that exclusively.[254] This reality was further witnessed by Thomson and reflected in a cable to Appleton in June - "1. Compton informed me U.S.A. tube alloys committee reorganised. It consists of Conant Briggs Compton Murphee Urey and Lawrence. There will be fewer reports…2. Proposals have been out up to the U.S. Army and probably the President asking authority to proceed on large scale plant…*Decision on 1 July* (my italics)."[255] This was further confirmed by Perrin who cabled Appleton and Akers on 8 June 1942, saying that "progress in U.S.A. enormous." [256] Thus while Britain was discussing pilot plants,

[251] Ibid.
[252] Ibid.
[253] Sir Edward Appleton was a leader on radio physics and Nobel Prize winner in 1947.
[254] Halban to Appleton for Akers, 1 May 1942, TMSN 6, CCA.
[255] Thomson to Appleton, 8 June 1942, TMSN 6, CCA.
[256] Perrin to Appleton and Akers, 8 June 1942, TMSN 6, CCA.

in America the move to the next phase of militarised fission, the full industrialisation of the 'Manhattan' project, was imminent.[257]

While atomic affairs continued to move towards a separation between the powers, the war would stimulate far greater cooperation in non-nuclear matters. Supply arrangements were now discussed using "the principle of a combined pooling of war-making resources."[258] As a result of these Anglo-American discussions, intimate governmental collaboration was actually achieved in this domain. The governments could get on well when cooperation was in the interests of both parties, it seems. The Combined Production and Resources Board was established in June 1942 and aimed to roll the production programmes of the two countries into one, and also to assure that the combined programme continually adjusted to the changing military needs of the day. Such work was valuable as it facilitated the quick resolution of production problems.[259]

A further example of transfer collaboration, in the critical area of the war at sea, was the formation of the Combined Shipping Adjustment Board. This was another area of a valuable coordination at a the time when the allies remained on the defensive. The key objective became the provision of shipping to keep Britain supplied and fed, rather than simply supplying the military needs of each individual nation. This then transitioned to the supply of shipping to underpin Operation Overlord, the allied invasion of Europe in 1944.[260] Another area of close cooperation was the Combined Chiefs of Staff, which grew out of the Washington conference declaration of December 1941.[261] The harmonisation of

[257] Appleton to Thomson, 3 March 1942, TMSN 6, CCA.
[258] W.K. Hancock and Margaret Gowing, *British War Economy* (London, HMSO, 1949), p. 381.
[259] Ibid, pp. 399 – 400.
[260] Ibid, pp. 426 - 437.
[261] Ibid, p. 405.

grand strategy took some years to achieve, not least because disagreements persisted amongst senior politicians and service chiefs about when a cross-channel assault was to be launched, the value of fighting in Italy and the war at sea. As a result of the wartime summits between Roosevelt and Churchill, and latterly Stalin as the 'Big Three', strategic planning of conventional coalition warfare eventually become a more integrated activity. So collaboration at the governmental level could happen. Its existence in other areas simply highlights what was absent in atomic affairs.

Let us now turn to the point at which 'Manhattan' was formerly initiated and how this decision was conveyed to Britain. When did Roosevelt actually approve 'Manhattan', and was 1 July 1942 (as mentioned above) a key date? The final American move to the full conceptualisation of the bomb as a viable weapon would be based on continued consensus and structural support, as in Britain before. The increasing speed and development of an appropriate advocacy coalition reflected the urgency of America's new wartime status. In March 1942, Bush sent a report to Roosevelt suggesting that Army be more integrated into the project, still officially one of research at this date, and that plants be established later in the year. Once again however, it is the wording used that is key to the Report's likely reception and outcome. In it, Bush refers to the realisation as "the way to full accomplishment is exceedingly difficult" and there was certainly no mention of the word 'bomb'.[262] Further, this report references the British code name for atomic development – 'Tube Alloys' – again sending subliminal messages about lack of American ownership to the President. Additionally this report showed that the German threat, while referenced, was again a concern but

[262] 'Report to the President: Status of Tube Alloys Development', March 1942, Bush-Conant File f 13.

not a driver. America wanted the fission weapon for positive control not reactive threat.[263]

In his reply, Roosevelt focused on the area that Bush's appeal seemed to highlight – time. He handwrote the word "push" on the document.[264] Once again, in the absence of the necessary precise language to support action, it was a case of just further accelerating current research. The main outcome was in the development of structure and in May Bush formed the S-1 Executive Committee. The aim was to further segregate the research and industrial components, the latter of which the military would adopt, and thus streamline the atomic work in hand.[265]

An American scientific consensus converged over the first six months of 1942. This consensus is described in the increasingly amazed reports of Thomson, Halban and others above, and confirmed that America's domestic science community now concurred that weaponised fission was possible. This sense of development in atomic affairs was summed up in the words of Glenn Seaborg at this time when he said "no matter what you do for the rest of your life, nothing will be as important to the future of the World as your work on this Project right now."[266] Conant was also now discussing the sort of financial investment that gave a vital credibility to the programme. Figures of $500,000,000 were being openly canvassed.[267]

[263] Bush to Roosevelt, 9 March 1942, Bush-Conant file, f.13.
[264] Roosevelt to Bush, 11 March 1942, Bush-Conant File, f 13.
[265] *MDH*, Vol.1, p. 3 - on this structural re-focus "thus, in a sense, confirming officially the direction of work that already existed unofficially."
[266] Glenn Seaborg was a chemist whose investigation of ten trans-uranium elements earned him a share of the 1951 Nobel Prize in Chemistry. Glenn Seaborg, *History of the Met Lab Section C-1, April 1942 to April 1943* (Lawrence Berkeley Laboratory, 1977), p. 42.
[267] Conant to Bush, 14 May 1942, Bush-Conant File, f 5.

The British Minister of Production, Oliver Lyttelton's, report back to the Cabinet should have left no one in any doubt on the huge resources being mustered in America, and in contrast to what was available in Britain. This gap in financial capability between Britain and America would soon apply specifically to the atomic programme and would be a telling factor during the relative industrialisation, or wartime lack of it, of the new bomb in Britain.[268] What was now needed in America was the final step of precise, advocacy supported language in order to permit the move to an industrialisation phase. This was provided by the Bush's report submitted to Roosevelt in June 1942.[269]

Interestingly, key American historians of the atomic bomb, such as Rhodes, do not have a rationale to explain the imminent point of transference to an industrialised programme.[270] The June report is seen by him as just one of many. However this was the key turning point between the 'genesis' and the industrialisation of the fission weapon. The succinct but effective nature of the June report, with its four sections, has resonances of Lindemann's letter of August 1941. This was a communication between two people in a 'trusting' relationship and was based on the now well understood scientific concept of the atomic bomb. Section One of the Report makes it plain that scientific agreement existed, while Section Two mentions the scale of the explosion that can be achieved, and stated "the scientists in charge of various phases of the program were unanimous in believing production of atomic bombs was possible."[271] We have here a concisely expressed consensus and codification of security risk in one document. Section Two also mentions that all the key players are in accord

[268] The Minister of Production, CAB 66/25 268, 26 June 1942, TNA.
[269] *MDH*, Vol.1, pp. 3.7-3.14.
[270] Rhodes, *The Making of the Atomic Bomb*, p, 412.
[271] *MDH*, Vol.1, p 3.8:

– the ‘program chiefs’, Chairman of the Planning Board, and all members of the S-1 Committee – which reaffirms this unity of view. They also jointly endorsed the building of plants to pursue a broad technical approach in terms of uranium refinement, mirroring the British thinking. Sections Three and Four were comments by Bush and Conant - ‘trusted voices’ - that backed the initiative and set out the tens of millions of dollars that will be required to move ahead - creating believable scale to match the size of the threat/opportunity expressed. They also recommended the takeover of the work by army engineers and discussed new structures required. When Bush took this forward he was acting as a ‘policy broker’ – recommending the steps to be pursued to the Executive function - in that he had the authority to conceptualise the atomic threat based on scientific consensus and the war time existential situation.[272] This was the full package needed to engage and give confidence to Roosevelt as he decided what to do. His decision was thus highly predictable – “O.K. FDR” – and by return.[273] Therefore *17 June 1942*, rather than the first of July as surmised by Thomson above, and certainly not Gowing’s pre-Pearl Harbor suggestion, is the date at which the industrialisation the first atomic bomb was actually authorised.

This is further confirmed by the letter from Bush to Roosevelt sent just two days later, contained in the FDR Library archive, which references the ‘initials’ added by the President. Perhaps Bush sent such a letter as a way of reconfirming such a momentous decision based as it was just on initials. It stated that: “the program

[272] Ibid.
[273] *MDH*, 3.6 and also Rhodes, *Making of the Atomic Bomb*, p. 412 though Rhodes does not discuss this key report in detail.

of a very confidential nature which you initialled on the seventeenth is now being put into effect."[274]

How did this decision process get reflected back to Britain and what implications did it have for Anglo-American relations? The essence of the new relationship emerging as the atomic age now dawned can be seen during the meeting of Churchill and Roosevelt at the latter's country house, Hyde Park, in New York State. The Second Washington Conference of June 1942 had many pressing matters to discuss – the outlook for Soviet resistance, the war in the Pacific and the options for a second front amongst them. However it seems clear that the issue of atomic weapons was raised by Churchill during private, undocumented discussions with Roosevelt at his country residence on 20 June 1942. This was just days after the fateful decision was taken by Roosevelt described above.

In his later memoirs Churchill set out that atomic discussions occurred here in which an equal split in the future industrialised atomic project was agreed. Historians have been sceptical about such an agreement, not just because one did not become manifested in practice, but also because of Roosevelt's renowned political skills. Reading Churchill's own words, however, gives a firm clue as to the actual outcome. His plea to Roosevelt had been that Britain and America should work totally as one. The response of the President, as documented by the only other participant in the discussion, was not 'ok, lets pool matters', but "the President said he thought the United States would have to do it."[275] That is a very different thing. Churchill was also clearly not told explicitly that 'Manhattan' had already been commissioned.

[274] Bush to Roosevelt, June 19 1942 in the FDR Library, accessed at - http://www.fdrlibrary.marist.edu/_resources/images/psf/psf000485.pdf.
[275] Churchill, *Hinge of Fate,* pp. 336 – 341.

The next day Churchill told Lord Ismay that simply an 'agreement' had been made.[276] The lack of excitement in Ismay's memoirs seems to confirm the lack of a sea change in atomic relations having been settled here.[277] Margaret Gowing, also found no further confirmations of any form of a deal.[278] This is further supported by Cabinet records which, unlike on previous occasions when Churchill gave an update on matters such as his first meeting with President Roosevelt, the atomic issue was conspicuous by its absence.[279] This was, it is true, also because of the decision to keep secrecy to the very highest levels. However it also did not indicate any intention for a broad and significant deployment of Britain's precious financial resources into a massive programme of atomic building. The conclusion seems to be warranted that the British Prime Minister, a rival leader in many respects, received the very best of Roosevelt's political repertoire – all private positivity but with a slippery lack of solidity. Indeed, the lack of formal commitment of the legislature of America, rather than the words of its Executive head, would come to shape Anglo-American relations in the years up to 1958.[280]

Gowing in fact confirms that Bush at this time, and consistent with the above analysis, considered excessive linkages including "complete technical co-operation", unwieldy and likely to cause delay. He therefore preferred that therefore the two countries should work separately "but of course there should

[276] General Hastings Ismay was the principle link between Churchill and the British Chiefs of Staff. He became the first Secretary-General of NATO in 1952.
[277] Hastings Ismay, *The Memoirs of General the Lord Ismay* (London: Heinemann, 1960), p.254, and as reflected in the Foreign Relations of the United States (hereafter FRUS), The Conferences at Washington, 1941–1942, and Casablanca, 1943, Document 267.
[278] Gowing, *Britain and Atomic Energy 1939–1945*, p. 145.
[279] CAB 65/26/82, 27 June 1942, TNA - this was the first Cabinet following Hyde Park that Churchill attended and there is no mention of anything other than the Administration's "staunch" support.
[280] Ruane, *Churchill and The Bomb,* p. 61.

continue to be the fullest interchange of information and ideas".[281] This evidence continues to suggest that Bush's aim was that of a conscious and consistent drive for an American atomic monopoly, while using a smokescreen of dialogue to keep Britain onside. If required, this drive would be at Britain's expense. This explains the discrepancy between Bush's words and deeds. There was to be no nuclear 'special relationship' during the wartime years.

As the development of the atomic bomb moved from conceptualisation to industrialisation, with the Manhattan Engineering District being commissioned on 13 August 1942, there are several important conclusions that can be drawn from this early period.[282] The first is that all states struggled to adapt to the scale of the innovation, threat and investment suggested by nuclear warfare. Their reaction is also to hold it close and to confine evolving knowledge to the very upper echelons of the science-military-political elite. This was in common in Britain, Germany and America. The second is that it was scientists played the lead role is creating and defining the military options around fission. Next, existential events played a role. The rise of the Nazis had driven émigré scientists westwards and the arrival of the Wehrmacht at the English Channel concentrated the MAUD minds. In a lesser way, Pearl Harbor created change in America – or at least it brought a focus on security needs that made sharing with erstwhile rivals less likely. Such external pressures would grow significantly as the Soviet Union gained its own access to fission, then fusion weaponry. Forces from outside would act on American and British nuclear systems in a way that would create the requirement to change from policies of separation to ones of

[281] Gowing, *Britain and Atomic Energy*, pp. 140 – 141.
[282] The Manhattan district of New York City was the area in which the first engineering elements of America's emerging nuclear programme were based. 'Manhattan' then became the title of the whole of America's wartime bomb programme.

partnership in 1958. Finally, as soon as it could sense the prospect of power resulting from fission, America moved to create a separate path to the Bomb, shutting out its wartime conventional ally.

As these processes matured to the stage which might be termed ‘the point of ignition’, something more was required – resources, formulation and management. This was to be provided by the organisational componentry of the huge American nuclear system that was now emerging. The next part of this thesis will describe in detail how America’s nuclear structures developed during the remainder of the Second World War and their relationship to their British counterpart. It will also continue to show that Anglo-American nuclear cooperation did not exist in any meaningful way at the governmental level, even before McMahon.

In 1946 the McMahon Act would merely confirm, not create, the nature of a separated American nuclear system and its relationship to the outside world, including Britain.

Part Two

The Illusion of Anglo-American State Cooperation,

July 1942 to Hiroshima and McMahon

The events of this period, between America's decision to build the fission bomb and the McMahon Act of 1946, continue to support the argument that America and Britain were not governmental partners in the wartime atomic field. The scientists of the two countries did, however, cooperate extensively as their work, for instance at Los Alamos, attests. This a different interpretation from that of the majority of the historiography which makes no such multi-level distinction. America seized the chance to forge ahead alone in nuclear affairs as its huge resources gave it a significant advantage. Britain, on the other hand, would start the journey towards its 1958 position as a junior partner in the nuclear world.

Back in 1942 the two nations were operating in a unique set of circumstances. On the one hand they were becoming ever more aware of how the new weapon could be the key shaper of world power and were thus both desperate to get it. And yet on the other, they were also enforced partners in a common struggle against Hitler, Mussolini and Hirohito – an existential one for Britain at times. Indeed their troops were dying together daily on the world's battlefields. The leaders of Britain and America were thus constrained to mind both the imperatives of 'today', while looking towards the conditions of 'tomorrow'. This is the background for the fudges, for the handwritten deals and the private conversations – the wartime leaders knew they had to keep *both* aims alive.

David Reynolds has argued that 'cooperation' can actually mean differing things, and be pursued differentially at varying levels, within states.[1] Despite this potential distinction, the narrative often produced by historians is that Britain actively sought an all-encompassing atomic partnership and that, overall, America broadly participated in that relationship.[2] The nature of this partnership has typically been based on assessments of the dealings and accords between Roosevelt and Churchill, especially that of the Quebec Agreement of 1943, which are seen as re-establishing governmental cooperation.[3] In her assessment of the 1943 Quebec Agreement, Margaret Gowing in fact summed matters up as "against a background of latent suspicion, it is remarkable that Anglo-American collaboration was in general so friendly and fruitful. This was entirely due to *personal relations* at the day-to-day working level (my italics)."[4] This thesis will argue that such an interpretation actually supports Reynolds' view that there could be multiple levels within transatlantic relations. On the one hand, scientists did continue to cooperate with each other and establish just such warm personal relations during the war; there was also coordination over uranium resources. On the other hand, America, through the actions of its President and the leaders of Manhattan, did everything possible to avoid any meaningful assistance to Britain at the industrial and policy level.

This American pursuit of sole atomic control, argued here for the first time to have originated from the outset of militarised fission, in fact contrasted starkly with the sometime fractious but ultimately effective wartime conventional partnership

[1] David Reynolds, *From World War to Cold War: Churchill, Roosevelt and the International History of the 1940s* (Oxford: Oxford University Press: 2006).
[2] See the Introduction for an analysis of such authors.
[3] Ruane, *Churchill and the Bomb*, p 73. Indeed some see the Quebec Agreement of 1943, for instance, as restoring cooperation and cordiality, in Denis Fakley, The British Mission, *Los Alamos Science* (Winter/Spring 1983).
[4] Gowing, *Britain and Atomic Energy*, p. 236.

between the allies.[5] Another new argument made in this thesis will be that the post-war McMahon Act would simply reaffirm the existing estrangement between Britain and America in atomic affairs.

One recent American writer has contextualised Manhattan as being "the product of years of scientific experimentation, ethical debate within the science community, and significant changes in the conduct of the war – all undertaken globally."[6] Such a global interaction between scientists of different nations was occurring increasingly in the shadow of the reality of fission weapons and that, gradually, "a fear of a nuclear nightmare transcended nations."[7] Additionally, Naomi Oreskes and John Krige have repeated Michael Gordin's argument that "many "national" nuclear weapons programs were actually cooperative endeavors; for example, the Manhattan Project involved British and Canadian cooperation and many European émigré *scientists* (my italics)."[8] It is interesting to note that the cooperation referred to here is particularly that of scientists. Similarly, Audra Wolfe argues that Manhattan was the largest "collaborative *scientific* project the world had ever seen, requiring the efforts of more than 150,000 people in the United States, Great Britain and Canada (my italics)."[9] She also states that it was science which was the focus as the functional area of cooperation. Wolfe does not attribute a significant role for Britain in the development of wartime atomic affairs as, for instance, MAUD is not mentioned

[5] For a narrative on Anglo-American strategic disagreements, see Thorne, *Allies of a Kind*.
[6] Rotter, *Hiroshima*, p. 3.
[7] Ibid, p. 4.
[8] Naomi Oreskes and John Krige, *Science and Technology in the Global Cold War*, (MIT Press, 2014), note 18, p. 26 quoting Gordin, *Red Cloud at Dawn* , Introduction and p. 121.
[9] Audra Wolfe, *Competing with the Soviets: Science, Technology and the State in Cold War America* (Baltimore: John Hopkins University Press, 2013), p. 10.

in her work. However Wolfe does say that Anglo-American control of uranium resources was another important area of interaction.[10]

The ebbs and flows within this story of apparent Anglo-American political atomic cooperation have been closely analysed by other historians.[11] Barton Bernstein suggested that the new supposed openness of the Quebec Agreement would mark the end of the influence of Bush and Conant, whose November 1942 memo formalised the wartime separation of atomic knowledge.[12] No such changes actually occurred. What many historians have failed to demonstrate is in what way did America actually co-operate with Britain at the governmental level? The answer, beyond resource management, is not much. Some British historians, including Gowing, have also seen episodes like the 'Bush-Conant memo' one of several turning points in Anglo-American wartime atomic relations. Further, and focusing on individuals alone, Gowing thinks that it was James Conant himself who caused the rift between the countries, based partly on his dislike of the British idea of involving the chemical company, ICI. Ruane agrees and talks of Conant's specific "Anglophobia".[13]

However any analysis of the role of individuals such as Bush and Conant shows that they opposed the sharing of atomic information with Britain consistently, although their reasons would change.[14] That Vannevar Bush had become a key figure in the American scientific/military establishment by 1942 has already been

[10] Ibid, p. 14.
[11] See Martin Gilbert, *Road to Victory: Winston S. Churchill 1941 - 1945* (Guild Publishing, 1986), p. 419.
[12] Quoted in Ruane, *Churchill and the Bomb*, p. 40. For details on the Bush-Conant memo see pages 141 – 142 and page 156 for the Quebec Agreement
[13] James Hershberg, *James B. Conant, Harvard to Hiroshima and the Making of the Nuclear Age* (Knopf Doubleday Publishing Group, 1993), p.180; Gowing considered Conant's attitude to be generally unworthy of the man - Gowing to Chadwick, 11 July 1963, CHAD/IV/12/5, CCA. Ruane, *Churchill and the Bomb*, p. 65.
[14] See Zachery, *Endless Frontiers*, p. 299 for more on Bush's change of motivation for denying other countries nuclear information.

seen during the first part of this thesis.[15] His continued senior role in wartime nuclear affairs, and indeed his decline from power, can act as a useful thread to guide an analysis of the 'Manhattan' years and the emergence of nuclear strategy in America.[16]

But what of the fact that some British scientists did actually assist in building the fission bomb for America? Some, including Rhodes, have seen their admission to Los Alamos not as the only option available to a Britain desperate to gain some benefit from its early lead, or resulting from America's desire to use free skills, but as an American intention to share weapons knowledge.[17] However no such intention ever appears in the archives. Indeed the actual contribution that British scientists made to the overall Manhattan programme is a subject of debate.[18] Ruane suggests that by being on the inside Britain actually gained more knowledge than it would have done on its own bomb project.[19] This has merit, but the point that is not made is that Britain was only at Los Alamos on American sufferance. It is also important to appreciate that such British scientific engagement is not the same as saying the British and American governments were officially cooperating throughout the war. For instance, Ruane cites just such a lack of higher level political alignment as being the cause of the failure of Britain and America to establish an immediate post-war nuclear partnership. He

[15] See the views of Alfred Loomis, a cousin of Stimson, in Henry Guerlac *'Conversation with Alfred Loomis'*, 21 May, 1945, Rad Lab, Loomis folder 49A, National Archives for New England Region, Boston.
[16] See Stanley Goldberg, 'Inventing a Climate of Opinion: Vannevar Bush and the Decision to Build the Bomb', *Isis*, 83 (1992) and the William Golden memos, 26 January, 1951, Truman Library, Independence, Missouri.
[17] Rhodes, *The Making of the Atomic Bomb*, p. 523.
[18] See Hans Berthe, quoted in Fakley, 'The British Mission', 186–189 "the work of the Theoretical Division would have been very much more difficult and very much less effective without the members of the British Mission". This omits to comment on the lack of British involvement in industrial process development. Overall, Groves viewed Britain's role as "helpful not vital" in Groves, *Now it can be Told*, p. 382.
[19] Ruane, *Churchill and the Bomb,* p. 93.

states that “since the fusing of US and UK defence policy was the only practicable way to share the atomic weapon, the two countries would need to first conclude a full blown post-war military alliance”.[20] This would prove to be largely true, but the circumstances were not right, even by 1946. Both nations would need to go through a process of maturation before the relative equilibrium of their respective nuclear systems, and the pressures of the wider systemic nuclear world, facilitated such an unprecedented relationship.

There is also the issue of how the matter of atomic development was capable of being addressed by both powers in resource terms. The traditional view was that Britain was financially weak and that American aid, from the outset, made the difference.[21] That view has also been convincingly challenged by Edgerton who establishes a narrative of British initial strength but one then supported by schemes such a Lend-Lease.[22] Edgerton’s conclusion was that the Second World War saw American strength grow, rather than merely Britain’s decline. As evidence, he points out that America’s labour pool grew by 50% during the wartime years, unleashing a huge programme of industrial growth in areas like shipbuilding, infrastructure and, indeed, atomic development.[23] There was also the fact that America did not suffer direct war damage – Pearl Harbor aside – and so was not faced with costs and dislocations of that nature. America was thus uniquely placed economically to devote the resources needed to create the first atomic bomb – if it so chose. As mentioned above, Edgerton himself points out

[20] Ruane, *Churchill and the Bomb,* p.71.
[21] See Robert Parker, *The Second World War* (Oxford, 1997), p.57 and Peter Cain and A.G. Hopkins*, British Imperialism, 1688-2000* (Harlow, 2002), p. 620.
[22] Edgerton, *Britain’s War Machine*, p.79.
[23] Ibid, p. 296.

the huge costs involved in developing the first atomic weapon – such a figure being well beyond any sensible assessment of Britain's wartime resources.[24]

Others have suggested that we should look at the relationship of the leaders for analytical insight. Some, such as Rhodes, argue that Churchill had a decisive influence over Roosevelt, and that he was able to secure agreements, including Quebec, that changed American policy.[25] Alternatively Farmelo has suggested that Churchill was duped in the series of wartime atomic agreements.[26] The new argument made here is that Churchill was very aware of the wartime 'game' that he and the President were playing, and that he was actually highly cognisant of the limitations of his powers. Churchill has also been criticised for his poor grasp of atomic affairs in general. For instance, the Prime Minister told his doctor in 1945 that America spent £400m on developing the Bomb. This figure is challenged by Ruane, who puts the cost at the more widely recognised $1.8bn. However as the wartime exchange rate was pegged at $4.03/£1, perhaps Churchill wasn't so far from the mark.[27]

Views on the behaviour of Franklin Roosevelt himself have also been part of the debate on Anglo-American wartime nuclear affairs. Martin Sherwin and Warren Kimball suggest that the President's approach was secretive and manipulative. They argue that this allowed a cloak of confusion to create flexibility.[28] The truth would in fact be that Roosevelt, the four times elected and very shrewd leader of

[24] Ibid, p. 120.
[25] "Winston Churchill turned Franklin Roosevelt's head", in Rhodes, *The Making of the Atomic Bomb,* p.500.
[26] Farmelo, *Churchill's Bomb,* p. 229.
[27] For exchange rate information see Chris Parker, A Short History of the British Pound, *World Economic Forum* (27 June 2016), accessed at https://www.weforum.org/agenda/2016/06/a-short-history-of-the-british-pound/.
[28] Martin Sherwin, *A World Destroyed: The Atomic Bomb and the Grand Alliance* (New York: A.A. Knopf, 1975), p.67-68; Warren Kimball, *Forged in War* (Ivan R. Dee, 2002), p.147.

America, adopted a conscious policy to keep the conventional alliance going while not compromising America's nuclear monopoly. As Sherwin points out, Roosevelt realised that fission "was a technological breakthrough so revolutionary that it transcended in importance even the bloody work of prosecuting World War Two."[29] The American President was in fact successful in both his conventional and atomic aims. In fact this dual approach was not that far removed from the ambitions of the British Prime Minister.

In terms of the latter stages of the war, and the role of Britain in the decision to use the first and second nuclear weapons on Japan, the historiography has two opposing views. The first is that Britain had a serious role available to it at the time, and a second which sees the matter as purely American.[30] Ruane's view is that it was, once again, Churchill's error that Britain was not more assertive at this time, although he also suggests that America was not going to allow Britain to veto any decision. Andrew Rotter has argued that the dropping of the bomb at the end of World War Two was influenced by several factors. Rotter contends that it was neither the clear cut use of a weapon on a people that deserved it, and who were looking to fight on, nor was it simply America looking to see if a weapon worked, and to establish a post war order based on it, if it did.[31] However, revealingly, he later goes on to argue that the American administration "came to see the atomic bomb as a vital instrument of wartime and post war diplomacy towards the Soviet Union."[32] The latter assertion supports the argument of the thesis that there was a conscious American policy of securing the advantages of nuclear technology. The dropping of the first fission weapons was the culmination

[29] Sherwin, *A World Destroyed*, pp. 85 - 89.
[30] Ruane, *Churchill and the Bomb*, p.149.
[31] Rotter, *Hiroshima*, pp.3 - 4.
[32] Ibid, p.155.

of that long-term American drive for atomic military power. Rotter then argues that the McMahon Act marked the ending of close pre-war relations amongst scientists and that ”the United States was no longer interested in participating in a republic of nuclear science and engineering.”[33] What is distinct here is that it will be shown that the door was closed on such information sharing far earlier than 1946. As a final example of the typical view of the historiography on the McMahon Act, Gordin states that the British are described as “the initiators of the American effort” and thus McMahon is should be seen as a major slap in the face for Britain.[34]

Part Two will contain four chapters. The first will examine this period from the start of ‘Manhattan’ until the Quebec Agreement and, using the minutes of the Tube Alloys Technical Committee as its principal focus, will chart the growing divergence of the nuclear paths of the two conventional allies. A dualism in the nature of cooperation will be pointed out. This is a view which is distinct from the existing historiography and thus re-calibrates our understanding of the wartime relationship. The next chapter will take the Anglo-American wartime atomic relationship through to the death of Roosevelt. His death marked a change away from even the veneer of cooperation with Britain and towards a frostier post-war relationship. The third chapter will chart Truman’s emerging view on the fission bomb and conclude just before the debate in Britain over the building of its own device. The final chapter will focus specifically on the debates surrounding the McMahon Act in detail, and ask whether it deserves its reputation as a significant turning point in Anglo-American nuclear relations. Throughout these four

[33] Ibid, p.276.
[34] Gordin, *Red Could at Dawn*, pp. 44 - 45.

chapters the emergence of America's nuclear social system will be charted and contrasted to its equivalent in Britain.

The immediate post wartime year would be one of reflections – on the war, on the new atomic age and on the effects of timing. Indeed, after Hiroshima, Bush made a comment very similar to that of Franz Simon – "if the scientific knowledge which rendered the development for the bomb possible had come into the world, say, five years earlier we might indeed have succumbed to the Nazis."[35] It is thus important to always bear in mind just how critical the first development of atomic weapons technology was in these dramatic years.

[35] Bush to Tate, August 3, 1945, Vannevar Bush Papers, Library of Congress, Washington, D.C..

The Technical Committee of Tube Alloys and Dualism in Anglo-American Atomic Relations, 9 July 1942 – August 1943

The British inability to build a functioning atomic weapon during the Second World War is a self-evident reality for which historians have offered several explanations.[36] What has not been highlighted before in this period is the dualism that existed in the nature of wartime cooperation between Britain and America. Collaboration existed at the level of science and uranium resource planning, but rarely at the governmental level. This multi-level analysis is at variance with the one-dimensional assessment of the existing historiography. America's active policy of atomic domination over Britain led to the latter country's fission programme increasingly becoming reactive and ineffective in nature. It foundered on a lack of resources and in the absence of critical information on industrial processes that was within America's gift to give, if it had so chosen.

A useful lens through which to view wartime atomic relations are the detailed discussions, debates and often revealing comments of the Tube Alloys Technical Sub Committee (TATSC). The Technical Sub Committee was set up in September 1941 by Sir John Anderson, and was placed under Sir Edward Appleton's Department of Industrial and Scientific Research.[37] From the time of the American decision to build the fission bomb in mid-1942, through to its final session in the post-Hiroshima world, TATSC was involved at the heart of these highly secret affairs. So secret in fact that the British Joint Intelligence Committee

[36] Farmelo blames Churchill's over reliance on individuals, specifically Lindemann, for missing the opportunity to progress quicker see Farmelo, *Churchill's Bomb*, pp. 150, 191 and 203. Others put this down to a simple lack of resources – see Jim Baggott, *Atomic, The First War of Physics*, p. 108.

[37] TATSC held its first 5 meetings prior to Roosevelt's agreement to Bush's June 1942 proposal to launch Manhattan. However this Chapter will focus on the subsequent TATSC meetings which are within the timeframe being assessed.

itself, though cleared to know of ULTRA (Bletchley Park's code breaking), were not told about Tube Alloys.[38] The leading British scientists on the Technical Committee thus had a highly privileged access to this world. The minutes of these meetings warrant greater focus than has usually been afforded them because they reveal the views of key figures in the Anglo-American atomic field. TATSC's members did not set policy and their utterances are less opaque as a result. They are thus uniquely placed to illuminate the history of this phase of early nuclear affairs.

Between 9 July 1942 and 13 February 1946 TATSC met a total of 24 times in differing countries and with new scientific and political concerns to deal with at every turn. Its structure was also very stable, in that Wallace Akers, formerly Director of Research at ICI, chaired every meeting, regardless of American antipathy towards him, and the members were also largely the same throughout.[39] TATSC's proceedings offer the chance to see Anglo-American atomic affairs of the time through a coherent and consistent framework. The first in this series of meetings, held in London on 9 July 1942, immediately gives a very clear view of how Britain's nuclear activity was very widely dispersed. The structure of this meeting reflected the university-based and largely research-led activity that still constituted the British programme. The Americans, by contrast, were already entering the industrialisation phase. Britain's move to build the fission bomb was left un-resourced as a result of the demands of conventional

[38] See Michael Goodman, *The Official History of the Joint Intelligence Committee, Volume 1*, (Routledge, 2014), p. 137.

[39] For instance, the concerns that Akers was effectively a British 'industrial mole' on behalf of ICI can be seen in Eden to Hopkins, 13 April 1943, and Halifax to Eden, 14 April 1943, in Antony Eden, *The Reckoning: the Memoirs of Antony Eden, 1st Earl of Avon* (Houghton Mifflin Co,1965), p.569. Membership of the Technical Committee consisted of: Chadwick, Simon, Halban, Peierls, and Roland Slade also from ICI as its original members, with Michael Perrin as its secretary. It was later broadened to include Charles Galton Darwin, Cockcroft, Oliphant and Feather.

war. America on the other hand had the means available to progress to the next stage and build the weapon. This meeting also reviewed Heisenberg's possible movements, again reflecting the unease that continued to exist over German progress. Finally, recent British scientific results that had obtained a 50% increase in concentration (using the Electro Magnetic method of separation) of U^{235}, and which was at least twelve times the best factor yet obtained by the Americans, were discussed. It was agreed that this new data should be cabled at once to America, perhaps reflecting how Britain wished to contribute to simply the winning of the war, despite the absence of any formal governmental partnership in the nuclear sphere.[40]

That Britain was well informed about America's scientific progress is shown by Halban's remarks in this meeting about their switch of activity to focus on graphite work, to the exclusion of heavy water. However being informed is not the same as being treated as an active partner. For Halban the American programme was already all about speed, though in his view the Americans were being hampered by "not having a first-class nuclear physicist in charge."[41] The accuracy of this observation was attested by the appointment of Robert Oppenheimer to head up the theoretical work just twelve weeks after this prescient comment. Oppenheimer was a brilliant Berkeley theoretical physicist who acted as the technical head of Manhattan, based largely at Los Alamos, and was a key figure in the success of the Bomb programme. His reluctance to countenance the move to the fusion weapon, together with his left wing sympathies, caused his spectacular fall from grace in the early 1950s. The meeting then noted that the first large plant for making element 94 would be constructed under the direction

[40] Minutes of the Tube Alloys Technical Sub Committee, 9 July 1942, Point 54, AB1, TNA.
[41] Minutes of the Tube Alloys Technical Sub Committee, 9 July 1942, Point 55, AB1, TNA.

of American Army Engineers, although there seemed to be no thoughts that the British Army might play a similar role at home. Critically, there was no mention of any America offer to share such important construction plans with Britain. The TATSC scientists were simply appraised of events, not determining them.

In August 1942, the TATSC Minutes reflect a temporary surfacing of thoughts about a British industrial programme. Franz Simon outlined the preliminaries of a full scale plant.[42] There was an additional debate about another newly formed Sub Committee, involving the industrial giants Metropolitan-Vickers and I.C.I., with the aim of determining individual plant and machine design.[43] These debates merely serve to show the massive difference in scale and ambition that already existed between 'Tube Alloys' and the 'Manhattan Programme'. Britain was not, and would not for some years, be capable of the effort required to build a fission weapon and TATSC already recognised this reality. Indeed, and perhaps giving a true sense of the differential in British thinking compared to that already confirmed in America, the September meeting even questioned the efficacy of the Bomb as a weapon. It was further suggested that nuclear contamination could easily be washed away by water. These were not points of debate in America. Additionally a discussion was held on how many bombs might be needed. In contrast, under General Leslie Groves, America would soon drive all out for one fission weapon that worked, not the "strategic problem of how many bombs might be required."[44] This difference in focus and decision making, quite apart from the

[42] Minutes of the Tube Alloys Technical Sub Committee, 14 August 1942, Point 66, AB1, TNA.
[43] Minutes of the Tube Alloys Technical Sub Committee, 14 August 1942, Point 70, AB1, TNA.
[44] Minutes of the Tube Alloys Technical Sub Committee, 9 September 1942, Points 78 and 82, AB1, TNA. Leslie Groves was born in 1896 and came to prominence when he project managed the construction of the Pentagon, before being appointed to run Manhattan. He then headed the Armed Forces Special Weapons Project, which had been created to control the military aspects of nuclear weapons. He died in 1970 at the rank of Lieutenant General.

oft-quoted reason of resource deficiency, were the characteristics that shaped the differing systemic realities of 'Tube Alloys v. Manhattan', in 1942.

The lack of any British industrialising strategy was again highlighted in the October meeting of TATSC, which confirmed the theoretical mass of a viable bomb at 10kgs and that a production rate of material of 1kg per day should be the British production plants' aim. The scientists reluctantly concluded that far more engineering and design work was needed before decisions of this nature could be taken.[45] America's complete lack of sharing of information relating to its new industrialising processes is clearly reflected here. In discussing the letters of Vannevar Bush to the Lord President, which stated that the American programme was being hampered by conflicting priorities, this group then continued its overly optimistic take on affairs by hoping that this delay might now signal the despatch of engineers from America. They might, TATSC members suggested, work with Metro Vickers on the completion of the new designs for a plant being undertaken by them.[46] These were hopes, never genuinely entertained by America, that would go unrealised. TATSC minutes once again show here that only theoretical scientific knowledge became available to Britain. Britain was not capable, given its lack of resources and the lack of details on the key industrialisation elements of American progress, of taking this forward to build its own weapon. In fact the scientists here were giving an excellent example of the very typical British approach to early transatlantic wartime atomic matters: the hope that any American hint or offer would yield meaningful interaction. Britain was looking to America almost instinctively given its wartime pressures. The lack of an American state response to such hopes gives the lie to assertions that full wartime

[45] Minutes of the Tube Alloys Technical Sub Committee, 15 October 1942, Point 85, AB1, TNA.
[46] Minutes of the Tube Alloys Technical Sub Committee, 15 October 1942, Point 88, AB1, TNA.

cooperation occurred. Cooperation would largely remain at the level of science and, latterly, resource organisation.

The role of Vannevar Bush in the Anglo-American nuclear relationship has much to tell us about how America manipulated Britain during World War Two. As has already been seen, he was a key player in the early manifestation of knowledge delays that occurred between America and its alleged nuclear ally. Bush looked to ensure that all knowledge flowed westwards only, as first highlighted in Part One when he initially benefitted from the Tizard Mission and then MAUD, both of which had kick started the transfer process. His centrality is underscored by Gowing, who dates what she regards as the temporary end of Anglo-American cooperation to the exchange of letters specifically between Bush and Anderson, in the August and September of 1942. Bush's language, as Gowing herself affirms, was always "nearer a no than a yes" in respect of cooperation between the governments.[47] This continues to support the argument of this thesis that Bush, acting as America's nuclear governmental representative, consistently pushed British attempts to draw closer to America into the long grass, while offering warm words or attendance at meetings as a sop.

In October 1942 Bush again wrote to Anderson in response to the latter's request for a formal merger of 'Tube Alloys' and 'Manhattan'. This reply had been conveniently delayed for ten weeks. It set out that America was undertaking the building of pilot plants, a full scale Electro-Magnetic separation plant and conducting additional experiments. Consequently Bush argued that this necessitated postponing any actual joining together until after the results of these activities would be known. There was no room for a shared approach here, he

[47] Gowing, *Britain and Atomic Energy*, p.147.

once again argued, although there should be lots of "close liaison."[48] American historians have supported the contention made in this thesis, that this was a stalling tactic and that Bush was at the centre of such American governmental-level activity.[49] Gowing describes this lack of cooperation as a "new policy".[50] In fact it should properly be seen as a continuance of a consistent American approach that had already started, as has been shown above, and would span the whole war years.

American engineering and construction activity increased hugely from 1942 - 1943 onwards, and it was Bush who took the lead when he suggested that General Summerville appoint a determined and full time leader for this mammoth project. He got General Groves. Bush and Groves first met on 17 September 1942 and the meeting was tense. However, Bush was experienced enough to recognise that the bullish Groves was ideal for the purpose in mind – the speedy development of a weapon during World War Two.[51] 'Manhattan' was now well structured, with Groves as the operational leader and with a Military Policy Committee to provide political linkages.[52] It had access to special funding from Congress, whose members (including a certain Harry Truman) were prepared to accept Roosevelt's assurances despite the vast sums involved. This was a well-oiled machine that would start to integrate political, scientific and industrial elements together into the world's first nuclear social system. It was also designed for delivery. This was a state actor growing its military capability in a

[48] Bush to Anderson, 1 October 1942, CAB126/41, TNA.
[49] Zachery, *Endless Frontiers*, p. 209.
[50] Gowing, *Britain and Atomic Energy*, p. 149.
[51] "Groves is going to be ok", in Bush to Conant, September 21, 1942 (Harvard University, Conant Papers, Special Subject File, 6).
[52] The 1942 MPC consisted of General Styer, Admiral Purnell and Bush/Conant. There was a looser Top Policy Group involving Stimson, Marshall and, once again, Vannevar Bush for any top level decisioning needed.

way never seen before. From the outset, the sheer speed of activity supports the view that a useable weapon, within the window of the war, was the likely aim. In October 1942 Oppenheimer was hired as the technical head of the project by Groves and the latter formed an unshakeable belief in Oppenheimer's capability to surmount the technical challenges involved. In the next 12 weeks alone, Groves approved the start of work on the major industrial sites of Manhattan – Los Alamos (Site Y – the central laboratory and ordnance centre) and the huge Oak Ridge complex in Tennessee (Site X – uranium enrichment).[53] Hanford (Site W – reactors for plutonium production) in Washington State was acquired in January 1943 and work started just 8 weeks later.[54]

Against this background of rapid domestic progress, the deliberate Bush inspired practice of stalling on Anglo-American atomic cooperation evolved into a named strategy – 'wartime use'. This was a clear statement of non-cooperative intentions on the part of the American government and needs to be fully recognised as a legitimate reflection of American wartime policy. In late 1942 growing confidence in America's technical progress, and perceptions of the costs that would be involved, underpinned a key Military Policy Committee (MPC) debate. In this MPC meeting James Conant argued that, as Britain was not in a position to actively build its own wartime bomb and that the post-war relationship should not be founded on the basis of giving away American knowledge, any cooperation should be scaled back accordingly.[55] The MPC then concluded that "there is only one reason for free interchange of secret military information between allied nations – namely, to further the prosecution of the war in which both are engaged"

[53] The X-10 area contained the experimental plutonium pile and separation facilities.
[54] The B Reactor (105-B) at Hanford was the first large-scale plutonium production reactor in the world. It was designed and built by DuPont based on an experimental design by Fermi.
[55] About American hostility to British post-war atomic advantage see Bernstein, *Uneasy Alliance*, p. 209.

and consequently, because there was *apparently* no appetite in Britain to gain a weapon during the war, discussion on this matter and thus cooperation in any true sense, would not be desirable.[56] This same reason – shared aims of winning a war through nuclear cooperation – would resurface in the 1958 debates. Only then, during the intensifying Cold War, would America see sharing as a new, now positive, strategy in the nuclear field. That would, though, be a critical realisation in the move to partnership.

This MPC decision was in fact just formalising the status quo and putting it on a more overt basis. As knowledge about the technical path towards building a fission bomb was acquired by America, it would continue to want to safeguard its investment – and the power that would flow from its' successful realisation. Recognising this American consistency at the policy level differentiates this thesis from the existing historiography. The Secretary of War, Henry Stimson, had already had conversations with the President in October about the imbalance of resource commitments between Britain and America in atomic matters, and so when the memo prepared by Conant summarising the MPC agreement was presented to Roosevelt by Bush in December 1942, the President was happy to support this view. It underpinned the primary American wartime nuclear strategy – build the fission weapon for themselves.[57] Ruane has also seen this as yet

[56] Military Policy Committee Report, December 15, 1942 (Records of the Office of the Chief of Engineers, National Archives), accessed at *http://tothosewhoserved.org/usa /ss/usass10/chapter10.html :231.* Hewlett and Anderson, *New World*, p.266 argue that these were the thoughts of Bush, Conant and Groves.

[57] See Bush to Roosevelt, December 16, 1942, with the added note of December 23, 1942; Roosevelt to Bush, December 28, 1942 (Office of the Commanding General Files, General Correspondence, Record Group 77, National Archives) referenced in *http://tothosewhoserved.org/usa/ss/usass10/chapter10.html#fn12*; also Stimson's Diary, December 26-17, 1942. Also Bush to Hopkins, March 31, 1943, confirming FDR's earlier 'approval' in Ruane: *Churchill and the Bomb*, p. 69.

another point of recalibration of policy change – it was in fact merely the formalisation of what had gone before.[58]

Bush and Conant had taken a view on what the consequences of this more open statement of divergence between the two countries might create, including the possible slowing of British scientific knowledge flows. They considered that any such reduction, given the confidence they now felt in America's own science, was acceptable. Inter-state rivalry drove them to the conclusion that minor delays to development, but which would ultimately ensure exclusive American post war military and strategic dominance, were well worth accepting.[59] They also had not banked on the superb political skills of their President who would, via the forthcoming Quebec Agreement, find a way to re-open the flow of British expertise (in the form of certain individuals nominated by America only) while not requiring any policy change in practice.

Gowing affirms the reality that, by the end of 1942, "the Americans were going to suck whatever information was still available in Britain and then eliminate any exchanges on the grounds that the British were not proceeding to large-scale plans."[60] However she does not give any examples of prior, governmentally authorised, positive activity towards Britain. No detailed information on the emerging plants being constructed, for instance, had been offered by America to Britain, as shown in the TATSC archives. This implies consistency in the American position, not radical switches. Scientists cooperated, but the American government never even made the pretence of formulating an official policy of sharing atomic information with Britain, at least before Quebec. It will be argued

[58] Ruane, *Churchill and the Bomb*, p. 69.
[59] Conant to Bush, March 25, 1943 in ibid, p.70.
[60] Gowing, *Britain and Atomic Energy*, p. 153.

here that, even then, Quebec was a clever device which created an illusion of cooperation (important because of the conventional alliance), while its mechanics meant that American control over its atomic secrets was retained.

In fact this 'new' policy was not even aimed exclusively at Britain. As would be the case later with the McMahon Act, America was an actor pursuing an atomic monopoly and *all* other parties were to be excluded. Margaret Gowing points out that actually it was the Canadians who were first advised of the implications of this policy formulation. The letter from Conant to Dean Mackenzie, the President of the National Research Council of Canada, setting out the highly restricted limits on information on the various separation processes and use of heavy water in chain reactions, amongst others, supports the argument.[61] The British were not advised until mid-January when it was also made clear that Britain would still be expected to give any useful information to America, regardless of any lack of return. Gowing argues "an era of cooperation" had ceased and that the heads of state would be the last chance of regaining that, apparently, "happy arrangement".[62] Such phrases have a powerful resonance in the historiography to this day and yet the archives do not sustain the claim that any governmental collaboration had previously occurred.

At the end of 1942 we can see the true nature of the Anglo-American relationship at this time through the conversations of British scientists in the TATSC Minutes. They show that "the narrow compartmentalism that is envisaged" was to be regretted as it would clearly threaten the longed hoped for cooperation in "the design of large scale plants."[63] Gowing sees this 'compartmentalism' as a

[61] Ibid, p. 155.
[62] Ibid, p. 157.
[63] Minutes of the Tube Alloys Technical Sub Committee, 11 December 1942, Point 98, AB1, TNA.

convenient way of imposing a “go-slow on collaboration with the British”, but the reality was even starker: that meaningful industrial/governmental collaboration had never even started.[64] The implication, in these archives, is that the scientists themselves were well aware that America’s actions suggested a threat to any lingering hopes of American support for industrialisation in Britain. The lack of such help, as consistently seen in these revealing minutes, leads to a view being created amongst the members of the Committee that Britain would have to go it alone. Anglo-American atomic industrial and governmental cooperation, even while the nations were wartime conventional allies, was not happening.

As 1943 started, the TATSC minutes continue to reveal British knowledge of American affairs as they discussed James Conant’s letter to Dean McKenzie, dated 2 January 1943, and the aforementioned memo.[65] While TATSC shows that inter-scientist communication gave Britain a perception of America’s fission programme, it was but a tantalising glimpse. Once again this primary material demonstrates that Britain was not receiving any critical American technical or industrial assistance, as might be expected if a genuine partnership existed. The minutes also state that this American governmental position was highly disappointing to Britain and had created considerable consternation at the policy level. The TATSC dialogues also reveal that British scientists were aware of the highly secretive October 1941 ‘offer’ by Roosevelt, a fact not stated elsewhere in the literature.[66]

[64] Gowing, *Britain and Atomic Energy*, p. 151.
[65] Minutes of the Tube Alloys Technical Sub Committee, 22 January 1943, Point 104 AB1, TNA; also Vincent Jones, *Manhattan, the Army and the Atomic Bomb* (Centre of Military History, Washington D.C., 2007), p. 235.
[66] Minutes of the Tube Alloys Technical Sub Committee, 22 January 1943, Point 104, AB1, TNA.

An early outcome of this now formalised American governmental policy of estrangement was experienced by Akers on 12 January 1943 when he was told that any information exchange would be subject to Groves' approval.[67] Akers conclusion is clearly set out in the 22 January 1943 TATSC minutes and his realism is in contrast to the pleading of the politicians during the forthcoming meetings across 1943. The evidence, Akers stated, now available "forced the Committee, reluctantly, to the conclusion that these American proposals are designed to give the U.S.A. a position of control in the T.A. field and to ensure to themselves the *sole use* of the results of the work both as a military weapon and for industrial purposes (my italics)."[68] Here in the minutes of the TATSC committee is a clear and accurate recognition of the Anglo-American nuclear relationship – of British scientific conceptual awareness, but yet unable to industrialise itself, and of a growing American desire to keep the fission weapon for itself.[69]

Given that it was the next step in the process of militarised fission, TATSC continued to examine options around plant building (despite the MPC's earlier and convenient assumptions to the contrary).[70] They concluded that consideration should only again be given to the possibility of constructing a full-scale separation plant in Britain. This consideration would be justified because "it now seems probable that such a step would involve less effort than was

[67] Memorandum for File, Nichols, sub: 'Mtg With Akers on Jan 12th', January 13, 1943 (Administrative Files, General Correspondence, 001 (Meetings), Manhattan District Records, National Archives).
[68] Minutes of the Tube Alloys Technical Sub Committee, 22 January 1943, AB1, TNA.
[69] Ibid.
[70] That Britain had a far higher wartime financial burden to bear, even without Manhattan, see the percentage of GDP figures committed to military expenditure for example in 1942: 52% in Britain v 31% in America. This gave very little scope for expansion into a full scale atomic Bomb programme, in Mark Harrison, *The Economic History of World War Two: Six Great Powers in International Comparison* (Cambridge, 1998), pp. 1 – 42.

previously envisaged."[71] We see the start of future British nuclear development – less expensive and smaller scale because of the lessons learnt first by America. However this was not true cooperation or partnership; it was merely the residual benefit of following America's lead.

Evidence of America's growing desire to create a useable wartime weapon for itself alone is also supported by the scale of its contemporary funding decisions. For instance, even though the gas diffusion stream, based on Simon's initial work, was taken forward by Dunning and Booth at Columbia in 1941 - 1942, the development of the appropriate barrier mechanism still needed resolution. This did not stop Groves authorising millions of dollars to be spent on a full scale plant to be built in early 1943: cash and the drive for an American weapon now led, not followed, the science at this time.[72]

It was against such a background of British frustration and growing American expenditure that the meetings of the wartime leaders proceeded. In January 1943 Churchill met Roosevelt at Casablanca and tackled Hopkins on the lack of atomic cooperation.[73] The relationship between the two leaders in nuclear matters always flattered to deceive and Casablanca was a classic case in point. The Casablanca attempt at bridging the ever widening gap with America on nuclear linkages had been stimulated by a letter to Churchill from Anderson. The latter urged an approach to the President to try to heal the "intolerable" gulf created by the Conant Memo.[74] However at the highest level, Anglo-American wartime government was often run on a personal basis and nothing was kept as personal

[71] Minutes of the Tube Alloys Technical Sub Committee, 22 January 1943, Point 104, AB1, TNA.
[72] On 14 December 1942, the Manhattan District contracted Kellex to design, build and operate a full-scale production plant. Vincent Jones, *Manhattan: The Army and the Atomic Bomb* (Center for Military History, Washington D.C., 1985), pp. 150 - 151.
[73] Gilbert, *The Road to Victory*, pp. 416 - 417.
[74] Anderson to Churchill, 11 January 1943 and Churchill marginalia, Prem 3/139/8A, TNA.

by both Roosevelt and Churchill as atomic weaponry.[75] It is highly plausible that both leaders kept things so secret simply to enable them to fully control matters and achieve the multi-level objects of the war years. At Casablanca, Churchill received a pledge from Roosevelt's confidante, Harry Hopkins, that he would raise the atomic matter with his master. That was sufficient for Churchill.[76] As so often before (and later) nothing concrete was achieved – because, at core, America did not have a policy of sharing with Britain. While conventional agreements may have been struck at Casablanca over the Italian campaign and the Far East, thus showing that governmental collaboration was possible when in America's interests, in atomic affairs Britain and America were competitors for the power of the fission weapon. America merely sought to keep its conventional ally, Britain, happy while it got on and built it.

Historians have seen Churchill's dealings with Roosevelt at this time as another missed opportunity, one in which Churchill's lack of persistence created problems that would come back to haunt him. Ruane, for instance, argues that "if Churchill had been more forceful and direct with Roosevelt he might have avoided many of the arguments and recriminations which blighted Anglo-American atomic relations over the next eight months."[77] This misreads the underlying potential of such action as it does not factor into account that, prior to its actual use, the fission weapon was still theoretical and one not in the possession of an enemy.[78]

[75] "Just before Casablanca, Churchill told Eden that 'my whole system is based on friendship with Roosevelt", in David Reynolds, *In Command of History: Churchill Fighting and Writing the Second World War* (Penguin, 2005), p. 414.
[76] Churchill (Stratagem 196) to Anderson, 23 January 1943, Prem 3/139/8A, TNA.
[77] Ruane, *Churchill and the Bomb*, p. 69.
[78] Though the significant threat of Russia was being debated; for example, see Lindemann to Churchill, 11 May 1943, Prem 3/139/8A, TNA.

Also it does not take into account the active intention of America to develop the first atomic monopoly for itself.

The increasing imbalance in the power of the two states in 1943 can be seen in the TATSC records. The costs of getting any separation machines up and running was soon put by the Sub Committee at between £1-2m and take 1-2 years, with a full plant taking a further 2-3 years at a cost of £40m, with a supporting 250,00kw power station costing a further £6.25m. The labour requirements were put at 35,000 man years. This was contrasted with the Committee's knowledge of an American Army report estimating that the contracting company, Kellex/Kellogg's, separation plant would cost $140m, but take a mere 17 months to construct given the huge and growing resources available to America. Once again simply being aware of these developments is not the same as being an active partner in what America was doing. Britain was cognisant of the scale of Manhattan because its scientists had dealings with their American counterparts. Such material was never forwarded officially by Bush or Conant to Anderson or Churchill at a governmental level. It was the realisation of the irreconcilability of capability factors that prompted TATSC, while still wanting to press ahead in Britain, to sadly conclude that "a full-scale plant could not be built during the war either because of the extent of the interference with the national effort or because the time required would be too long."[79]

Churchill complained to Hopkins about this lack of information sharing, but the responses were slow and not of any reassurance.[80] In a subsequent proposed

[79] Minutes of the Tube Alloys Technical Sub Committee, 10 February 1943, Points 107-8, AB1, TNA.

[80] Conant's Memo "drastically (limits) interchange of technical and entirely destroys (Roosevelt's) original conception" of a "combined or even jointly conducted effort between the two countries", Churchill (T.233/3) to Hopkins, 27 February 1943, Prem 3 / 139 / 8A, TNA. Also Memo from

memo to Hopkins, the words “I must shortly commit myself to full scale action” were deleted and replaced by the far less strident, but revealing, “time is passing, no information is being sent.”[81] The need to constantly request material confirms that no effective, governmentally backed, relationship existed between Britain and America in atomic affairs at this time. Limited resources, and America’s decision not share the vital data on industrialising processes, meant that Britain could not then replicate Manhattan. This continues to undermine the claim that there was an Anglo-American atomic ‘special’ wartime relationship.

The period in wartime Anglo-American relations between the Churchill - Roosevelt meetings codenamed ‘Symbol’ in January and ‘Trident’ in May 1943, was one of continued frustration for Britain. Nevertheless, a conversation between Hopkins and Roosevelt, about what Roosevelt had personally offered to Churchill previously, seems to have triggered a rare positive reaction during the Trident meeting in Washington. Britain sought a collaborative programme between wartime partners and this would require active dialogue at the governmental level. This never occurred. But Roosevelt continued with his personal policy of keeping Churchill onside and thus now appeared to assent to renewed ‘cooperation’.[82] Crucially, he did not consult internally on the matter and this suggests that this wily operator knew that such a decision was for the purposes of the occasion i.e. the wartime alliance only. It is hard to believe that Roosevelt was not undertaking a typical political manoeuvre – one that he knew would not outlast his time in office and not outlast the war. As he probably

Conant, *Interchange with British and Canadians*, in S-1, January 7, 1943 (Office of Scientific Research and Development, National Archives).

[81] Martin Gilbert, *Road to Victory*, 1986, pp. 417-418 and also Churchill to Hopkins, “In a Locked Box”, 18 March 1943, PREM 3/139/8A, folio 556, TNA.

[82] 'Conversation with the President entirely satisfactory', Churchill cabled Anderson, (Pencil 251 and 405) to London, 26 May 1943, Prem 3/139/8A, TNA.

intended, the Conant guidelines remained in place and Anglo-American nuclear wartime relations at the state level continued to be un-cooperative.

Historians have drawn attention to Roosevelt's wartime changing positions.[83] In fact, in respect of relations with Britain, he was consistent; consistent in keeping the British sweet during the war, starting to focus on post-war affairs and gaining the (still theoretical) power of the new weapon for America's sole use.[84] With Churchill needing to concentrate on matters such as the Second Front, warm sentiments and the shared ultimate goal of keeping the conventional alliance 'on the road' continued to prove enough to achieve both aims. Roosevelt was the winner, as Churchill was delighted with the President's words alone and in May 1943 he cabled Anderson that exchange of 'Tube Alloys' information was back on.[85] In reality, Roosevelt conveniently forgot to discuss these promises with Bush and nothing actually changed.[86] Indeed when Bush visited Roosevelt on 24 June 1943 he was not even advised of any alteration in course by Roosevelt. Instead Bush actually felt free to say that they should sit tight on British relations as Britain had virtually abandoned its effort, to which Roosevelt apparently nodded. [87] Nothing therefore altered.

The following month, Churchill again had to write to chase up the Trident commitments and once more, probably deliberately, there was no reply.[88] However, by 20 July 1943, Hopkins had decided that Roosevelt needed to keep Churchill onside by delivering on the offer to share information that he had

[83] Ruane, *Churchill and the Bomb*, p. 78, who imputes inconsistency to the President. See also Sherwin*, A World Destroyed*, pp. 68 and Kimball, *Forged in War*, p. 47 for other views on why Roosevelt appears to change policy.
[84] Sherwin, *World Destroyed*: pp. 84 – 85.
[85] Churchill (Pencil 251 and 405) to London, 26 May 1943, PREM3/139/8A, TNA.
[86] Ruane, *Churchill and the Bomb*, p. 79
[87] Bush Memorandum, June 24, 1943, *FRUS*, 1943 / Washington-Quebec, p. 631 – 632.
[88] Churchill to Roosevelt, 9 July 1943, PREM3/139/8A, TNA.

previously voiced. The President thus tardily wrote to Bush – the central player on the American side – to advise of a change.[89] At this very time, Bush was making one of his extremely rare visits away from Washington during the war years. In fact he was in London, as Roosevelt may well have known. Yet again, communications were delayed and Bush was thus not apprised of Roosevelt's amendments when he had to face Churchill in Downing Street. He had a difficult conversation.[90]

In the absence of any actual action on inter-government cooperation, Churchill's badgering of the President therefore had to recommence yet again.[91] The false promises of 'Trident' can also be seen in, first, the optimism of the minutes of the TATSC June meeting and then in the subsequent lack of American follow up action as reported by Perrin in July.[92] Peierls was thus very much to the point when he stated that "the present scale of British effort is appropriate to the uncertain policy position" and "there was a danger of the direction of this effort being vague owing to the uncertainty on policy."[93] The stasis at the political level is what makes the technical interactions all the more important. A dualism in relations existed that has not been pointed out in the previous historiography – science continued, while governmental relations were not cooperative. It is this activity, at the technical level, that has given rise to an illusion of overall cooperation.

Roosevelt's manoeuvrings were clearer to those in Britain who chose to avoid rose-tinted spectacles. In an interesting letter written by Akers to Perrin on 23

[89] Roosevelt to Bush, July 20, 1943, *FRUS*, 1943 / Washington-Quebec, p. 633.
[90] Bush memorandum, August 4,1943, ibid:.645; Bush, *Pieces of the Action*, p. 282.
[91] See Churchill to Roosevelt, 9 July 1943, PREM 3/139/8A, TNA.
[92] Minutes of the Tube Alloys Technical Sub Committee, 2 June and 26 July 1943, AB1, TNA.
[93] Minutes of the Tube Alloys Technical Sub Committee, 26 July 1943, Point 128, AB1, TNA.

July 1943 from Ottawa, the former stated that the Canadian Prime Minister, Mackenzie King conceded that if challenged by his own people about apparent transatlantic atomic agreements, Roosevelt would profess to know nothing. Akers went on to write that "as time went on and there were no signs that the President was doing anything we got more concerned" and that they were consequently worried by "what looked like an ominous crumbling in Roosevelt's authority". Akers put these concerns down to American domestic policy as the President faced a looming election. However he also took the view that "our scepticism about the likelihood of Roosevelt restoring co-operation in our project does not mean that we think that he did not promise in good faith."[94] Thus perhaps we should also not be too harsh on Churchill when he was being misled by his apparent wartime partner – there were many in the post-Chamberlain British governmental elite who still mistakenly believed that a gentleman's word might be his bond.

Gowing confirms that, in the first six months of 1943, even scientist to scientist communication across the Atlantic almost completely ceased.[95] She uses this as part of her argument that the Bush-Conant memo was responsible for a complete breakdown in all relations. However this was the period in which America was constructing the Manhattan infrastructure, and Los Alamos in particular. Thus the relative lack of scientific contacts in this period can in part be explained by the fact that America did not have need of British theoretical fission and explosives knowledge in this construction phase. It would encourage Britain's scientists back

[94] Akers to Perrin, 'Collaboration with Americans and Canadians. General Policy', Letter No.12, 23 July 1943 in CHAD I / 28 / 4, CCA.
[95] Gowing, *Britain and Atomic Energy*, p. 160.

across the Atlantic once it had need of them. This is the explanation for the relative reduction in communication at this specific time.

It may not therefore have been an accident that, on 27 July 1943, Churchill finally heard from Roosevelt directly that he had intervened in nuclear affairs. What actually did the President then offer – that America would be opening the doors of the newly constructed laboratories of Los Alamos, or that files would be despatched to London explaining the new industrial processes?[96] No. What was offered was that Britain's top man should be sent westward so that discussions could occur. It seems feasible that the actual intention was the continuance of the extraction of scientific knowledge while allowing the perception of interaction to grow. This saw a handful of outstanding British science minds being put to work in the latter years of the war: but for America's, not Britain's, benefit. Bush and Conant, when they eventually heard of this initiative, saw it as an error and one made by Roosevelt without full knowledge of affairs. However, it can be argued that it was they who were the ones without the fullest of understanding.[97] The conventional wartime Anglo-American alliance was essential to Roosevelt and had to be protected, even while the nuclear golden egg was being laid. Once again there is no evidence that, in practice, anything actually changed in terms of America giving Britain secret nuclear information for its national strategic benefit. This continues to support the argument that America was pursuing its own separate atomic policy with post-war power in mind.

It was Anderson who was despatched to America on 1 August 1943 with a plan to secure a written agreement – Britain perhaps had started to learn that

[96] Roosevelt (Telegram 326) to Churchill, 27 July 1943, PREM3/139/8A, TNA.
[97] Conant to Bush, July 30, 1943, FR1943/Washington-Quebec, p. 639. And in Bush, *Pieces of the Action*, p. 284.

Roosevelt needed to be pinned down. Nevertheless Anderson soon started to realise that, while those like General George C. Marshall and Secretary for War Henry Stimson might make friendly noises, the actual controllers of 'Manhattan' were not ready – indeed had not actively been encouraged – to share the intimate details that Britain sought. As Ruane has noted at this point, the penny soon dropped for Anderson that nothing in reality was really going to alter.[98] Before 'Quadrant', the codename for the Quebec meeting, even started, the Canadian Prime Minister, Mackenzie King and Anderson debated the future role of atomic weaponry and concurred that "atomic weapons will give control of the world to whatever country obtains them first", and interestingly made the point that the Soviet Union was already seen as potential nuclear threat.[99] This would mark the end of the period of American nuclear focus on just one country – Britain. Henceforth it would have to contend with multiple potential nuclear actors. The effect of this new threat would only serve to intensify the separation by America of its sealed system from the wider nuclear socialised world that was emerging.

Following Anderson's work, and given added momentum by the conventional bonds that existed at this critical mid-way point in the war, an agreement emerged at Quebec on 19 August 1943 between Britain, America and Canada. Clause four of the agreement left the keys to American industrial information to the discretion of a new Combined Policy Committee (CPC).[100] Importantly, America had a structural veto in-built to the CPC, as three of the six members were to be

[98] Anderson to Churchill, 10 August 1943, PREM3/139/8A, TNA and Ruane, *Churchill's Bomb*, p. 91.
[99] Also see King diary, 8 August 1943, in John Pickersgill,(ed.),*Mackenzie King Record, Vol. 1* (Chicago: University of Chicago Press, 1960), pp. 531 - 532.
[100] Clause Four of the Quebec Agreement is key – "d) In the field of design, construction and operation of large-scale plants, interchange of information and ideas shall be regulated by such ad hoc arrangements as may, in each section of the field, appear to be necessary or desirable if the project is to be brought to fruition at the earliest moment. Such ad hoc arrangements shall be subject to the approval of the Policy Committee".

Americans. This supports the argument that America created a structure deliberately designed to avoid giving any atomic knowledge to others, beyond what they saw fit. Additionally, Bush and Conant were not even invited to Quebec, suggesting that this agreement was indeed more about the conventional wartime alliance than any genuine and meaningful atomic sharing commitment. In fact at Quebec Roosevelt had pulled off perhaps the biggest success of his wartime atomic strategy. Britain was kept on board and yet America's own atomic power was protected. Churchill, similarly to Roosevelt, needed the two allies to work together at least as much in conventional terms as atomic ones. Thus Quebec also represented a success in Churchill's own personal crusade to keep close to Roosevelt.[101] Finally the Quebec Agreement could not accurately be described as 'governmental', given the lack of approval by either the American or British legislatures.

The question was then – would this agreement, concluded only after much activity at the highest of levels, actually go on to produce any genuine governmental or strategic cooperation between Britain and America, and which had been so conspicuously lacking to date?

[101] See Ruane, *Churchill and the Bomb*, p. 86.

Anglo-American Scientific Cooperation and Political Stasis – Quebec to the Death of FDR

The Quebec Agreement of August 1943 is often seen as a major milestone in atomic diplomacy during the Second World War. Some, like Farmelo, see it as Roosevelt simply giving Churchill what he wanted.[102] Gowing makes the assessment that, after Quebec, "friendliness and goodwill reigned once more and made possible collaboration between the atomic scientists of the United States, Britain and Canada."[103] However others, including Edgerton, see Quebec as the point at which British scientists had to march to a new tune and that "thus was a mighty empire humiliated and the special atomic relationship born."[104] In fact, it can be seen from the previous evidence that Britain had already been snubbed by America. This trend would only intensify.

As also mentioned above, under the Quebec Agreement all matters of significant decision making were passed to the new CPC. This group, perhaps not surprisingly given American policy, was limited in its activity and only met some eight times in the next two years. It was thus, judged on the actual outcomes, not a forceful body but a 'holding point', skilfully designed by the Americans with their effective President at the helm. It was also not endorsed by Congress. It would thus not be accurate therefore to claim it as a governmental agreement, as Roosevelt again no doubt fully appreciated and intended. The 1958 MDA was, by contrast, ratified by both the American and British legislatures. Gowing is forthright in her assessment of the utility of the CPC. She says that it was not a dynamic body and that it did not discuss high policy. In terms of the latter, Gowing

[102] Farmelo, *Churchill's Bomb*, p. 240.
[103] Gowing, *Britain and Atomic Energy*, p. 173.
[104] Edgerton, *Britain's War Machine*, p. 120.

states that “the British played almost no part in such deliberations”.[105] If that was the case, where is the argument for a true wartime nuclear governmental partnership? Over the coming period, Gowing cites Anglo-American atomic achievements such the establishment of the Combined Development Trust in respect of raw material allocation and work on patents as evidence of such a partnership.[106] While this is valid, it is a short list when dealing with such a huge programme and a major relationship.

Some historians have made a link between Quebec and the argument of this work - that any true Anglo-American nuclear cooperation would only be enforced by the pressure of post-fusion, systemic military realities.[107] As Lindemann put it on 12 September 1944, such a sharing of the emerging power of nuclear weaponry would occur only when the countries “were united by a close military alliance”.[108] Such a truly effective alliance would now require the military linkage to include nuclear weapons – something that would not occur until 1958. The power of nuclear weaponry meant that sharing would be a last resort between state actors. It would require special circumstances to create the pressures that would make the boundaries between Britain and America’s nuclear systems susceptible to permeability. These conditions did not exist in the later war years, or even immediately after, and thus Britain would be forced to develop its fission weapon alone.

Proof of just how little shifted, even immediately after the Quebec Agreement had been signed, can be seen in the discussions of Akers and Bush in Washington

[105] Gowing, *Britain and Atomic Energy*, p. 234.
[106] Ibid, p. 235.
[107] An example of this emerging line of thought can be seen in Ruane, *Churchill and The Bomb*, p. 85.
[108] Lindemann to Churchill, 12 September 1944, PREM3/139/8A, TNA.

later that same month. Writing to Perrin on 21 August 1943, Akers continued to reveal the same American tactics of delay. Akers stated that Bush "talked generalities for some time" and when Akers asked him about what should actually happen, Bush replied that they "ought to do nothing until official information is received that the agreement is signed….he thought that there would be no harm in my sending in the pile of accumulated reports, although he said nothing about their *sending us* reports" (my italics). Akers further states in this letter that the arrival of Oliphant and Peierls in America had been quicker than he expected, and so he asked Bush if he thought they should start discussing technical sharing immediately. Bush thought that "unwise". After Akers then suggested that Oliphant could head to Lawrence at Berkeley, he wrote - "Bush then startled me by saying that surely we did not expect to get interchange on an equal basis when Oliphant had only just started while the Americans had already spent millions of dollars on the Electro-magnetic project…."[109] It is therefore clear that the Quebec Agreement did not result in any quick or meaningful change in Anglo-American wartime atomic relations at the process or industrial level. Delay, the acquisition of British knowledge and the policy of 'wartime use' were still America's atomic governmental policy in practice towards its conventional ally.[110]

Even Churchill, when reflecting later, confirmed that there were definitely multiple components in play on the American side. He told Lindemann that he was "absolutely sure we cannot get any better terms by ourselves than are set forth in my secret Agreement with the President…..only those who know the circumstances and moods prevailing beneath the Presidential level will be able to understand why I have made this Agreement. There is nothing more to do now

[109] Letter Akers to Perrin, 21 August 1943, 'Collaboration with the Americans' in CHAD IV / 3 / 1, CCA.
[110] Ibid, CHAD IV / 3 / 1, CCA.

but to carry on with it, and give the utmost possible aid".[111] This contrasts with the view of some writers that Quebec terminated both the Conant Memo and the role of pro-American monopoly figures such as Bush from positions of influence.[112] As the Akers letter and Churchill communication attest, nothing actually altered in the Anglo-American wartime alliance at the strategic level. While Bush may have not fully grasped Roosevelt's reasoning in making the Quebec Agreement, this may once simply reflect the differing perspectives of an administrator and a three time elected politician.[113]

In the September of 1943, TATSC minutes again accurately reflected the developing history of Anglo-American affairs – that Britain was increasingly a minor actor in an American atomic story. The high water mark of British development in 1941 was already fading fast. James Chadwick, with his excellent knowledge of the 'Manhattan' programme, reported that Groves was now very confident that the Americans alone would have a fission bomb in the next 12-18 months. Once again, this strategic knowledge was not the result of any official American policy of sharing information, but the consequence of British scientists being employed for America's benefit. The clear targeting of production towards a viable weapon inside a specific window of time is again shown here. The discussion implied that the overriding American aim was thus to actually use the fission weapon and that this "dominates General Groves' attitude to the problem of co-operation."[114] It was with British scientists that America was prepared to

[111] Churchill (M.662/4) to Lindemann, 27 May 1944, PREM3/139/11A, TNA.
[112] As an example of this view see Bernstein, *Quest for Security*, p. 1006.
[113] For Bush's view (see *Pieces of the Action*, p. 284 - "he just did not care to bring up the fact that he had been persuaded by Churchill to take a stand that would have been very unfortunate ... [and] would have made all sorts of trouble for him after the war, had he lived".
[114] Minutes of the Tube Alloys Technical Sub Committee, 19 September 1943, Point 134, AB1, TNA.

collaborate, and only because of the urgency of Bomb development during the wartime window, but not their government.

The same meeting went on to confirm that America was now focusing on the electro-magnetic route to separation and it was thus suggested that Britain must therefore follow suit. There seems now to be pitifully little left of the pioneering work of only two or three years earlier. The life had been sucked out of the British effort, including research, by the huge gravitational effect of the American programme.[115] Chadwick then discussed the personnel who should go to Site Y, adding that he himself was prepared to help there and that Bohr would be useful and would be welcomed by the Americans.[116] He also stated that 'Manhattan' now had major issues around ordnance and that perhaps once more the British could help the Americans. The feeling in late 1943 was now that Britain should contribute to whatever was going on: passivity was dominant, true cooperation illusory.[117]

Only three months after Quebec, in November 1943, the 'Eureka' Conference was held in Tehran and was attended by Stalin for the first time as part of the 'Big Three'. This meeting has been credited with being a significant moment in American thinking as it confirmed the start, mentioned above, of focusing on the rising military power of the Soviets.[118] In terms of Anglo-American relations, this Conference was a surprise even to an experienced politician like Churchill. If Roosevelt could bait him in front of the Soviet leader, what else might he be

[115] Ibid, 19 September 1943, Point 135, AB1, TNA.
[116] 'Site Y' was the code name given to Los Alamos by the Manhattan Programme; Oak Ridge was 'Site X'.
[117] Ibid, 19 September 1943, Point 136, AB1, TNA.
[118] For views on the rise of Russia in American assessments at this time see - Kimball, *Wheel within a Wheel*, p. 300, Roy Jenkins, *Churchill* (Pan, 2002), p. 729 and Ruane, *Churchill and the Bomb*, p. 90.

capable of?[119] It was indeed a distinctly uncomfortable experience for Churchill – the start of the realisation of the new emerging world order, and the start also of the more openly similarly treatment of Britain and the Soviet Union, by America, in nuclear affairs.[120] Britain's declining imperial power was evident from Tehran onwards.[121] It might reasonably be deduced therefore that Tehran marked the start of the formation of what would become the post-war Anglo-American nuclear relationship. This relationship would increasingly have elements of dependency. Until such dependency was satisfied by American nuclear weapons support after 1958, and with Soviet power on the rise, Britain would see itself as very vulnerable in the new post-war and fission-armed world.

Nevertheless, Britain continued to cooperate at the scientific level with America and thus assist 'Manhattan'. Indeed some such as William Penney and Chadwick were highly valued. Penney was a British mathematician who became head of the British mission at Los Alamos. He, like Chadwick, witnessed the 'Trinity' test, and Penney also saw the destruction of Nagasaki first hand.[122] Penney was highly regarded in America as an expert on damage assessments and was later to become appointed as the practical head of the British 'High Explosive Research' project in May 1947. However British scientists were few in number and, as Gowing confirms, Chadwick realised that "the British were not necessary for the fulfilment of the project".[123] They were there to contribute specific ideas and were kept under very close scrutiny. Again this does not really merit a

[119] Kimball, *Forged in War*, p. 18.
[120] Sainsbury, *Turning Point*, p. 307.
[121] See Churchill's comments to his doctor, Lord Moran, in Moran Diary, 28 and 29 November 1943 in Lord Moran, *Winston Churchill: The Struggle for Survival* (London: Constable 1966); also see Toye, *Churchill's Empire,* p. 233 on declining British power.
[122] 'Trinity' was the code name given to the first atomic test carried out in the Jornada del Muerto desert, New Mexico on 16 July 1945. It was of the 'Fat Man' device type that would be used weeks later on Japan.
[123] Gowing, *Britain and Atomic Energy*, p. 241.

description of “full and effective collaboration” which was the aspiration of the Quebec agreement.[124] It was becoming ever more apparent that British scientists were only in New Mexico on American sufferance, were policed by America and delivered exactly what America specified. While British scientists were under American instruction, they could also not be developing a bomb for a rival – Britain. As ‘Manhattan’ moved forward, the huge sites at Hanford and Clinton reflected the scale of the investment that America continued to make. This was a state putting its entire might into the pursuit of future power. As Rhodes has observed, America was fast moving towards claiming the atomic prize and denying it to all others, including Britain.[125]

By November 1943, Britain’s role in Manhattan could not have been made plainer in TATSC’s meetings. Akers explained that General Groves was forthright in his attitude that “the object of the mission to the U.S.A. is to speed up the American construction programme, and said he believed that any discussions directed towards obtaining information for ourselves….would be stopped.”[126] That any shared activity was wartime only, and aimed at preserving an American atomic monopoly, is clearly confirmed by these archival statements.

It was then suggested that a discussion between the Chancellor and the Americans was necessary to discuss British nuclear work, which was now starting to be appreciated as post-war in its initiation, lest it adversely impact the American programme. That ‘Tube Alloys’ was tottering on the edge of closure is revealed in these archives. The British nuclear system during the later wartime years was conspicuous by its lack of substance. ‘Tube Alloys’ was always stymied by

[124] Ibid, p. 233.
[125] Rhodes, *The Making of the Atomic Bomb*, p. 500.
[126] Minutes of the Tube Alloys Technical Sub Committee, 16 November 1943, Point 142, AB1, TNA.

transatlantic headwinds and lack of resources at home. Indeed Simon was very concerned that the arrangements for assisting America should, in effect, lead to the disbandment of the Technical Committee. Akers replied 'Tube Alloys' closure depended on *when* the "decision had been taken as to the extent of the work to be continued in the U.K.."[127]

The continuing debate over the most effective variant of the gaseous diffusion process, incidentally involving an appeal to British knowledge at the end of 1943, led to further huge investment in this technology by America. But it also conveyed, to the scientists involved, that America was driving towards a Bomb regardless of the declining German threat and also, importantly, regardless of the impact of diverting funds away from conventional war production.[128] Half a billion dollars could have bought a lot of tanks. America had realised that it would be in nuclear weaponry that military and political future power would rest. Science was now increasingly central to the defence of the nation and thus a more sophisticated domestic alignment was required. The scale of a 'military/industrial complex' was starting to grow rapidly consequently.[129] This 'complex' was the term that evolved to reflect the linking together of the economy of America with its defence needs on a scale never seen before. It has been described as a fully-fledged governmental-industrial collaboration which was wrapped in secrecy, and was less vulnerable to the scrutiny of the media or democratic institutions. Its consequences were thus less predictable, and potentially threatening, while at the same time delivering America's new power over the world.[130] Scholars have

[127] Ibid, Point 144, AB1, TNA.
[128] Groves involved Britain in the debate over the Norris-Adler process, while in fact using it as a screen to justify his huge proposed spending on diffusion technology in Rhodes, *Making of the Atomic Bomb*, p. 498.
[129] The term 'military/industrial complex' came to prominence in Eisenhower's speech of January 17, 1961.
[130] Wilber Caldwell, *American Narcissism: The Myth of National Superiority*, (Algora, 2006),

also contextualised the nature of the complex by describing it as a reaction to 'fear', typically that of the Soviets in the Cold War but Manhattan was the forerunner. A sense of panic has been suggested as the tool that stimulated the development of military-industrial structural integration.[131] America was flexing its economic might through the development of the first atomic bomb and creating a source of power that would continue into the future.

The huge gravitational effect of the American programme is again reflected in the TATSC records by the fact that the next four meetings were themselves held in New York in January 1944 (though classed in the Archives as simply the 21st Meeting), with the following one taking place in Washington in the May of that year. British scientists were now located close to the centre of atomic development – America – and TATSC reflected that reality. In New York, a discussion was held on the diffusion method of separation which was apparently being discarded by Groves. Particularly interesting is that the meeting then noted that the Americans had "handed over all reports and drawings for which we asked" about certain barrier diffusion developments, and that this was of value and a foundation of a possible future British plant.[132] This was the only time in the archives that allegedly significant technical information made its way eastbound across the Atlantic. However this was not driven by a change of American strategy, nor was it with the aim of helping Britain, but it was in fact caused simply by changes in America's industrial priorities. The gaseous diffusion method was

p. 73 and Alex Wallerstein, 'We Don't Need another Manhattan Project', *Federation of American Scientists*, (November 14, 2013), accessed at https://fas.org/pir-pubs/dont-need-another-manhattan-project/

[131] Sheldon Ungar, 'Moral Panics, the Military-Industrial Complex and the Arms Race', *The Sociological Quarterly*, Volume 31, Number 2, (1990), 165 -185.

[132] Akers in Minutes of the Tube Alloys Technical Sub Committee, January, 1944, New York, AB1, TNA

the brain child of Franz Simon. The need to industrialise its scale meant that different sub-methodologies emerged. Groves cleverly used British knowledge in America to assist in deciding which barrier sub method was the best. The British were then allowed details of the Norris-Adler solution *after* it was superseded by the new industrial approach created by the Kellex Corporation.[133] The scientists had on this occasion misunderstood the juggling that was going on: crumbs from the table, indeed.

The temptation to totally meld the British and American activities surfaced once more in the New York meetings of TATSC. Specifically, Akers proposed that the British research programme should be revived, but only to the extent that "there was a good prospect that contributions could be made to the *American* project in time to be of use" (my italics).[134] This would have been total subordination and the lowest of nadirs. Chadwick and Oliphant successfully made an alternative case. They argued that, by inserting as many scientists as possible into 'Manhattan', this would not just assist America but could, especially on the approach they favoured - electro-magnetism separation - be a way that "much of the knowledge of this method would be available to Britain, at the end of the war, by bringing all available men into the American project, than by leaving a small group working in England".[135] At least a positive British tactic was being articulated here, and by TATSC rather than by the political elite. The Committee

[133] See Rhodes, *Making of the Atomic Bomb*, p. 496.
[134] Minutes of the Tube Alloys Technical Sub Committee, January, 1944, New York, AB1, TNA.
[135] In fact the idea of embedding British scientists in America was brought up by Anderson in August 1942. The key difference then was that it was part of a carrot to unite the programmes; a carrot that Bush rejected – see Anderson to Bush, 5 August 1942, and Anderson to MacDonald, 6 August 1942, CAB126/41, TNA; and Bush to Anderson, 1 September 1942, ibid, and then his final rejection of 'further integration' in favour of 'close liaison', Bush to Anderson, 1 October 1942, CAB 126/41, TNA.

thus agreed to find as many good men as Groves would accept.[136] The strategy to gain what Britain could from American nuclear pre-eminence would have implications for Anglo-American affairs as a whole. It was seen first in TATSC in early 1944. The key human elements of a British nuclear system were thus dispersed across the Atlantic and it would not now have the chance to develop until after the war. Nuclear, indeed global, power had tilted firmly westward across the Atlantic.

The May TATSC meeting in Washington showed once again that emerging American leadership, scientifically, did not directly or immediately assist Britain. The minutes reported that it was agreed that element '94' would work as an explosive source and that the Chancellor had now provisionally approved a British atomic pile but this was postponed due to debates over the cost.[137] It would not be approved for a further three years even at trial size. The minutes go on to mention a 300,000kw plant costing $50-$100m, but that no firm plans or assistance could yet be obtained from America, in the form of the contractor, DuPont, in order to aid any British endeavour. Once again therefore it was agreed that this should be dropped.[138]

The ineffective debates at the political level should be set against the clear examination of post-war nuclear realities being articulated by TATSC. The Washington meeting discussed the realisation that the power of the new weapon would enhance realist rather than liberal sentiments in American government. Thus at least certain members of the British elite recognised that atomic

[136] Minutes of the Tube Alloys Technical Sub Committee, January, 1944, New York, AB1, TNA.
[137] Minutes of the Tube Alloys Technical Sub Committee, 13 – 16 May 1944, Washington, Point 3, AB1, TNA.
[138] Ibid, AB1, TNA.

weaponry would change geopolitical affairs. That was something that Churchill, and possibly even Stalin, did not understand until after 'Trinity' at the earliest. While Chadwick, one of the charmed circle of Brits cultivated by General Groves, said that his own experience with the MPC had led him to conclude that the American army intended to pursue a policy of collaboration after the war, he also made the following accurate prediction – "as a weapon, a T.A. bomb is likely so far to transcend any other, that is reasonable to believe that the U.S.A. may take a purely nationalistic attitude towards its use". He therefore recommended that Britain should acquire for itself (note – not in collaboration with America) "a stock – say 10 – of T.A. bombs as soon as possible after the war".[139]

The meeting went on to discuss the practical implications of such a suggestion and the consequent need to produce bombs piles, enrichment facilities and an electro-magnetism plant. No decision was documented. It was clear that, apart from Norman Feather in Cambridge, another physicist who had trained under Rutherford, there was no one suitable left in Britain to drive work in this direction. The development of British nuclear systems would, in practice, have to await the return of the scientists from America in a year's time or more. In essence the minutes of these meetings convey an air of an inability to make a decision, partly because of the changing nature of the science and partly because of the resources that it agreed to deploy in terms of scientists being sent abroad to support America's Bomb.[140] The policy of 'knowledge extraction', as devised by TATSC itself, was being continued here because it was seen that there was no

[139] Minutes of the Tube Alloys Technical Sub Committee, 13 – 16 May 1944, Washington, Point 7, AB1, TNA.
[140] Minutes of the Tube Alloys Technical Sub Committee, 13 – 16 May 1944, Washington: 'Note', TNA - "the policy might change in view of the fact that the whole science and art of the use of nuclear energy was in its infancy."

real alternative. Neither was there any mention of engaging with the military on the British side. Research was thus to continue in Britain into nuclear physics but with a paltry fourteen physicists.[141]

Included in the TATSC papers is a report written by James Chadwick, which gives a huge amount of detail on the scientific areas of American nuclear development, including the implosion method of bomb detonation and the new lens design for which he said the outlook was good. He summarised with the very accurate (for a year ahead) statement that – "there would become available a few bombs between spring and midsummer 1945 and several bombs a month from then onwards".[142] Once again an awareness of American developments by British scientists is revealed. However the data was never at the detailed, industrial level that Britain would have needed to build its own wartime Bomb, and would have had to be sanctioned at the political level in America. Such knowledge was never officially delivered to Britain by America. British scientists were allowed to work on the theoretical science but never on the key industrial processes of Manhattan. Add to this strained wartime resources, and it is not surprising that no nuclear system emerged in Britain during the Second World War.

This was supported by the note attached to this Report, and signed by Akers, following the Chancellor's instruction in the Consultative Committee of 11 September 1944 to establish what kind of large scale work was needed. This note stated that there were only a few of the TATSC members available currently in Britain, and it agreed with the outcome of a meeting with Simon and Chadwick,

[141] Ibid, Point 8, AB1, TNA.
[142] Chadwick Report to Tech Committee, 30 August 1944, AB1, TNA.

on 21 September 1944, which argued that Britain did in fact have enough knowledge to start the immediate building of a gaseous diffusion plant. The same physical paper then starts the formal Minutes of the 22 September 1944 meeting at which "it was agreed that, *if* it is considered desirable that T.A. bombs should be produced in the U.K. as soon as possible, the design and construction of a Gaseous Diffusion Plant, to produce 600g per day of two-fold enrichment material, should be undertaken at once (my italics)" However it was noted that this was a technical decision and that, for 'policy' reasons, no decision might be taken at this time. Thus it was clear that TATSC was trying to do what it could, based on the 'knowledge extraction' approach. It estimated such a plant as costing £8-9.75m and would take 3.75 – 4 years to build.[143] Given lack of knowledge and resources the outcome was again predictable – no action.

Almost as early as the start of industrialisation of the bomb, thoughts were surfacing about its potential consequences and implications. The forward thinking Anderson had written to Bush in August 1942 about the future misuse of atomic power, though his solution was to be that of international cooperation and not the nationalistic view that came to dominate American strategy.[144] Bush himself, as a trained scientist, understood that knowledge was not limited by frontiers and that, eventually, other states would catch up with America's atomic skills. He wrestled with the arguments over the consequences of this realisation, as others in the science community did, but also, because of his political affiliations, he can be seen to understand realist concerns. In April 1943, Bush had written to Hoover saying that his wartime experiences had already educated him that America could not avoid unpopular foreign entanglements. He also had suggested that the

[143] Minutes of the Tube Alloys Technical Sub Committee, 22 September 1944, Point 1, AB1, TNA.
[144] Anderson to Bush, 5 August 1942, CAB126/41, TNA.

country was about to take on its shoulders the role of 'world policeman', with all the implications for maintaining military superiority that this role would, and still does, require. In the same letter he had clearly articulated the fundamental role that the emerging new weaponry would have on war and peace in the world – "for the next thousand years I expect that the preservation of civilisation will be based on such force if it is preserved at all" and "the chances of regulating war between the major powers is very small."[145]

Rhodes makes an interesting point about similar existential concerns at this time, but without fully following through on its effect on policy. Rhodes realised that America's location created a different mind-set - "it was easier for Americans guarded by the wide moat of the Atlantic than the British to dismiss the possibility of radioactive attack" when referring to debates over possible 'radioactive dusting' of London by the Germans in mid-1943.[146] Much later, existential fears of fusion weaponry and missiles would create systemic pressure on America that led to its geopolitical rethink, and the signing of the 1958 Agreement. The seeds of these concerns can be seen here in these earliest of days of nuclear technology.

September 1944 also saw the intensification of American arguments in favour of internationalising the knowledge of the Bomb. A series of memos were sent and conversations held between Bush, Conant, Stimson and Roosevelt during this month. In a 19 September Interim Committee Scientific Panel Meeting, Bush and Conant proposed that the new nuclear science required free interchange of scientific information, regulated by whatever international association materialised at the end of the war.[147] On the 22nd, Bush met Roosevelt who was

[145] Bush to Hoover, April 19, 1943, Vannevar Bush papers, Carnegie Institute, p. 119.
[146] Rhodes, *The Making of the Atomic Bomb*, p. 512.
[147] Bush/Conant to Stimson, September 19, 1944, MED 76, S-1 Interim Committee Scientific Panel, Washington D.C..

entertaining Lindemann. The result of the meeting was the politically astute outcome that Roosevelt stated that he wanted “complete interchange with the British on this subject *after* the war in all phases (my italics)”, which in fact simply reflected America’s current ‘wartime use’ governmental policy.[148] Bush still opposed any sharing, but by this time on internationalist not anti-British grounds.[149]

By 30 September 1944 Bush and Conant issued the last in a string of these communications which effectively occupied the middle ground between those, like Niels Bohr, who hoped for a positive outcome based on creating international relationships, and those who knew of America’s growing realist policy. Bush was certainly aware of the main American strategy, hence this memo tried to bridge the gap between these two schools of thought. It stated that America had a temporary scientific/industrial advantage only, and warned against an arms race. It recommended "complete international scientific and technical interchange on this subject, backed up by an international commission acting under an association of nations and having the authority to inspect", but importantly this would only occur after the Bomb was used. For now, the two academics wrote what logically would be the case – that the lead in science would last three or four years (accurate), that an arms race might be the result of a lack of openness (accurate) and that an inspection regime might help the restraint of use of the weapons (partially accurate). No "manufacturing and military details" were to be

[148] Bush to Conant, September 26, 1944, Bush-Conant Correspondence, S-1 files, 1/1, National Archives, Washington D.C..
[149] Bush to Conant, September 25, 1944, NARA/RG227/OSRD/M1392/Bush-Conant file. See also the comments in Hershberg, *Conant*, p. 210, Robert Dallek, *Franklin D. Roosevelt and American Foreign Policy, 1932–1945* (New York: Oxford University Press, 1979), p. 471.

divulged.[150] Bush and Conant also recommended that the first use of an atomic bomb might be over enemy territory or at home with a warning given to the Japanese about its actual use.

Bush's 30 September and earlier recommendations were simply set aside by Secretary of War Stimson. The use of the Bomb and post-war problems seemed far away compared with the immediate conventional war alliance with Britain, and increasing concerns over Soviet behaviour in Eastern Europe. As Pascal Zachary has summed matters up, "while Bush was thinking about the next war, Stimson and the President were bent on finishing this one."[151] In fact Stimson personally shared some or even most of Bush's concerns but still, on 31 December 1944, he advised Roosevelt not to discuss any atomic details with Stalin.

The third and final Anglo-American wartime atomic agreement was part of 'Octagon' held on 18 September 1944, and actually signed at Roosevelt's private residence, Hyde Park. This was appropriate because this agreement was again to be a personal one without the force of Congress behind it. Roosevelt had just been made aware of the financial weakness of the British.[152] The President thus had yet another reason to support the view that America now faced a post-war world in which emerging nuclear rivals existed, but it was not at all clear at this stage who, of its rivals, might be a worthwhile partner after the conventional war had ended. The Hyde Park wartime accord had three short sections.[153] The third of these agreed that "enquiries should be made regarding the activities of Professor Bohr and steps taken to ensure that he is responsible for no leakage

[150] 'Letter to The Secretary of War; Salient Points Concerning Future International Handling of Subject of Atomic Bombs' and Supplementary Memorandum, September 30, 1944, Bush-Conant Files, RG 227, microfilm 1392, roll 4, folder 19, National Archives, Washington D.C..
[151] Zachery, *Endless Frontiers*, p. 217.
[152] Ruane, *Churchill and the Bomb*, p. 106.
[153] For the text of the Hyde Park Agreement of 18 September 1944, see Appendix 2.

of information, particularly to the Russians."[154] In fact the Soviet Union, as a state, was not specifically mentioned here strategically, as the two leaders had very different emerging views. Roosevelt now saw them as a rising force, one who perhaps could be worked with. Churchill saw Stalin as a huge threat to British interests and appreciated that Britain was within reach of their war machine. Such similar existential concerns would only spread to America as rocketry and fusion combined together in the late 1950s, as we shall see later. The first section of the Agreement stated overtly that the dropping of a fission weapon during the war was an objective. The second section mentioned continuing to Anglo-American cooperation on nuclear matters after the war but which could be ended by joint agreement. There seems little doubt that the President was well aware that his writ would not run after his final term in such matters, and also that Churchill was prepared to accept this fantasy. It suited both men's twin strategies to do so once more.[155]

Gowing sees this meeting as significant and highly positive. She writes that "a savoury spirit was abroad when Churchill and Roosevelt met in September 1944 and signed another agreement at Hyde Park (in America) which provided that full atomic collaboration should be continued after the defeat of Japan. Mr Churchill, in particular, put his faith in post-war Anglo-American control of the whole atomic business."[156] However Gowing also confirms the personal nature of the agreement, and thus its non-governmental status, when she states "none of the atomic energy people in Washington knew of the existence of the agreement until after Mr Roosevelt died."[157] Andrew Rotter also argues that the Hyde Park

[154] Ruane, *Churchill and the Bomb*, p 106.
[155] Churchill to Anderson, 21 September 1944, and Churchill (Gunfire 293) to Admiralty, 21 September 1944, PREM3/139/8A, TNA.
[156] Gowing, 'Britain and the Bomb', 36 - 40.
[157] Ibid, 38.

meeting was ineffective because “the President neglected to inform anyone else about the agreement”, which is hardly indicative of it being of central importance to the American President. Consequently he concludes that “American casualness or inconsistency concerning post-war collaboration rightly told the British that the issue would not be easily managed after Roosevelt’s death.”[158] Gowing goes on to say that there was “in the United States what a British diplomat - who loved America deeply - called an 'ill-defined and almost unconscious feeling that atomic energy is and should remain an American monopoly, both for military and industrial purposes’.”[159] Margaret Gowing’s comments thus continue to support the argument of this thesis that there was governmental atomic partnership between Britain and America, at least until 1958.

By the autumn of 1944, the implications of atomic warfare on post-war alliances were also on the minds of those such as Groves. Speaking with Lawrence and Oliphant, the General stated “that whether America liked it or not she was bound to make a military alliance with Britain after the war. Such an alliance would entail material contributions from the two countries, America contributing 70% and Britain 30% of the total. The preponderance of American contribution and the fact that the alliance was military in nature rather than political would enable the American Army and Navy to dictate policy on such questions as new weapons.” He also stated that all manufacturing had to be in North America away from “paratroop attack” and agreed that the Soviet Union was the threat.[160] These were some of the first mentions of American homeland security risk as a factor in emerging nuclear military strategy, and also an explicit statement of how America

[158] Rotter, *Hiroshima*, pp. 274 – 275.
[159] Gowing, *Britain and Atomic Energy*, p. 39.
[160] ‘Record of Conversation between Groves, Lawrence and Oliphant’, 3 October 1944, CHAD IV*I*3/1, CCA.

would wish to dominate any future relationship with Britain. However in 1944, and indeed perhaps until systemic pressure had settled the debate between 'independence' and 'interdependence', Britain was not yet ready for such an explicitly subordinate role in any future Anglo-American relationship surrounding future nuclear strategy.[161]

In March 1945, Groves made a similar point concerning the hard wiring between future nuclear and geopolitical factors, this time in discussions with Halifax.[162] This was an interesting and revealing insight into what was actually happening in practice in the wartime Anglo-American relationship, and also on how the future might develop. Groves discussed such matters alongside his admission that he had retarded any mechanisms of sharing – such as the CPC - as he openly declared a few years after the war.[163] Ultimately, in respect of America's wartime policy of cooperation towards Britain before the death of Roosevelt, Groves was very open that he "did everything to hold back on it."[164]

The proof of the mirage of the Roosevelt policy of cooperating with Britain would swiftly emerge after the President's sudden death. This was confirmed by the fiasco over locating the second Hyde Park agreement, when Stimson had to ask for a copy.[165] Stimson's conclusion on what it contained was an accurate summation of how America regarded the Quebec accord with the British – "the agreement, like Roosevelt, was now history", he stated.[166] Churchill, for his part, also recognised that a crucial moment had been reached in Anglo-American (and

[161] See Part Four for further details of the British independence v. interdependency debate.
[162] For Groves' repeated view on the relationship of nuclear weapons and defence generally, see Halifax to Anderson, 'Recounting a meeting with Groves', 6 March 1945, CHAD IV/3/1, CCA.
[163] 'The decisions of the Combined Policy Committee did not at any time interfere with the United States program', in Groves, *Now It Can Be Told*, p. 136.
[164] USAEC, *Groves' Testimony*, Oppenheimer hearing, 1954, Archive.Org. accessed at - https://archive.org/stream/unitedstatesatom007206mbp/unitedstatesatom007206mbp_djvu.txt
[165] Wilson (ANCAM259) to Anderson, 30 April 1945, CAB126/183, TNA.
[166] Stimson diary, 25 June 1945.

atomic) affairs as a result of Roosevelt's death on 12 April 1945. As Edgerton has pointed out, ultimately "Churchill's first concern in discussing the bomb was always the effect any position he might take would have on the wider Anglo-American relationship."[167] About Roosevelt himself, Churchill lamented "now the rock was gone. Ties have been shorn asunder which years have woven. We have to begin again in many ways."[168] In retrospect, Churchill probably could see better than most that the late President had also effectively implemented a twin strategy – Britain was still a conventional ally, and the atomic bomb was available for Roosevelt's successor's exclusive use. With Roosevelt's early passing the truth about Quebec and the Hyde Park agreement would become plain.

[167] Edgerton, *Britain's War Machine*, p. 120.
[168] Churchill to King George VI, 13 April 1945, CHAR 20/193A-B, (image 192-193), CCA.

Truman and the Bomb Decision

Harry Truman's unexpected occupancy of the Presidency was to have a significant impact on the development of nuclear military strategy, and not a positive one for Britain. The nuclear relationship that existed between Britain and America on Truman's adoption of office was already highly disadvantageous to the former. Even worse, gone now were the days when Roosevelt, with his memory of British first mover advantage in nuclear affairs, also pursued a conventional alliance. Truman would re-evaluate America's needs as the world war rapidly approached its conclusion. The fission bomb, for the new President, would be a welcome bonus but one that needed to be accommodated fully into America's world view. The decision to drop the Bomb itself would be a political, not a military, one. The nature of this decision can be seen as early as Truman's first appointments in the atomic field - the membership of the 'Interim Committee' of May 1945 contained no military figures, for instance – and in such a political decision, Britain would have no effective say.

The first mention of the fission weapon to the incoming Harry Truman was by Henry Stimson. His briefing was the simplest possible and left Truman with more questions than answers. Into that void stepped James Byrnes who gave the decisive first opinion.[169] Truman later recalled reeling at the power being offered and that Byrnes stated that "in his belief the Bomb might well put us in a position to dictate terms at the end of the war."[170] Truman was also advised by Averell Harriman, American Ambassador to Moscow, that Europe faced a barbarian invasion but that a deal was possible as long as America was firm.[171] Immediately

[169] Byrnes was Director of War Mobilisation under Roosevelt, and very influential behind the scenes. Described by Rhodes in *Making of the Atomic Bomb*, p. 619 as "a politician's politician".
[170] Harry S. Truman, *Year of Decision* (Doubleday, 1955), pp.11 and 87.
[171] Martin McCauley, *Origins of the Cold War, 1941 – 1949* (Routledge, 2016), p.175.

the concept of the Soviet Union as a serious overseas rival was being seeded in Truman's mind. Thus even in its earliest days, which were no doubt a whirl of knowledge acquisition, the concepts of domination and Soviet threat were looming large in the vocabulary of the Truman White House. These were powerful thoughts and ones that would make a 1958 style sharing Agreement with Britain highly unlikely at this time. It was perhaps not surprising that the new, and inexperienced internationally, President was likely to react by adopting a consistent and monopolistic American atomic strategy.

Stimson briefed Truman more fully on 25 April 1945 having initially left Groves outside the Oval Office. Stimson set out the bottom line consequence of the Roosevelt policy towards its rival, Britain, when he stated that "we controlled the factories that made the explosive material and therefore no other nation could reach such a position for some years."[172] The exclusion of Britain from key industrial knowledge is once again affirmed here. However Stimson was also clear about the importance of the atomic bomb, just three years after the decision to try to create one – "furthermore, in the light of our present position with reference to this weapon, the question of sharing it with other nations and, if so ahead, upon what terms, becomes the primary question of our foreign relations."[173] And, when Groves was ushered in to meet the new President for the first time, he brought a 24 page report to summarise 'Manhattan' – Britain had but five, cursory, lines.[174]

[172] Stimson, 'Memorandum discussed with the President', April 25, 1945, Manhattan Engineering District, MED 60, S-1, White House quoted in Rhodes, Making of the Atomic Bomb, p. 625.
[173] Ibid.
[174] Groves, 'Report of Meeting with the President', April 25, 1945, Manhattan Engineering District, MED 24, S-1, White House quoted in Rhodes, *Making of the Atomic Bomb*, p. 625.

The effective side-lining of the British role in the bomb deployment decision was first shown by Marshall's 30 April 1945 memo to Field Marshall Sir Henry Wilson. While it gave a 'heads up' about when the Bomb might be used, an interesting fait accompli on the strategic decision in its own right, there was no invitation to become involved in the decisioning process.[175] Once again underscoring the dual nature of relations in the atomic sphere, there continued to be British involvement at a technical level. William Penney was an important member of the Target Committee which determined details of the Bomb's deployment. This had met for the first time 3 days earlier and drawn up a list of 16 possible options, including the imperial city of Kyoto. In the end Kyoto was removed from the Target List at the personal insistence of the concerned Stimson. The differences between widespread, but still tactical, conventional bombing and the indiscriminate effects of atom bomb destruction were emerging also for the first time, and would play an important role in future nuclear military strategy.

Britain was aware that matters were reaching a crunch point – though it is argued here that the actual result had been a formality since almost the inception of militarised fission – as Anderson's memo to Churchill in early May shows.[176] The delayed response suggests that Churchill may well have come to understand that no governmental level cooperative partnership actually existed between Britain and America.[177] In contrast to Ruane's view, that Churchill assumed that his agreements would be transferable between American administrations, it might be more accurate to conclude that this well informed Anglo-American Prime Minister, highly aware of the reality of Congressional governance, knew that he held no

[175] Wilson (ANCAM264) to Anderson, 30 April 1945, CAB126/183, TNA.
[176] Anderson to Churchill, 2 May 1945, PREM3/139/11A, TNA.
[177] Churchill to Anderson (M.512/5), 21 May 1945, CAB 126 / 183, TNA.

sway over the new President and, in any event, wanted to see the reality of the Bomb in action himself.[178]

Truman established an Interim Committee in May 1945 with a brief to investigate post-war atomic controls, together with development and research matters for the nuclear field. It did not include military elements or a deployment role. Many historians have thus agreed that dropping the atomic bomb was already a given.[179] Though chaired by Stimson, it was Byrnes who would dominate the Committee in his role as the President's nominee. Byrnes pushed for the maintenance of American superiority and this confirmed that the influence of Bush, and other internationalists, was on the wane in the final summer of the war.[180] Gowing confirms that the "British were not kept closely informed of the progress of the American discussions" in the Interim Committee. Instead it was the tacit acceptance of all parties, argues Gowing, that the predominant position of the Americans gave them the right to decide these issues.[181] This is consistent with the argument of this thesis that America pursued atomic dominance throughout the war.

The Interim Committee meeting of 31 May / 1 June 1945 was the critical session. It was agreed to continue active nuclear development, but importantly alone, and to try to keep other states, including new rivals such as the Soviet Union, content with political gestures. Bush was quoted as making it perfectly clear that Britain

[178] Churchill later wrote – "the decision whether or not to use the atomic bomb ... was never even an issue" in Churchill, *Triumph and Tragedy*, p. 553; Ruane, *Churchill and The Bomb,* p. 97
[179] Ruane, *Churchill and The Bomb,* p. 98. See also, Sherwin, *World Destroyed*, p. 5, and also Barton Bernstein, 'Roosevelt, Truman, and the Atomic Bomb', *Political Science Quarterly*, Vol. 90, No. 1 (Spring, 1975), 62.
[180] Byrnes stated later that "I had sufficient imagination to visualise the danger to our country when some other country possessed such a weapon" James Byrnes, *All in One Lifetime* (Harper & Bros, 1958), p. 283.
[181] Gowing, *Britain and Atomic Energy*, p. 363.

had obtained nothing of practical use for bomb construction.[182] The final decision of the two days of the Interim Committee was that "the bomb should be used against Japan as soon as possible."[183] Robert Gilpin has made the point that "in retrospect, the truly amazing thing is not that scientists were not consulted more extensively prior to the decision to drop the bomb, but that they and their colleagues on the Interim Committee and its scientific advisory panel were consulted at all. It was most unusual that scientists were called upon and were listened to on questions of the correctness of a political-military decision. This occurrence presaged the forthcoming revolution in the relationship of the scientist to national decision-making."[184] This meeting would thus be indicative of the new, expanding relations between the state and the world of science which would influence the way post-war American nuclear policy was formulated in the coming 15 years. This will be explored in the next two sections of this thesis. On 1 June 1945 Byrnes took the final recommendation to drop a fission weapon on Japan straight over to Truman, who agreed. Such prompt decision-making was in strict contrast to the prevarication and politicking of the Roosevelt years.[185]

In geopolitical terms, the mid-1945 Interim Committee was also seminal in that it was reflective of how the balance had tilted away from Britain and towards the Soviet Union as the focus of American nuclear strategy. The Committee, on 21 June, suggested that the Quebec Agreement should be revoked, but without

[182] Richard Hewlett and Oscar Anderson, *The New World: A History of the United States Atomic Energy Commission* (Pennsylvania: University of Pennsylvania Press, 1962), pp. 356 - 61 and "Dr Bush pointed out that even the British did not have any of our blueprints on plants" in 'Interim Committee Notes', May 31, 1945, Bush-Conant file, f.100.
[183] Ibid, May 31, 1945, Bush-Conant file, f.100.
[184] Robert Gilpin, *American Scientists and Nuclear Weapons Policy*, (Princeton University Press, 1962), p. 52.
[185] Interim Committee, June 1, 1945, Truman Library Online - "the bomb should be used against Japan as soon as possible; that it be used on a war plant surrounded by workers' homes; and that it be used without prior warning." Accessed at https://www.trumanlibrary.org/whistlestop/study_collections/bomb/large/documents/index.php?documentid=40&pagenumber=1.

mention of the Hyde Park Agreement, and it was also suggested that Stalin should be included in atomic information and that he should be assured that the new weapon was "an aid to peace."[186] The very reference to Quebec reveals the awareness of the new administration about Anglo-American wartime dealings – they just chose to ignore them. The ground for Potsdam, the final wartime leaders' meeting, was also laid. As Groves' communication with Wilson on 22 June demonstrates, Britain simply was advised of the imminence of nuclear usage.[187] The crucial decisions about the first use of the fission weapon had been taken already. So, on 28 June 1945, Halifax, Wilson and Anderson were recorded as agreeing to the use of the Bomb, but in the manner of someone who might process a cheque that had already been signed.[188] This is in contrast to Gowing's later view that while "in the end, the British were the junior partners in the atomic project which they had launched" they were still governmentally linked as "the British Government's consent was asked for and duly given."[189] This overplays the British influence considerably and contradicts her earlier statement that the development of Tube Alloys had been retarded "because they (the Americans) wanted to keep everything in their own hands."[190]

By 3 July 1945 Byrnes had become Secretary of State, and Stimson's attempt to gain some form of lower level equivalency of surrender to that of total surrender for Japan, and avoid the horrors of nuclear warfare, was officially rejected. The Soviet Union was also an increasing concern as the Japanese tried to involve them in creating a solution and with the threat of their troops entering Manchuria.

[186] Interim Committee, June 21, 1945, Truman Library Online, ibid.
[187] Wilson (ANCAM 294 and 298) to Anderson, 22 June 1945, CAB126/146, TNA, and 23 June 1945, CAB 126/188, TNA.
[188] Halifax/Wilson (ANCAM313) to Anderson, 28 June 1945, CAB126/146, TNA.
[189] Gowing, 'Britain and the Bomb', 36 – 40.
[190] Gowing, *Britain and Atomic Energy*, p. 322.

Certainly an atomic free, post-war period would have been troubling to America with Soviet power on the march. They had to be contained and this sense would emerge into an eponymous policy very shortly. At the Allied conference Potsdam in Germany, delayed precisely because of the date of the 'Trinity' test, America and Britain's leaders waited for news.

On the morning of 21 July 1945 Groves' report was finally received in Berlin. Stimson's diary revealed the sense of power that had been handed to America and that the effect on Truman in particular was significant. The answer to many foreign policy conundrums seemed to have been handed to the new President. Ruane suggests that Churchill was slow at understanding the significance of the Bomb's power and needed more information.[191] However Ruane also rightly argues that it took some while before Truman himself "grew more certain about the value of the Bomb."[192] In truth, this was a moment of new understanding at the very top of government, as elsewhere, and this perhaps excuses such hesitations. The potential capability was soon grasped, and within 72 hours Truman had approved the now validated weapon for use against other Japanese cities - Hiroshima, Kokura, Niigata and Nagasaki were specified. In his command there was no mention of exclusively military targets having to be hit or that civilians should be spared.[193] Nuclear war would be total war.

Some recently released archive material also gives some interesting insights into how the events of the first fission bombings were viewed by the American intelligence community. By mid-August 1945, and just a week after the Nagasaki

[191] Ruane, *Churchill and the Bomb*, p.156.
[192] Ibid, p. 158.
[193] 'Directives, Memos, Etc. to and from C/S, S/W, etc', Records of the Office of the Chief of Engineers, Manhattan Engineer District, TS Manhattan Project File '42 to '46, Folder 5B, Record Group 77.

bomb has been dropped, the Office of Strategic Services (OSS), the wartime centre of American espionage, described the attacks as “a small scale demonstration” of the weapon but that it was clearly a game changer.[194] It also concluded that, pace Bohr and Bush, science would progress across the world and thus “it appears that no degree of security in regard to the atomic bomb can be expected and that all the major powers are likely to have weapons of this sort within the next ten years.”[195] It also argued that (like British bomber pilot, Leonard Cheshire, below) it would be the ‘offense’ that held the advantage in the nuclear age of weapons and would be a governing factor in international relations over the next twenty or more years. This was the realisation of the importance of the need to create a military nuclear strategy.

It is also interesting to note that the OSS assumed that both Britain and America controlled the new weapon when it stated “now that they both possess atomic weapons”. Finally this review goes on to rank the importance to American power in the following order of priority – atomic laboratories and facilities, the air force, intelligence and all other military. This would be a very early indicator of how American policy had changed during the war – science was now top of mind.[196] By November 1945 senior American officials were stating that the atomic bomb was the centrepiece of American military might even though it was still assumed that a first class set of conventional forces would also be needed. Such a placement of military fission thinking at the heart of affairs demonstrates the huge shift that had taken place in the few short months after Hiroshima.[197] The

[194] ‘Report from the OSS Asia-India Theater Headquarters to Gen Donovan’, 18 August, 1945, accessed at https://www.cia.gov/library/readingroom/docs/CIA-RDP84-00022R000300100007-4.pdf.
[195] Ibid.
[196] Ibid.
[197] ‘Letter William Jackson to James Forrestal’, November 14, 1945, CIA Archives, accessed at https://www.cia.gov/library/readingroom/docs/CIA-RDP80M01009A000100120103-2.pdf.

American nuclear system was now front and centre in terms of defence and foreign policy matters.

The America of 1945 was very different to the nation of 1941 – more powerful, more confident and more engaged in the world. This mood of change was recognised by the British Embassy in Washington which stated that "the psychological impact of these events upon the public, especially of the atom bomb, was greater than anything America has experienced in the war, even Pearl Harbor, and profound changes in the currents of thought seem inevitable."[198] The Embassy also identified two streams of domestic opinion that would influence Anglo-American atomic relations going forward. The first were those it termed the 'nationalists' amongst whom the embassy detected a new brand of 'America-First-ism' which ignored Britain altogether, and even saw Britain as a hindrance. This it contrasted with those it called the 'internationalists', of which the Embassy deemed Truman to be one. However, and perhaps presciently for the 1958 agreement, the Embassy was suggesting that, even as early as August 1945, this more Anglophile group could only potentially "accept us as a valuable junior partner."[199] It was probably Isaiah Berlin, the philosopher who was then working for the British Diplomatic Corps, who accurately observed that "the Administration seemed genuinely disposed to keep us informed of developments, while allowing us little enough opportunity to shape policy."[200]

The requirement of obtaining uranium resources for the massively growing American nuclear programme has been referenced above. It was one area in which it is possible to conclude that genuine inter-governmental atomic

[198] H.G. Nicholas, *Washington Despatches, 1941 – 1945* (George Weidenfeld and Nicholson, 1981), p. 598.
[199] Nicholas, *Washington Despatches, 1941 – 1945*, pp. 602 – 603.
[200] Nicholas, *Washington Despatches, 1941 – 1945*, p. 603.

cooperation did occur in the wartime years between Britain and America, and also Canada. The issue of raw material resources had been an important element of the CPC's discussions at the end of 1943. Uranium was in very short supply and the Belgium Congo looked to be the best bet for resources. This was an area over which Britain had some influence. A Trust was eventually constituted, using the same control formula as in the CPC, with Groves in the lead and as a vehicle to contract for supplies. Such negotiations continued throughout 1944 and, after much debate and just before the Belgian government in exile in London returned to their country in November 1944, a ten year deal was struck. This gave an element of certainty to supplies. The role of Sir John Anderson in the negotiations was assessed by Gowing as "as (one of the) most important contributions by the British to the wartime project: Groves did not believe that the negotiations would have succeeded without British participation."[201] Here we see the resources of governments, which included legal advice over the constitution of the Trust, finances to purchase the materials and the administrative skills of senior figures, acting in a manner which constitutes true collaboration. It stands in sharp contrast to the lack of governmental cooperation in other areas and therefore, by its very exceptionality, supports the argument of this thesis.[202]

The short time period from 1942 to the end of the Second World War had seen Britain, in relative terms to America, fall back in both resources and nuclear science. Inconveniently, world power was now dependent on the new atomic weapons being developed, and Britain had yet to build one. Its nuclear system was virtually unformed, relying as it did on the services of a small number of theoretical scientists left in Britain. By contrast, America had created a system

[201] Gowing, *Britain and Atomic Energy*, p. 319.
[202] Ibid, p. 312.

with a growing scientific-industrial complex to support it. All that remained was to formalise that system through the process that led to the McMahon act of 1946. In the end, all that can be said is that Britain's governmental wartime nuclear relationship with America had been as unproductive as one based an illusion might suggest.[203]

[203] See Thorne, *Allies of a Kind,* in which the case is strongly made that mistrust, differing views of world politics and 'mutual ignorance' did not allow a truly coherent alliance to exist.

The McMahon Act of 1946: The Myth and the Reality

The historiography of the 1946 McMahon Act (McMahon) has created a myth that this legislation was focused on Anglo-American relations and ended wartime atomic cooperation.[204] The detailed origins of the myth are described below and this thesis will offer a very different interpretation to that provided in the existing histography. Britain was adversely affected by the eventual terms of the Act but, importantly, the Act was not targeted specifically at one country alone. Indeed the Act simply made explicit the lack of meaningful cooperation between Britain and America that has been set out above as having been the true reality of the wartime period. The Act also established the Congress-driven background to Anglo-American atomic relations for the next dozen years. The context of McMahon was the changing political climate created by the unwrapping of the wartime conventional alliance between the two countries. The Act therefore reflected the evolving domestic sentiment of America that was anti-imperialist in nature. McMahon also established a new system of control over American atomic affairs, one founded on debates between government, scientists and now the military and which had started during the wartime years. Thus, without an accurate understanding of McMahon, the atomic relationship of Britain and America between 1939 and 1958 cannot be properly understood.

The existing literature argues repeatedly that the McMahon Act represented a breaking point in Anglo-American atomic affairs. Margaret Gowing found it curious that the formulating committee of the Act did not appreciate that “Britain

[204] Brien McMahon was a successful lawyer who was elected Senator for Connecticut in 1944. Finding atomic warfare a key new topic that could provide him with a vehicle through which he could progress his new, legislative career, McMahon became Chairman of Senate Special Committee on Atomic Energy in late 1945. His name became associated with the 1946 Act only in the latter stages.

had a special atomic relationship with the United States which could conceivably merit special treatment."[205] She also described the McMahon Act as a "disaster" and one that provided a death blow to the co-operation of the war years.[206] Gowing later suggested that the reason that the McMahon Act locked Britain out was that "the fact was that at this time Britain had no lobby for her atomic interests in Washington."[207] Also she recognised that, after the war, "Britain was the importunate poor relations….and counted for nothing provided she played the game."[208] There are elements of truth in both of these explanations, but the underlying reality was that McMahon reflected the American atomic monopolistic approach of the whole wartime period.

Gowing's views have been echoed by many historians. Timothy Botti has seen the effect of McMahon as being one that reduced the alleged significant wartime atomic bond to one simply reduced to a focus on raw materials.[209] John Baylis has described McMahon as being important because it meant that "the most important breakdown in defence cooperation at this time was in the field of atomic energy" and that it created "considerable uncertainty in the (Anglo-American) relationship."[210] He also argues that the alleged close collaboration of the Quebec and Hyde Park agreements promised close post-war cooperation. However Baylis also points out that many countries, and not just Britain, were affected by McMahon.[211] Matthew Jones argues that by 1946 cooperation had been decisively ended as "by this time all substantive nuclear cooperation with the United States had been terminated after Congress had passed the McMahon Act,

[205] Gowing, *Independence and Deterrence, Vol. 1,* p.108.
[206] Ibid, p.106.
[207] Gowing, 'Britain, America and the Bomb', p. 132.
[208] Ibid, p. 132.
[209] Botti, *The Long Wait*, pp. 22 – 23.
[210] Baylis, *Anglo-American Defence Relations 1939-1984*, p. 30.
[211] Baylis, 'Exchanging Nuclear Secrets', 33 – 61.

designed to preserve the American atomic monopoly."[212] Greg Herken has described this period as a watershed and that Britain was henceforth to be excluded from all nuclear energy development with America.[213]

The legacy of these views has been the establishment of a myth that McMahon was an unexpected and significant point of disconnection in Anglo-American atomic affairs. The myth prevails to this day. The British Ministry of Defence, for example, still suggests that there had been a change in relations when it says that "wartime UK-US nuclear collaboration was brought to an end by the 1946 US Energy Act (McMahon Act)."[214] Similarly, the U.K. National Archives website implies a halting of a previously beneficial arrangement for Britain by stating that "the McMahon Act of 1946 stipulated that the US would not share information concerning atomic weapons. This was a bitter disappointment to the British government."[215]

A more nuanced view is possible, however. For instance, Richard Wevill argues that in fact McMahon was the final stage in a cessation of cooperation and so "the door that had already become closed to Anglo-American co-operation was now locked." He goes on to say that "it is difficult to ascertain a fundamental change in American policy" in respect of the build up to the Act.[216] This supports the argument of this thesis, made in the preceding two sections, that no governmental arrangement worthy of the term 'partnership', had ever actually

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[212] Matthew Jones, *British Defense Policy and the Atomic Bomb at the Dawn of the Cold War, 1945–52*, (undated), accessed at *http://www.secretintelligencefiles.com/Overview/Subject-Essays/Matthew-Jones#_edn6.*

[213] Greg Herken, *The Winning Weapon, The Atomic Bomb in War 1945 – 1950*, (Princeton University Press, 2014), pp. 147 – 148.

[214] Ministry of Defence History, accessed at *https://fas.org/nuke/guide/uk/ doctrine/sdr06/FactSheet5.pdf.*

[215] U.K. National Archives Online, accessed at *http://www.nationalarchives.gov.uk/ cabinetpapers /themes/co-operation-competition-testing.htm.*

[216] Richard Wevill, *Diplomacy, Roger Makins and the Anglo-American Relationship* (Routledge, 2014), pp. 64 – 66.

existed in the atomic field between Britain and America during the Second World War.

In terms of the context in which the McMahon debate was held, Britain was not a favoured nation in the minds of many in America. An example of anti-British and anti-imperialist sentiment at that time can be seen in newspapers such as the *Chicago Tribune*.[217] In a piece entitled 'Mr Attlee's Empire' in November 1945 the paper described Britain's systems as in a state of collapse, despite the "most brutal measures" being made to sustain them. It says that Attlee was trying to both persuade America to give the new weapon to the Soviets, despite it being an offensive weapon, and also seek billions of dollars in what amounted to a gift from America. The paper goes on to say that the British 'caste system' had been living off the wealth generated by the empire, and effectively therefore its enslaved populations, for three centuries. It does not see any reason why America should support the British aristocracy in their faltering lifestyles.[218] This was harsh stuff and not conducive to the formation of a new atomic alliance. It seems hard to imagine that this was written just months after the conventional alliance had ended and men had been killed jointly fighting the same foes. The paper was in favour of the subjects of the British Empire gaining their freedom and, despite the decline that would result for the mother country, it concludes that "it is even hard to see how the United States would suffer from such an event."[219]

This also chimes with the background information being provided to the British Government by its embassy in Washington. The embassy noted in August 1945 that "pride in America's unequalled might is the dominant mood at the

[217] For background see Peter Clarke, *The Last 1000 Days of the British Empire* (Penguin, 2008).
[218] *The Chicago Tribune*, November 21, 1945, accessed at - *http://archives.chicagotribune.com/1945/11/14/page/20/article/mr-attlees-empire.*
[219] Ibid.

moment."[220] Further supporting this anti-British and bullish climate of immediate post-war American opinion, in a 1945 State Department survey of the American public's attitudes to its wartime allies, Britain was actually seen as one of the least trusted countries.[221]

A more concrete example of this hardening in Anglo-American sentiment was the cancellation of the Lend-Lease agreement by President Truman in August 1945. When it was announced, the British Embassy in Washington's view reflected many when it said "the abrupt end of Lend-Lease came as a surprise even in this country."[222] The Embassy believed the decision was solely that of the President and was due to concerns over Congress' negative view on continuing this favourable deal after VJ Day. Alan Sked has commented that "the U.S. didn't seem to realize that Britain was bankrupt." [223] In this vein, the Embassy quotes the Prime Minister as stating in the House of Commons that the change puts Britain into "a very serious financial position."[224] Indeed the economist John Maynard Keynes described this amended American policy as presenting a "financial Dunkirk" for Britain.[225] Anglo-American animosity, formerly buried beneath the wartime conventional alliance, was evidenced again during this financial debate. Such underlining sentiment assist in explaining the lack of any willingness to cooperate atomically during the war with a former rival. With the shackles of the conventional alliance removed, legislative figures such as

[220] Nicholas, *Washington Despatches, 1941 – 1945*, pp. 598 and 602.
[221] See Patricia Clavin accessed at *http://news.bbc.co.uk/1/hi/magazine/4757181.stm.*
[222] Nicholas, *Washington Despatches, 1941 – 1945*, p. 609.
[223] See Alan Sked, *Britain's Decline: Problems and Perspectives* (Oxford: Basil Blackwell: 1987), and *International Herald Tribune*, May 2006; also Baylis, *Anglo-American Defence Relations*, p. 3.
[224] Nicholas, *Washington Despatches, 1941 – 1945*, p. 612. See also Cadogan who thought it reflected 'stark ruin', in Cadogan Diary, 20 August 1945 in Cadogan Papers, ACAD 1/15, CCA.
[225] David Moggridge (ed.), *The Collected Writings of John Maynard Keynes, Vol XXIV* (MacMillan: London and Basingstoke, 1979), p. 410 quoted in Richard Toye, 'Churchill and Britain's 'Financial Dunkirk'', *20 Century British History*, 15 (4) (2004), 342.

Democratic Congressman Emanuel Cellar called on Britain to “play cricket and to open up the sterling markets to American exports in return for economic aid.” The same Embassy record also observes tellingly that “outright chauvinists were openly jubilant that the President had no intention of continuing to squander American resources overseas, especially for the purpose of salvaging a poverty-stricken and ungrateful British Empire.”[226]

The passage to the eventual agreement of a loan from America to Britain was a rocky one and it has been argued that Churchill played a key role in smoothing the wheels. Richard Toye writes that “Churchill’s intervention (at a dinner given by Lord Halifax on 10 March 1946) may not have been the sole cause of Vandenberg’s change of heart, but it seems likely to have been an important one.”[227] In contrast, the very fact that such a key figure as Churchill did not play any role in post-war discussions over atomic relations, the Fulton invitation notwithstanding, is revealing. This shows the internally orientated nature of the American atomic debate as opposed to those over financial arrangements. America was far more territorial over its fission bomb than its dollars. In the end the British Embassy was probably correct when it surmised that “there is no doubt that the Truman Administration did the popular thing in unequivocally terminating Lend-Lease.”[228] Edgerton sums up the eventual loan as having strings attached and being unpopular with the British elite.[229] The convertibility crisis that followed was further evidence of the post-war changes in power that Britain had to endure and demonstrates, in practical terms, the subordination of Britain’s financial and

[226] Nicholas, *Washington Despatches, 1941 – 1945*, p. 612.
[227] Toye, ‘Churchill and Britain's "Financial Dunkirk"’, pp. 329-360. Arthur Vandenberg was an influential Senator who held isolationist views prior to 1941. These gradually changed to ‘internationalist.’ He held powerful roles including becoming chairman of the Senate Foreign Relations Committee in 1947.
[228] Nicholas, *Washington Despatches, 1941 – 1945*, p. 616.
[229] Edgerton, *Britain’s War Machine*, p. 297.

economic power to America. It was against such a background that the passage of the McMahon Act proceeded. Gowing has described the immediate post-war relations between Britain and America, especially when discussing support for its domestic programme to build atomic piles in the UK, as "distressingly similar to those of the Anglo-American atomic imbroglio of 1943." She points to the "confusion at Presidential levels" and the distinction with what she terms "the working level."[230] This again supports arguments in favour of the requirement for a multi-level approach to Anglo-American wartime relations. Such "confusion" may have been the case under Roosevelt; under Truman, with no conventional war partnership to manage, matters were far clearer – no linkages with Britain, as will be seen in Part Three.

The McMahon Act was the culmination of a debate about American internal control of the emerging weapon, and which featured military-civilian clashes as the reputation of both scientist and soldier were boosted by the developments of the war. The McMahon debates would need to determine practical matters such as whether the new armaments should, like conventional equipment, sit under the Department of War (reshaped in 1947 and then brought together under the new Department of Defense in 1949), or elsewhere. Should something that was as existential in its threat to the whole of humanity fit simply under the control of the Generals and what about the role of scientists?

Once again it was to be Bush who led the way in this debate, arguing for a reversion to science as pure research and for it to be able to act freely as a main driver for America, both economically and militarily. This would have had implications for the control of further generations of nuclear weapons already

[230] Gowing, *Independence and Deterrence Vol .1*, p. 99.

being created by scientists. After earlier exchanges with Roosevelt's office, Bush had prepared 'Science – the Endless Frontier' as a future vision and one which used the centralised, contracting model of the OSRD but across all fields of science.[231] The model was to be regulated by committees but independent of the heavy hand of government. Using the language of the frontier, based on Frederick Jackson Turner's thesis that the ability to expand across geography sustained American democracy, it was well reasoned. It was also the high water mark of the wartime, non-political and exceptional, American nuclear system. Such dreams for continued science-led weapons development and control would not survive the need for full post-war scrutiny.

The document set out how centralised American power had been forged to win a war. Unfortunately for Bush, such governmental power would now become more regulated, not less, as McMahon would reveal. 'Endless Frontiers' was a reflection of the growing battles that were being fought between the three elements of the American establishment in this area – science, military and industry – or the 'complex' as one of the earliest references to use such an expression framed it.[232] The question was, how should this new grouping be regulated and how far should private enterprise play a role? Bush saw the military's role to be limited to the improvement of current weapons, although whether he meant that to include the not-yet-proven Bomb is not recorded. The thrust though was clear – government should let science get on with keeping America safe. 'Endless Frontiers' was formulated under one President, one era,

[231] Zachery: *Endless Frontiers*, pp. 223, 450, and Bush, *Science – the Endless Frontier*, pp. 13 and 17.
[232] See the Agronsky Broadcast text, July 20, 1945, Reports to the President, 2, Office of Scientific Research and Development, Record Group 227, National Archives, Washington D.C..

and then, in early June 1945, assessed by another.[233] Truman refused to endorse it, and this set the seal on the end of the system of atomic weapons control that had existed between science/administrators and the wartime politicians.

At roughly the time that Bush was publishing his ideas, Truman was choosing Byrnes, as his right hand man to accompany him to the Potsdam conference. Truman never warmed to the control methods of the wartime years, however successful they had been in practice. Byrnes soon asserted his, and his master's authority, in the area of control. The British Embassy ascribed Byrnes' more forceful stance once again to "the persistent public demand for a stronger and more independent American foreign policy."[234] This was evident at the Interim Committee meeting of 18 May 1945, which Bush did not attend, when the Quebec Agreement was debated and Byrnes asked what America had got in exchange. Groves said access to the Belgian Congo raw materials – Byrnes was not impressed. Byrnes "felt that Congress would be most curious about this phase of the matter."[235] It seems clear here that the ground was being laid for an even more closely governed American nuclear system, one which would have both domestic and international systemic implications.

Bush did play an informative role in the commencement of the new structural and systems debate. It was his, together with Conant and Stewart's, two page summary document in July 1944 which first called for a 12 member post-war commission with wide ranging authority over everything nuclear, including Bomb construction and new research.[236] The balance of power would rest with the

[233] The Report was effectively sent to Truman via his aide, Samuel Rosenman – Bush to Rosenman, June 01, 1945, OF 53, Truman Library, Independence, Missouri.
[234] Nicholas, *Washington Despatches, 1941 – 1945*, p. 608.
[235] Conant to Bush, May 18, 1945, Bush-Conant file f.12.
[236] Zachery, *Endless Frontier*, p. 290.

National Academy of Science members, not the military. With his concentration on actual wartime affairs, Stimson, its recipient, 'parked' the matter while the conventional war was being fought. In the summer of 1945, Stimson finally ordered his assistant, George Harrison, to create draft atomic legislation for Congress. In turn he tasked Brigadier Kenneth Royall and William Marbury, both experienced lawyers, with the job. This was an important moment – atomic affairs were being translated into the law of the land or the first time.

Their proposal was presented at the Interim Committee meeting of 19 July 1945 and it had resonances of the earlier Bush memo. They suggested a nine man, voluntary, commission group (spilt 5/4, civilian/military) but still with wide powers, including that scientists would need permission to undertake atomic research.[237] Bush protested about the level of censorship and the meeting agreed that a compromise would be that publication by scientists should be allowed, except where it affected national security. The party who would make such a security judgement was not spelled out. The military figures were to be drawn from retired as well as active officers.[238]

Once details of the proposed Bill became public after Japan's surrender, scientists acted quickly to utilise their recently enhanced status to protest the Bill's restrictions. On 1 September 1945, seventeen leading atomic physicists in Chicago said that they would stop work in the field if restrictions were not relaxed. Bush's monopoly, as the voice of science, was now a thing of the past and so soon after 'Manhattan's' secret was revealed. The decline of the 'rationalist – sharing' international view was importantly reflected in Stimson's exit from

[237] Richard Hewlett and Oscar Anderson, *The New World: A History of the United States Atomic Energy Commission* (Pennsylvania State University Press. 1962), p. 412.
[238] 'Notes of the Interim Committee Meeting', July 19, 1945, 'Decision to Drop the Atomic Bomb' Research File', Truman Library, Independence, Missouri.

government in September and in particular by the overwhelmingly realist voices that now held sway.[239] Bush, in his final few months at the centre of affairs, nevertheless wrote to Truman in September stressing that the window of sharing with the Soviet Union (that period in which an advantage could possibly be extracted from Stalin because of American knowledge leadership) was closing. Additionally, and interestingly almost concurrent with Cheshire's thoughts set out in Part Three, he also entered the debate on military nuclear strategy by discussing three things – missiles as a threat, the race to destructive capability and the costs involved. These would be highly relevant themes for the years ahead and would shape nuclear military strategy in the years to 1958 (and beyond).[240] It was, however, largely a statement of risks not one of solutions and Truman was unconvinced. The passage to McMahon would thus see the continuance of Bush's rapid slide from power.

On 3 October 1945 Truman asked Representative Andrew May and Senator Edwin Johnson to introduce an Atomic Energy Bill which was largely based on the 19 July Interim Committee agreement. The uncertain reaction of Congress was perhaps not surprising given the entirely new nature of what was being discussed. Political parties did not yet have a view. How was such a fundamental debate to be addressed? The McMahon debates were thus a complete re-think on America's whole defence and nuclear system, one that would then remain in place until the worldwide systemic pressures of 1957 - 1958 forced a restructure of external relationships.

[239] At Stimson's final cabinet meeting, Truman's appointees Fred Vinson, Treasury Secretary, and Tom Clark, Attorney General, showed the way things were heading as they argued that America should not give up its lead, in *Forrestal Diary*, September 21, 1945, Forrestal Papers, Princeton.

[240] See RG 227, Atomic Energy Commission, HDN, p. 217, National Archives and Records Administration, Washington D.C. - "there is no countermeasure to atomic bombs in sight".

In fact the first attempt at formal atomic legislation, the 'May-Johnson' Bill, was killed off by the Truman government not because of international power concerns, but because it was seen as insufficiently progressive in assisting the wider development of nuclear benefits for America. John Snyder, future Treasury Secretary and a personal friend of the President, was asked by Truman to reframe the Bill. Snyder stated that 'May-Johnson' did not achieve the necessary simplification, or stimulus to future applications, of nuclear technology.[241] He turned to James Newman, his Assistant at the Office of War Mobilisation, who wanted an atomic Bill to assist America to take advantage of "this new force which offers enormous possibilities for improving public welfare, for revamping our industrial methods and increasing the standard of living."[242] Newman distrusted the marketplace and wanted the new Commission to generate benefits for society as a whole, and not focus on military concerns.

The revised Bill was thus far from its myth as an internationally orientated and anti-British device. At source it was a Bill formulated by American politicians focused initially on domestic matters. In fact it was not even originally framed by Brien McMahon at all. It was Newman and Byron Miller who drafted this Bill, which was only latterly sponsored by the Senator from Connecticut. Brien McMahon, the man who donated his name to this important legislation, was a Yale lawyer who had come to fame through defending in the Harlan County Coal Miner's trial. He won the Connecticut Senate seat in 1944 defeating the incumbent, John Danaher, on an internationalist platform. Compared to those, such as Bush, McMahon's lack of technical capability was marked. In fact Bush was not involved in this process – indicative of his status as a famous name but now of the recent

[241] Snyder to Truman, November 14, 1945, Byron S. Miller Papers, 1, Library of Congress.
[242] James Newman, 'America's Most Radical Law: The Atomic Revolution', *Harpers,* (May, 1947).

past. This was now a political process being sponsored by an up and coming political actor who sought a vehicle for his ambitions. McMahon introduced the first iteration of the Bill on 20 December 1945, and it is important to appreciate that it was both representative of the multi-faceted debate occurring in America over nuclear power, and that its phases would reflect the dynamics that were generated. The McMahon Act was thus not the conception of one person, not reflective of a change in nuclear policy and certainly was not aimed at just one country, Britain.

This Bill's first iteration increased the power of the President, reflected the concerns of scientists and has been described as almost 'New Deal' in its focus.[243] The Bill had 21 sections and set out a structure with the new Atomic Energy Commission (AEC) being staffed by a reduced number of Commissioners – 5 – who would have to serve fulltime, thus reducing the likelihood of serving military being appointed. The stated aim in Section 1, B (1) was "to encourage maximum scientific progress", with clause (2) of this first iteration continuing that it would be "a program for the free dissemination of basic scientific information and for maximum liberality in dissemination of related technical information". "Maximum liberality" would probably not be the phrase many people would later associate with the draconian myth of the McMahon Act.[244] But the sense of a potential victory for the openness, pressed for by Szilard and others for so long, was continued in Section 9 which was entitled "Dissemination of Information". This contained another perhaps surprising phrase, that information should be shared "with utmost liberality", consistent with the foreign policies established by the President. This could even be argued to have given some 'wriggle room' for

[243] Zachery, *Endless Frontiers*, p. 299.
[244] See Howard Morland, 'Born Secret', *Cardozo Law Review*, Vol 26, No. 4 (March 2005).

the Quebec Agreement to play a role. This iteration also put the emphasis on nuclear materials, not secret technical information, as being key: an important distinction. The Espionage Act was seen as the catch all for security breaches. Ironically, if the Bill had passed in this first form, there *would* have actually been a change in Anglo-American nuclear relations, and for the better for Britain.

The Bill was progressing well when, on 16 February 1946, the Gouzenko spy scandal broke, rapidly followed by Groves' announcement of Alan Nunn May's passing of secrets to the Soviets.[245] An executive session was urgently convened and the security concerns that had haunted Bush and Groves throughout the war were pushed to centre stage, and now with a concrete basis. These incidents reignited the dormant factor of geopolitical concerns. The McMahon debate was always about the reconciling domestic control with the power elements that atomic weapons had released. The result of the re-emergence of security concerns, which was extremely worrisome to Congressional leaders, meant that the Bill would have to change to be more restrictive in its final form.

The Bill was now rapidly reshaped with Section 1, B, (2) becoming "a program for the control of scientific and technical information", and it now stated that technical information sharing would only occur when "effective and enforceable safeguards against its use for destructive purposes can be devised".[246] This was a self-protecting condition and referred to potential international agreements, which it could be argued if required to never truly be "enforceable". Section 1, B, (4) was even more specific in linking nuclear matters and defence and that the Act was

[245] Igor Gouzenko defected to Canada on 5 September 5, 1945. He exposed the Soviet Union's sleeper agent tactic to steal nuclear secrets. Alan Nunn May was a British physicist who worked at the Canadian Chalk River reactor during the war and was recruited there by Soviet intelligence.

[246] See - *https://science.energy.gov/~/media/bes/pdf/Atomic_Energy_Act_of_1946.pdf.*

"a program for Government control of the production, ownership, and use of fissionable material to assure the common defense and security".[247] This area of nuclear ownership, so long debated, was now being resolved in law. Section 9 was deleted altogether and replaced by a Section 10, 'Control of Information', which introduced the concept of 'born secret', a legal notion still utilised by American law agencies today.[248] It stated that some things were so secret that any (unauthorised) discussion or sharing of them – in fact, even to think about them – was illegal. It was backed up by severe punishments. What this Section, the critical Section for Britain, did not do, was single out any individual nation. All countries were rivals and nuclear activity must avoid anything that – ""secured an advantage to *any* foreign nation" (my italics).[249] This would be the phrase that would shut out Britain for the next dozen years. However, as the words and Congressional debates reveal, it was not designed as anti-British per se. The sense of continuance of the policy of 'Manhattan', and indeed before, about excluding all rivals is the strongest influence here.

Following the intervention of Senator Vandenberg, a new sub-committee introduced the military into the emerging nuclear control framework. It was called the Military Liaison Committee (MLC) and had members of the Army and Navy, "in such number as the Commission may determine."[250] The dominance of the civilian AEC was clearly determined in law as it was the Commission who would simply consult of the sub-committee about "military applications, including the development, manufacture, use, and storage and use of atomic bombs, the

[247] Ibid.
[248] Morland, 'Born Secret', p. 1402.
[249] See - *https://science.energy.gov/~/media/bes/pdf/Atomic_Energy_Act_of_1946.pdf* Section 10, b, 2 (B).
[250] See - *https://science.energy.gov/~/media/bes/pdf/Atomic_Energy_Act_of_1946.pdf* Section 2, (C).

allocation of fissionable material for military research, and the control of information relating to the manufacture and utilisation of atomic weapons" when they choose. The sub-committee could merely "make written recommendations to the Commission on matters relating to military applications from time to time as it may deem appropriate".[251] Civilian control was to the fore in the final terms of the McMahon Act.

International matters were dealt with in Section 8 – but in a mere 112 words. There were two elements. The first stated that an international agreement had to be one approved by the Congress – Quebec and Hyde Park were implicitly killed off here. Secondly it stated that international agreements made after the Act could supersede the provisions. This was an interesting phrase that would allow America to create subsequent atomic treaties with Britain if it so chose.[252]

The intelligence community immediately saw the Bill as approved as a fudge between the needs of security and the need to disseminate scientific information, both sides of which were heard in the Congressional debate. It was noted, for instance, that there were certain conflicts that the Bill in fact created, such as between the role of the MLC and the AEC itself.[253] Truman signed the McMahon Act into law on 1 August 1946 and the AEC took over the responsibilities of the 'Manhattan' project on 01 January 1947. The new American nuclear structures were formally confirmed by these legislative provisions. McMahon legally defined

[251] Ibid.
[252] See - *https://science.energy.gov/~/media/bes/pdf/Atomic_Energy_Act_of_1946.pdf.*
Section 8, (B) - "any provision of this Act or any action of the Commission to the extent that it conflicts with the provisions of any international agreement made after the date of enactment of this Act shall be deemed to be of no further force or effect."
[253] Report to Director, Central Intelligence by Chief of the Legislative Liaison branch, September 23, 1946, General Observations Point 3, accessed at *https://www.cia.gov/library/readingroom/docs/CIA-RDP62-00631R000200100063-1.pdf.*

the boundaries that had existed in practice throughout the war. It would take a lot to puncture these boundaries.

The British scientists were soon instructed to leave Los Alamos by Groves. Britain was then faced with the reality of seeing what they could make of the any knowledge that its scientists had gained during the war. That knowledge had been surprisingly accurate in terms of America's technical progress but it was never industrial in its nature. Later only Chadwick had any form of optimism in the face of the concerns embodied in McMahon. He exclaimed - "are we so helpless that we can do nothing without the United States?"[254] In fact the answer was both yes and no. Britain, as it was to be proved, was scientifically capable of building a fission, and then fusion, weapon, but it would take several years and always be based on less than leading technology. The simple fact would be that, if an overstretched fading imperial power like Britain wanted the most modern and expensive nuclear weaponry, it would have to find a way to create permeability in the Anglo-American nuclear military system, as in fact had been forecast by Groves and Lindemann.

In the meantime the McMahon Act of 1946 set the seal on the wartime years of non-cooperation in the atomic field by Britain and America. It is because it was the public face of the refusal of America to share its secrets that McMahon has achieved such status in the history of Anglo-American military relations. The reality, as we have seen, was that it was initially configured for positive domestic purposes. It started as a way of creating American control over its new technology as a whole. However geopolitical sentiment, spy scandals and the realist thrust of American power projection resulted in an Act that set the backdrop for Anglo-

[254] Gowing, *Independence and Deterrence, Vol. 1*, p. 114.

American atomic affairs over the coming dozen years. The truth about McMahon was that it simply reformulated what had existed during the war, amended by the implications of Hiroshima. It also performed a valuable service by temporarily enabling the civilian-military control debate to be resolved in America. It certainly does not deserve its reputation as a fundamental breakpoint in Anglo-American governmental atomic matters.

When reviewing the wartime years it is important to understand that, as Gowing has pointed out, fundamentally "no British scientists were admitted to the US factories where plutonium was to be produced."[255] This supports the view that Britain never gained the cooperation of the American state in areas that were of true importance. Agreements, such the second Hyde Park accord, were also simply temporary devices designed to keep Britain on side and, as Gowing affirms, after Roosevelt's death the agreement could not even be found.[256] However this historiography has not questioned thoroughly why such a remiss state of affairs might be allowed to exist if, as she argued, the Hyde Park agreement was truly "an affirmation of the intention to preserve Anglo-American collaboration after the war."[257]

It is also instructive to note that when in April 1945 Chadwick was asked which process Britain should adopt, in order to initiate its own post-war atomic industrial programme, "he, with more knowledge than any other Briton of the whole project, simply did not know which process or which plant to recommend."[258] This is not a particularly strong confirmation of any focused and defined strategic benefit to Britain, having ploughed all of its atomic knowledge into Manhattan. What Britain

[255] Gowing, 'Britain, America and the Bomb', p. 127.
[256] Ibid, p. 128.
[257] Gowing, *Britain and Atomic Energy*, p. 340.
[258] Ibid, p. 329.

acquired during the war was ”basic know-how”, rather than detailed information or plans for the construction and industrial development of those processes.[259] This confirms and supports the notion that Anglo-American wartime relations were scientific and personal, not governmental and strategic, in character. Finally, as Gowing says about the emerging post-war relationship, “there were differences of emphasis in interpreting ‘full collaboration’ but these were never thrashed out.”[260]

Britain would now have to constitute its own nuclear system while it continued to pursue the illusion of “thrashing out” a restored level of governmental cooperation with America. It would be continuing technological developments in weaponry, and resultant changes in geopolitical relations, which would be the true reason that America agreed to an atomic partnership with Britain in 1958.

[259] Ibid, p. 338.
[260] Ibid, p. 339.

Part Three

Developing Nuclear Systems and the Logic of Stalemate,

Anglo-American Nuclear Relations, Hiroshima to November 1952

The development of nuclear systems in the later 1940s and throughout the 1950s created new relationships between scientists, soldiers and politicians in both Britain and America. As Naomi Oreskes has pointed out, "science was central to the Cold War, because it had been scientists who had perceived the possibility of nuclear weapons, scientists who had built them, and scientists who continued to develop the means of testing, hiding, detecting, and delivering them."[1] The creation of the fission weapon by scientists was not the fundamental cause of the new emerging Cold War struggle between east and west, but it was a key element in its format and character.[2]

In the mid-20th century J.F.C. Fuller had previously stated that "tools, or weapons, if only the right one can discovered, form 99% of victory."[3] The story of the evolution of nuclear military strategy from just after the Second World War until 1958 was the search for just such a right weapon. What was different about fission, and then fusion, weaponry was that these 'tools' were now of such power that they would change the nature of war, and potentially even threaten human existence itself. A further crucial factor was that, after 1945, nuclear weapons had simply been proven to work – geopolitical and social relations between actors would now be constrained to adjust to this reality.

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[1] Oreskes and Krige, *Science*, p. 12.
[2] Ibid, p. 14 and John L. Gaddis, *The United States and the Origins of the Cold War, 1941 – 1947* (Columbia University Press, 1972).
[3] J.F.C. Fuller, *Armament and History: a study of the Influence of Armament on History from the Dawn of Classical Warfare until the Second World War* (London: Eyre and Spottiswoode, 1946), p. vi.

Studies of Anglo-America relations in this period have often failed to apply the systemic logic of nuclear consequences to the security and political events that followed.[4] The 1958 MDA was a product of exactly these changing technological, systemic and inter-actor security relationships. Science is also a key factor in the geopolitical history of these times and its analysis needs to be a central thread. The discussion of the 'Zuckerman thesis' will be continued, as it became apparent at the end of the war that science, and scientists, would have a permanent and central role in post-war defence arrangements.[5] What was different, after 1945, was that work on improving fission weapons became more iterative than hypothetical. In the later 1940s, it would be politicians and the military who played a greater role in the development of the weapon as the newly created weapon had to be managed. As fusion entered the developmental framework, a hypothetical element returned to the fore. Hence, it will be argued, scientists would take the lead to a greater extent once more.

Regardless of such sequencing matters, atomic science in the post-war years now had to work within the boundaries of the security of the state. As Daniel Kevles has put it, ""for the majority of liberal physicists it was scarcely a halcyon time."[6] Alongside all the huge funding made available by the federal government for physics research in America, physical defences appeared around the Radiation Laboratory at Berkeley, as security became ever tighter and more constricting on the physicist community. Nuclear prioritisation was a two-edged sword for many in the science world.

[4] See John Baylis and John Garnett (eds.), *Makers of Nuclear Strategy* (London: Pinter, 1981) for an excellent analysis of the earliest thinkers in the field of nuclear strategy.
[5] For details on the Zuckerman thesis, see pp. 27 - 28.
[6] Kevles, *The Physicists*, Chapter XX111.

Also post-war, there emerged a change in the way in which geopolitical problems were approached as science and the scientific method became more integrated into policy making. This has been expressed in the historiography as the difference between rationality – decisions taken on the basis of algorithms and efficiencies – and reason, which is founded in human personality and context.[7] Thus some have argued that "from the standpoint of the American Cold war rationalists, the United States and the USSR shared both the predicament and its rational solution….America and the Soviet Union occupied symmetric positions."[8] This perspective points to the configuration of a shared strategic world, unified by increasingly similar ways of approaching nuclear military scenarios. This supports a view that the growing pressures in this area would have widespread geopolitical consequences; the MDA would be one of these. As decisioning methods, such as linear programming and game theory, were put forward, the world moved into period in which technical approaches were used to drive alleged "optimal decision making via the quantative evaluation of alternative outcomes."[9] It seemed better to many theorists to simply ignore history, prejudice and personality, as they searched for answers to the possibilities posed by the threats of Cold War American-Soviet rivalry.[10] Adding such a scientific rationale as part of the explanation of the commencement of Anglo-American governmental level partnership in 1958 has not been seen before in the historiography.

[7] Paul Erickson, Judy Klein, Lorraine Daston, Rebecca Lemov, Thomas Sturm and Michael Gordon, *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality* (Chicago: The University of Chicago Press, 2013), p. 3.
[8] Ibid, p. 17.
[9] Ibid, p. 64. Linear programming is a mathematical method for determining a way to achieve the best outcome and was pioneered by American statistician George Danzig. The seminal work on game theory, a method of deriving rational preferences, was published by mathematician John von Neumann and economist Oskar Morgenstern in 1944.
[10] Ibid, p. 107.

The existing literature of the immediate post war years has typically reflected a statist view. For instance, in John Baylis' excellent piece that marked the 50th anniversary of the 1958 MDA, he described the preceding years as being a "tortuous period of diplomacy."[11] Baylis argued that Britain had a geopolitical goal of 'interdependence' with America: what Harold Macmillan called "the great prize."[12] He saw this political debate as the centre of the Anglo-American dynamic rather than the argument of this thesis, which sees science and the effects of wider atomic pressures as also key. Baylis pronounced that his analysis would start after the "McMahon Act in 1946, which cut Britain off from the wartime nuclear collaboration between the two allies." This continues to reflect the 'McMahon' myths that were discussed in Part Two. Baylis also sees British policy as consistent, in contrast to the variability in the American position which he ascribes to America's attempts to maximise its security interests. Alternatively, Margaret Gowing sums up America's lack of help to Britain in this immediate post-war period as being because of "promises forgotten, former discussions misinterpreted, facts stood on their head and sheer administrative muddle with departments pulling in different directions."[13] In contrast, it will be argued here that from 1941 until late 1957 American policy in atomic affairs towards Britain was in fact settled and consistent: it was to avoid any form of true governmental partnership in transatlantic nuclear affairs.

From the American perspective, Botti sees immediate post-war Anglo-American atomic relations as being littered with what he describes simply as high and low points. These are largely based on the squabbles of the State Department, the Defense Department and the Presidency which he describes as being "phases in

[11] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 427.
[12] Harold Macmillan, *Riding the Storm: 1956–1959* (London: Macmillan 1971), p. 323.
[13] Gowing, *Independence and Deterrence,* Vol. 1, p. 261.

the continuing struggle."[14] Additionally, Botti is prone to judgements that seem overly optimistic when the evidence is analysed. About the Modus Vivendi agreement between Britain and America in 1947, for instance, he is sufficiently persuaded to say that this "had improved nuclear cooperation with its chief ally."[15] This thesis will analyse the document series Foreign Relations of the United States (FRUS) in particular, and show that agreement in a very different light. Botti does however bring the importance of the Congress to the fore, especially in his detailed descriptions of the changes of the make-up of the Atomic Energy Commission (AEC) and the Congressional Joint Committee on Atomic Energy (JCAE). These are key bodies in the Anglo-American relationship between 1946 and 1958. The McMahon Act had moved the American legislature centre stage in nuclear affairs, and yet this is often overlooked by British writers.

Matthew Jones' recent official history of Britain's nuclear strategy described the McMahon Act as a "stab in the back" by America.[16] He argues that Britain wanted the power of the fission bomb for two main reasons. The first is that it would be a re-admittance card to the nuclear relationship with America that it had just lost. Secondly he supports Gowing's view that Britain wanted the Bomb for 'great power' reasons and that the move to the Bomb was simply "the reflex action of a still great power."[17] Given his remit, Jones' view is necessarily concentrated on Britain in explaining transatlantic nuclear affairs; but it is also important to focus on America's actions if one is to obtain the best possible perspective. For instance, Jones does not discuss key milestones such as the Modus Vivendi which continued to stymie Britain's partnership ambitions, and thus had the effect

[14] Botti, *The Long Wait*, pp. 99 and 60.
[15] Ibid, p. 35.
[16] Jones, *Official History*, p. 10.
[17] Ibid, p.11. And see Gowing, *Independence and Deterrence, Vol. 1,* p. 209.

of requiring Britain to focus it on its own programme. With his in-depth and well researched information on British military affairs, Jones goes on to argue that a sense of vulnerability was what lay behind Britain's lack of keenness to participate in the Korean War of 1950, and also in its worry about the escalatory effects of American pressure on Russia.[18] Additionally Jones blames the rising pressures of defence concerns for growing inter-service arguments over resources, and which "did not aid the production of a coherent policy."[19]

Richard Moore focuses on a specifically military narrative in his detailed history of the British navy in this period, and separately on a study of the perceptions of nuclear thinking. In the latter work, Moore argues that "British nuclear capability was profoundly shaped by a belief in the need for credibility….this perfectionism seems to have been deeply rooted in British defence and scientific culture, and undoubtedly contributed to the costs of deterrence."[20] Such a multi-faceted approach will be adopted here in Parts Three and Four. In his detailed and thorough narrative concerning the Royal Navy's attempts to come to terms with a new way of waging war, Moore uses a level of analytical detail in military matters that moves us closer to the most important component of the reality of these times – the development of military nuclear capability. This complements, and is used by, Jones' later wider study of military affairs. It would be this new capability, developed as a dialogue between science, the military and politicians, which would create the systematic pressures that ultimately changed policy. Additionally, Moore concludes that "up to the end of 1955, then, new developments in nuclear weapons and nuclear strategic thought had made little

[18] Jones, *Official History*, p. 19.
[19] Ibid p. 19 and quotes Baylis, *Ambiguity and Deterrence*, pp. 76 – 84.
[20] Moore, *Nuclear Illusion, Nuclear Reality*, p. 248.

impact in the UK."[21] We will find here that they also were not powerful enough to shake off the stalemate of Anglo-American relations at least before 1952. Moore is also unusual in that he uses the same periodisation as this thesis, which argues that the post war period requires contextualisation in the Second World War or even before.[22] Other historians, including Jones, have started their work in 1945. They therefore miss the key precursor – the lack of American government-level cooperation in wartime. This sets the scene for, and makes it easier to understand, the immediate post-war separation. The latter period was simply a continuance of what went before. The question therefore to be answered is: what *changed* in Anglo-American nuclear relations to allow the 1958 agreement to be signed?

Recent writers have tackled the post-war transatlantic nuclear relationship through the eyes of a high ranking subject. The view that they give on Anglo-American nuclear relations is thus, not surprisingly, highly 'telescoped' through such a single individual's view. The two recent Churchill-centred works are cases in point. As a result Farmelo suggests that Churchill's post-war views ran through three phases. The first he says, when free of office, was initially aggressive.[23] Then after 1948 he believes his subject to become more careful with the still-preferred confrontation with the Soviets to be potentially one of threat only.[24] Finally, and after Churchill's speech at Edinburgh on 14 February 1950, he would move towards more of a 'summit' based approach (at which Churchill was to be a key player, of course).[25] Kevin Ruane also sees three Churchillian phases –

[21] Richard Moore, *The Royal Navy and Nuclear Weapons* (London: Frank Cass, 2001), p. 127.
[22] Moore, *Nuclear Illusion, Nuclear Reality*, pp. 254 – 255.
[23] Farmelo, *Churchill's Bomb*, p. 339, quotes J. Pickersgill and D. Foster (eds), *The Mackenzie King Records Vol 4, 1947-48*, (Toronto: University of Toronto Press, 1970), pp. 112 – 113.
[24] Ibid, p. 339.
[25] Ibid, p, 355.

"from wartime atomic bomb-maker through Cold War atomic diplomatist to nuclear-driven disciple of détente."[26] However Ruane's analysis of events is far more engaged in the minutiae of geopolitics, in line with his opening remarks concerning his own historical background against the science focus of Farmelo. He also concludes that the spy scandals of Fuchs and others were not the essential reason for the Anglo-American divide. Ruane's view is of a Britain estranged from America and he cites examples such as the lack of a pre-warning of the first American fusion test, codenamed 'Mike', as evidence of the disconnect.[27] So the conclusion reached by both authors – Anglo-American detachment – is sound, but its placement in the broader history of Anglo-America nuclear relations is not seen as the main outcome. This thesis aims to provide this important, longer term and international, contextualisation of post-war Anglo-American atomic history.

Finally, the Global Strategy Paper (GSP) of 1952 written by the British Chiefs of Staff, has been seen as influential over American thought, particular on what would become the Eisenhower's 'New Look', which was the policy of using nuclear power to square the circle of costs and requirements, including recently by British historians Baylis and Stoddart.[28] It will be argued here that Britain and America would share very similar developmental stages as their nuclear systems matured. However Britain never influenced America to the extent claimed. In fact it will be argued that, far from positively shaping American thinking, the idea of 'influence' over America became a euphemism for needing assistance, i.e. a state

[26] Ruane, *Churchill and the Bomb*, p. 12.
[27] Ibid, pp. 252 and 255.
[28] Baylis and Stoddart, *The British Nuclear Experience*, p. 13.

of dependency, given the scale of threat that emerging fusion weaponry would generate going forward.

Building on the findings of Parts One and Two of this thesis, that Britain and America were largely non-cooperative in nuclear affairs throughout World War Two at the governmental level, this section will argue that Anglo-American nuclear military relations in the first seven years after 1945 would remain stuck in a logic of systemic stalemate. This was because of insufficient progress in the development of the worldwide nuclear social system, both technically and militarily, and not because of political or espionage factors. Nuclear systems developed in other states and other ways during this first post-war period, and therefore America's structures effectively became one of many sub systems that increasingly broad atomic world. However the pressure from these emerging organisms was not yet sufficient to force policy change in America. Britain and America would, as a consequence, remain distant in nuclear matters.

Britain's Nuclear Decision

On 26 July 1945 the British wartime government was replaced by a Labour administration led by Clement Attlee. As knowledge about 'Tube Alloys' had deliberately been withheld by Churchill from his Cabinet, and shared with very few in government, the incoming Prime Minister had only a very vague appreciation of nuclear affairs. On 17 July Attlee had been present in the building when Churchill had entertained Truman to lunch in Potsdam, and when Stimson told Churchill that "the baby had been born and was larger than expected."[29] Churchill's immediate reaction was typical of the wartime approach – don't tell the Soviets and don't share the news with Attlee.

Back at Chequers during the same month, Churchill worked on the draft of his announcement on the history of the new weapon from the British viewpoint. This reflected the reality – early British foundations, scientific involvement and final hopes for the future.[30] Nothing could be put in about the 'agreements' of Quebec and Hyde Park, following Lindeman's advice.[31] In fact the reality of the war years can be fairly deduced from what was, and particularly what was not, said by the wartime leader in his address on the subject. Britain had been outmanoeuvred, outspent and out-powered. It had assisted America scientifically, and with resource acquisition, but it had never attracted a genuine cooperative governmental partnership which could now be made public.

Upon assuming power and gaining relevant awareness, Attlee acted promptly in setting up civilian nuclear control structures. As an example of his grasp of the dramatic shift that had happened in 1945 he wrote that "the answer to an atomic

[29] The code phrase that Trinity had been successful.
[30] Speech on Atomic Weapons, 29 July 1945, PREM, 3/139/9, TNA.
[31] Lindeman to Churchill, 26 July 1945 , PREM 3/139/9, f.640, TNA.

bomb on London is an atomic bomb on another great city!"[32] Consequently, on 29 August 1945, the new Labour government convened and organized a secret Cabinet committee on atomic energy with a brief to establish nuclear policy. This committee, called GEN.75, was a subset of the full Cabinet and was termed the 'Atom Bomb Committee' by Attlee. Later, an even smaller secret group of ministers known as GEN.163 was appointed, as a subset of GEN.75, and was tasked with making specific decisions relating to the weapons programme. This was the first control element in Britain's nuclear system. This was also similar to the civilian restructuring of control in America occurring at this time under McMahon, but with the vital difference that the stakes were so much lower – no actual nuclear weaponry was available as a specific point of argument in Britain. This may explain why the American post-war debate was more intense though, as ever, the processes in these matters across the world were remarkably similar.

At the military level, atomic strategic thinking was initiated in Britain by one of the most effective of the front line officers involved in delivering bombs during World War Two – Leonard Cheshire.[33] In a statement written as early as 21 August 1945, and based on his attachment to the fission project in the Pacific, Cheshire put forward three conclusions from his recent atomic experience that were remarkably prescient and one of the first expressions of the new military realities, certainly from the lips of a bombing practitioner. He suggested that, in the future, the critical factor in military affairs would not be the possession of atomic power itself but rather the means by which a weapon could be delivered. It was all very well to fly across an unguarded Western Pacific and drop one or two single bombs

[32] 'The Atomic Bomb: A Memorandum by the Prime Minister', 28 August 1945, CAB 130/3, (GEN 75), TNA.

[33] Group Captain Geoffrey Leonard Cheshire, Baron Cheshire VC, OM, DSO & Two Bars, DFC was one of the most decorated RAF pilots of World War Two and later a noted philanthropist.

on unprotected cities, but how would it work in the face of flak or an active air defence systems? Next, and flowing from the first point, Cheshire already foresaw that the heavy bomber had had its day. The strategic air forces that would be developed in America by General Curtis LeMay and others were already redundant according to this British expert in 1945. So it would prove in the face of Sputnik and the missile threat. He thus recommended 'space projectiles' as the vehicle of delivery.[34] In other highly pertinent military deductions, his statement went on that "the U.K. by virtue of its small size has become highly vulnerable and is now in a weaker position than any of the other Great Powers", and that ground forces were now obsolete. His essential argument was that it would be impossible to stop an aggressor using the atomic bomb and thus the logic was that all resources should be put into what were, effectively, anti-missile systems. Cheshire further argued that should be at the expense of all other military expenditure, if need be, as the threat was the most severe possible.[35] This was radical thinking. It shows that wider military strategic thinking commenced at the earliest possible moment after the weapon was used. It also reveals that Britain was not lacking new strategic ideas for the atomic age.

In terms of putting the Labour government's atomic strategy into practice on the international stage, and aiming to initiate a new phase in Anglo-American nuclear relations, Attlee wrote to Truman in September 1945 urging that the two countries work together to deal with the entirely new conditions facing the world.[36] Attlee later set out his own nuclear thinking in a memorandum to the Cabinet on 5 November 1945. He stated that the Bomb was a weapon against which there

[34] The Atomic Bomb', Cheshire to Chadwick, 21 August, 1945, CHAD 1 / 15 / 1, CCA. Curtis LeMay developed the strategic bombing of Japan including the firebombing of Tokyo.
[35] Ibid.
[36] Attlee to Truman, 29 September 1945, in Gowing, *Independence and Deterrence*, Vol.1, pp. 78 - 81.

could be no defence, unconsciously echoing Group Captain Leonard Cheshire's view, but his solution was, perhaps unsurprisingly, very different. Attlee suggested that all the powerful nations of the world must recognise this and "lay aside our nationalistic ideals."[37] He argued that fission bombs could be used against aggressor nations but was not able to state who should make that crucial decision. He specifically ruled out the new United Nations Security Council as a deciding body.[38] Such a policy document was therefore about as vague and woolly as it was possible to get, drafted by a leader of a nation still years from getting the fission bomb, and in a country who had just spent 5 years being rebuffed by the party to which this 'line' would be addressed: America. It was unlikely to be the basis of an effective Anglo-American nuclear policy.

Given the above lack of policy clarity and because British science was now well behind America's, it is therefore hardly surprising that Attlee's first meeting with Truman and Mackenzie King in Washington in mid-November bore little fruit.[39] In fact, and while this may have been for security reasons, Mackenzie King's diary has virtually nothing to say about the dealings of the three leaders in this sphere. It merely stated that he was very much aware of the threat posed by atomic weapons to the existence of the human race.[40] Following a United Nations Atomic Energy Commission investigation into the elimination of nuclear weapons, which recommended sharing the information necessary to build a fission bomb with other states, the Washington Conference agreed that this was not to be supported. As far as Truman was concerned that also meant between the three signatories to the agreement - not just 'other' nations. In the meantime there was

[37] 'Memorandum by the Prime Minister on the Control of Atomic Energy', CAB 130/3, (GEN 75), 5 November 1945, Point 2, TNA.
[38] Ibid, Point 9.
[39] For the text of the Agreement see Appendix 3.
[40] Diaries of William Mackenzie King, 8 November 1945, accessed at www.bac-lac.gc.ca.

agreement that the Soviets should not be brought into the secret. As Farmelo has put it, the Washington conference ended with a memorandum that was merely "a few hurriedly drafted lines" expressing the desire for cooperation, and that Attlee returned home believing that "the British and Americans saw eye-to-eye on nuclear policy."[41] In the official record of the talks, assurances can be noted which were uncomfortably close to those received by Churchill during the war. Gowing accurately points out that each of the wartime and immediately post-war Anglo-American agreements – Quebec in 1943, Hyde Park in 1944 and now the Truman-Attlee-King concordat of November 1945 – had the same elements. They were all secret, they did not inform policy at the 'working level' and they were publicly dismissed by America when push came to shove.[42] Once again there is a consistency here in American policy that Gowing underplays. However she was clear on the results at this time. She states that "the coming into force of the McMahon Act destroyed hopes of improved collaboration but did not make much difference to the immediate situation because there had been so little exchange of information ever since the end of the war."[43]

The true position of America, following the Washington Conference, is painfully revealed in the letter from the new British Foreign sectary, Ernest Bevin, to Lord Halifax written in April 1946. It reflects a Truman-Attlee communication of 20 April 1946 and makes it crystal clear that its post-war position on nuclear technology was very firmly the same – no sharing. It refers to the 16 November 1945 memorandum, signed at the end of the conference, and the letter is worth quoting extensively as it forcefully sums up the American position.[44] In point 2, Truman

[41] See Farmelo, *Churchill's Bomb*, p. 317.
[42] Gowing, *Independence and Deterrence, Vol.1*, p. 110.
[43] Ibid, p. 111.
[44] See Appendix 3 for the full text of this Memorandum.

states “I would regret it very much if there should be any misunderstanding by us as to this memorandum. I think that it was agreed by all of us that during the war under the Quebec Agreement the United States was not obligated to furnish to the U.K. in the post-war period the designs of such plants.”[45] Therefore the question was, Truman continued, whether the situation had changed and his answer was that “no one at the time informed me that the Memorandum was proposed with the United States to obligate itself to furnish the engineering and operational assistance necessary for the construction of another atomic energy plant. Had that been done I would not have signed the Memorandum.” He goes on to highlight Paragraph 5 of Quebec Agreement that mentions the ad hoc nature of operational co-operation. The President continues “as to our entering at this time into any arrangement to assist the UK in building an atomic energy plant, I think that it would be exceedingly unwise from the standpoint of the UK as well as the US”. He justified this by reference to the international control discussions currently under way and that American public opinion wouldn’t permit it as it would appear contradictory to try to limit but then also assist its spread. He is then very clear about sharing – “no such purpose was suggested by you or thought of by me.”[46] This communication continues to support the argument that there was no Anglo-American governmental cooperation in atomic affairs before 1958.

Churchill went on to express a view to the House of Commons, on 7 November 1945, that the nation should make atomic bombs.[47] The British government did not, in fact, officially share that view. In fact for over another year British defence

[45] Bevin to Halifax, ‘Following sent by President to Prime Minister dated 20th April 1946’: Tel. No. 3779, 23 April 1946, in CHAD IV / 3 / 1, CCA.
[46] Ibid.
[47] Churchill, *Hansard*, 7 November 1945.

policy was not one of a nuclear nature. An advisory group, called the Advisory Committee on Atomic Energy (ACAE) was set up by Attlee and on 18 December 1945 Attlee convened Gen.75 to consider this group's first report.[48] The initial recommendation of building one or more nuclear reactors was adopted and Attlee then appointed three senior leaders for the British atomic energy programme in late January 1946.[49] However the uncomfortable truth was, as Graham Spinardi has pointed out, that while "a number of British scientists had worked, often in important roles, at Los Alamos on the US bomb….considerable work was needed, however, in the practical application of this knowledge (which was fragmented due to the compartmentalized nature of work in the Manhattan project), in designing and producing components with unusual accuracy requirements, and particularly in producing the fissile material."[50] The realities of limited cooperation, as opposed to the generally assumed wider state of governmental partnership, were now being brought home.

On 25 October 1946 the famous debate in Cabinet occurred when Foreign Secretary Ernest Bevin, having been the subject of a talking-to by the American Secretary of States James Byrnes, said that Britain must have the fission weapon and it should "have the bloody Union Jack on top of it."[51] The scene was set for Britain to take formal steps towards becoming nuclear military power despite the costs. On 8 January 1947 the Gen.163 committee finally made the decision to

[48] The 'ACAE' was known as the 'Anderson Committee' and was setup on 28 August 1945 and finally dissolved in January 1948.
[49] To direct the British effort in atomic energy Lord Portal (Air Marshal Viscount Portal of Hungerford) was made Controller of Production, Atomic Energy (CPAE, after 1950 Controller, Atomic Energy or CAE). Physicist Sir John Cockcroft was named Director of the Atomic Energy Research Establishment (AERE), and Christopher Hinton (a senior ICI engineer) became the leader of the fissile material production programme.
[50] Graham Spinardi, 'Aldermaston and British Nuclear Weapons Development: Testing the 'Zuckerman Thesis'', *Social Studies of Science*, Vol. 27, No. 4 (Aug., 1997), 551.
[51] See Hennessy, *Cabinets and the Bomb*, p. 48 about Bevin's comments at the GEN. 75 meeting of 25 October 1946.

proceed with the development and acquisition of atomic weapons.[52] The nettle had to be grasped and Britain would have to endure a difficult period of military learning, the creation of its own effective nuclear system and the diversion of much needed cash towards a fission bomb building programme. It was the pain of a declining power still without a nuclear ally.

Matthew Jones sees the January 1947 decision as a ”ratification”, merely, of the path that Britain would need to take militarily.[53] However he has to admit that such a senior figure as the Chancellor was not present at the Gen. 163 meeting and thus, for whatever reason, the matter of financing this huge scheme was not raised at the critical juncture. Costs would be a constant shaper of nuclear strategy in the years ahead. It is thus inaccurate to state that the whole government supported such a move or even that it was inevitable. Gowing's view is that Britain wanted the bomb for 'great power' reasons.[54] Bevin himself is quoted by Jones as saying "we could not afford to acquiesce in an American monopoly of this new development."[55] This is not the same as just a 'great power' motive. In fact it implies the existence of a new emerging geopolitical logic – that the fission weapon was already the currency of world affairs. Whether it was to purely influence American policy or, more accurately, because of the new strategic reality, the first pressures of the nuclear world system were being felt here in Britain. Britain had to create its own system or remain outside the nuclear sphere. It had taken time for Britain to realise that, in nuclear matters, Anglo-American relations were never those of allies in the wartime and the immediate post-war period. It now had to press on alone.

[52] See CAB 130/16, TNA.
[53] Jones, *The Official History*, p. 1.0
[54] Gowing, *Independence and Deterrence*, *Vol. 1*, p. 209.
[55] GEN 163, 8 January 1947, CAB 130/16, TNA.

This would be despite progress in other aspects of the overall post-war Anglo-American relationship. Gowing points out correctly that cooperation of an economic variety between America and Western Europe as a whole was intensified, after June 1947, by the Marshall Plan.[56] Additionally the stationing of American bombers in East Anglia in 1948, though not nuclear, was to be a step on the journey of defence cooperation. The signing of the North Atlantic Treaty in April 1949 was another significant step in cross-ocean defence collaboration, although it could not yet be described as atomic in nature. These were for the future but they would stand in stark contrast to the absence of atomic linkages.

In the interests of completeness, mention will now be made of the most important points contained in the TATSC 'replacement', the Atomic Energy Nuclear Policy Steering Committee (A.E.N.P.S.C.), minutes until the end of 1946. In an interesting security echo of what was happening in America as part of the McMahon Act debate, in February 1946 it was noted that the Censorship Department did not now exist and thus the only control on nuclear secrets being published in scientific papers was the Official Secrets Act.[57] The programme then reverted back to its university roots and the minutes show several versions of their plans and planned expenditure. It makes very modest reading with the total large equipment capital costs estimated at an incredibly low £285,500 with annual costs of only £33,100.[58] The backwardness of British nuclear physics was agreed by this Committee as having its roots even pre-1939, in contrast to the views of those such as Edgerton who see Britain as relatively strong pre-war.[59] They stated "even before the war this country had rather fallen behind other countries

[56] Gowing, *Independence and Deterrence, Vol. 1*, p. 24.
[57] A.C.A.E. (N.P.) (46) 8 – 8 February 1946 in CHAD I / 5 / 6, CCA.
[58] A.C.A.E. (N.P.) (46) 10 – 8 February 1946 in CHAD I / 5 / 6, CCA.
[59] Edgerton, *Britain's War Machine*, p. 234.

in the number of e.g. cyclotrons which it possessed. During the war no new equipment has been provided and nearly all our nuclear physicists have been withdrawn from academic research. Today there is an almost complete lack in this country of apparatus comparable with that available for research in America….we do not suggest that this country can afford to keep pace with expenditure by the United States", but it recommended investment is several items of nuclear hardware - 2 large betatrons, 2 cyclotrons, 2 spectrographs, 3 van der Graafs and one special accelerator. The total cost was estimated to be in the region of £300,000 and the request was written in a pleading tone that recognised the stretch on Britain's budgets.[60] British nuclear science had fallen a very long way from the pioneering years of Rutherford and, later, the completeness of MAUD. In fact it points to the reality that Britain's nuclear system had dissolved rather than firmed up during the war and immediate post-war years.

It was a mix of knowledge and people that was seen as the most pressing threat now to the British programme and that, if these two matters were not corrected, then "there will be no leaders in the next generation able to direct either Harwell or the piles."[61] Design was taking its cue from the American lead, just as had been predicted by TATSC during the war years. Cockcroft in the March meeting described the piles that were to be set up at Harwell, with the Graphite Low Energy Experimental Pile ('G.L.E.E.P.') being similar to the Chicago Laboratory "C.P.2 pile", and the 6000K.W. pile following the design of Clinton in America.[62] Typical domestic political dynamics were also starting to show their hand in terms of the funding that was needed for these vital British developments. The April minutes, for instance, report that while the Cabinet had agreed the modest

[60] A.C.A.E. (N.P.) (46) 15 – 27 February 1946 in CHAD I / 5 / 6, CCA.
[61] A.C.A.E. (N.P.) (46) 18 – 15 March 1946 in CHAD I / 5 / 6, CCA.
[62] A.C.A.E. (N.P.) (46) 20 – 29 March 1946 in CHAD I / 5 / 6, CCA.

funding needs “the general approval now given….does not commit any Government Department to accepting in detail particular proposals.”[63] No evidence of enormous urgency or priority can be seen here. Indeed even by September, and just before the Cabinet started the October debate that was to lead to the January fission bomb decision, it was still possible to find in these records debates about the scale of university funding for research, and of Blackett having to chase around in connection with even the most trivial of laboratory needs. Nuclear systems in Britain in late 1946 now hung on the possibility that “thermometers and stop watches might eventually be located.”[64]

In the coming years, the nuclear systems of Britain and America would develop along a similar path, albeit with America being in the lead, with the next key milestone being the Anglo-American Modus Vivendi Agreement.

[63] A.C.A.E. (N.P.) (46) 23 – 12 April 1946 in CHAD I / 5 / 6, CCA.
[64] A.C.A.E. (N.P.) (46) 45– 21 September 1946 in CHAD I / 5 / 6, CCA.

American Nuclear Weakness and the Modus Vivendi

In early 1946, partly by way of a test of domestic opinion on Truman's behalf, Churchill was invited to speak at Fulton, Missouri. His 'Iron Curtain' speech of 5 March 1946 assisted in a change in the public rhetoric towards the Soviet Union, from ally against Nazism to world threat. The themes of stopping Soviet expansion and uniting behind American leadership were endorsed here.[65] It was a speech ahead of its time and Truman had to face questions about its impact on policy.[66] Walter Lippmann, the influential journalist and political commentator, reflected American nationalist concerns when he analysed the speech as suggesting that it would result in America supporting Britain's crumbling imperial might.[67] However this speech needs to be put in the context of the emerging systemic shape of the nuclear world. Seminal definitions of 'the other' were made by Churchill here, as he effectively framed the language of the emerging Cold War. The various nuclear local systems that formed in the later 1940s and 1950s would thus all fall into one half of this increasingly defined social world or 'the other'.

It is important to appreciate that the American military nuclear programme did not just flow on seamlessly from 'Manhattan'. As David Rosenberg has argued, "for two years after Nagasaki, the JCS did not collectively or formally review or approve any plan contemplating the use of atomic bombs."[68] It has also been shown that work at Los Alamos itself came to a virtual stop by September 1945.[69]

[65] For comments on this speech's wider implications, e.g. on the Empire and the financial loan to Britain (at that time under consideration by Congress), see Toye, *Churchill's Empire*, pp. 267 – 268.
[66] Ruane, *Churchill and the Atomic Bomb*, p. 174.
[67] Walter Lippmann, 'Mr Churchill's Speech', *New York Herald Tribune*, March 7, 1946.
[68] David Rosenberg, 'The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960', *International Security*, Vol. 7, No. 4 (Spring, 1983), 12.
[69] "Essentially it came to a grinding halt" – Raemar Schreiber in Arthur Norberg, *Interview*, (The Bancroft Library, 1980), p. 26.

Despite Edward Teller now feeling that a move to fusion weaponry was certainly possible, a fact confirmed in the AEC's Scientific Panel's report to Stimson on 17 August 1945, America was in a post-war lull.[70] Partly this was encouraged by widely varying assessments of how long it might take the Soviets to catch up. An American Joint Chiefs' Intelligence Committee report, for instance, gave an assessment of up to 10 years, based in part on the Soviet Union's industrial capability, rather than the science.[71] In the end Los Alamos was to be saved by Norris Bradbury, the American physicist who had been in charge of developing 'the gadget' for the Trinity Test, but only just. Bradbury proposed to Groves that he led the team to take forward a series of fundamental questions leading to the answer as to whether 'Super' was feasible.[72] As previously agued by this work, Bradbury's rationale also stated that the inexorable advance of scientific knowledge, whether it was in America or elsewhere, meant that no one could not avoid knowing "the facts, no matter how terrifying."[73] Here again is evidence of how it was science that preceded the military need. The military were not breaking down the doors of Los Alamos to demand a more powerful version of the fission weapon.

Fusion's first appearance had been in the work of Rutherford, Oliphant and Harteck at Cambridge as far back a 1934. This was when these earlier scientific 'giants' were bombarding H^2, and thus created the union of two deuterium nuclei with the consequent release of great heat, neutrons and gamma radiation.[74]

[70] Scientific Panel to Secretary of War, 17 August 1945, RG 77, National Archives, Washington D.C..
[71] 'Soviet Capability Report', JIS 80/15, 9 September 1945, RG 165, National Archives, Washington D.C..
[72] 'Super' was the nickname that teller had given to the fusion weapon during the war.
[73] Edith Truslow and Ralph Smith, 'Part II, Beyond Trinity', in David Hawkins, Edith Truslow and Ralph Smith, *Project Y: The Los Alamos Story* (Tomash Publishers, 1983), p. 363.
[74] M. Oliphant, D. Harteck and Lord Rutherford, 'Transmutation effects Observed with Heavy Hydrogen', *Proceedings of the Royal Society,* Vol. 144 (1 May, 1934).

However the calculations underpinning the theory of thermonuclear explosions were extremely complex and needed to await their assignment in early 1945 to a calculating machine – ENIAC - developed in 1944 at the Pennsylvania School of Engineering. On 5 October 1945, Los Alamos published a document setting out all the technical data that had been assembled at that time and this formed the bedrock for the first full meeting assembled specifically to discuss fusion work, held in New Mexico on 18 April 1946.[75] The report from the conference, issued in May 1946 and drafted by Teller, very clearly stated that a fusion bomb could be constructed and would work.[76] This was taking human weaponry to another level, even beyond the fission weapon. It is this quantum change and this is why science once again needed to assume the lead at this point. Fusion would create a huge shift in nuclear capability which in turn would generate geopolitical pressures and finally manufacture a new logic in Anglo-American nuclear affairs - for cooperation. But fusion weaponry was theory, not accepted fact, at this time. America still relied on fission.

The way America had at first sought to internationally exploit its control of fission was by proposing what became known as the Baruch Plan, after its author Bernard Baruch the well-connected businessman and a trusted Presidential advisor for many years. This was based on the Acheson–Lilienthal Report and presented to the United Nations Atomic Energy Commission (UNAEC) during its first meeting in June 1946.[77] It ostensibly sought international regulation of atomic energy. In fact, as Gilpin has argued, “despite its daring and idealistic enlightenment, the Baruch Plan was truly a reflection of American national

[75] *Super Handbook*, JCAE, October 5, 1945, RG 128, National Archives, Washington D.C..
[76] Rhodes , *Dark Sun*, p. 255.
[77] For details on the Acheson–Lilienthal Report see David Mayers, ‘Destruction Repaired and Destruction Anticipated: United Nations Relief and Rehabilitation Administration (UNRRA), the Atomic Bomb and US Policy 1944’, *International History Review* 38, 5 (2016), 961 - 983.

interest."[78] In return for the ability to inspect and ensure no other state possessed nuclear weapons, America would share the atomic secrets upon which its power position was temporarily based. Each step in the process was loaded in America's favour. The Soviet Union, realising that science would ultimately deliver the secrets of fission to its door in any event, did not find such a proposal attractive.

During this time, the American military were actively concentrating on perfecting their existing fission bombs. The subsequent 'Crossroads' tests, held at the Bikini Atoll in July 1946, proved to be a technical disaster and a PR fiasco as the bombs missed their targets. The third test was even abandoned as it was felt that another precious bomb might be valuable if a real crisis emerged. However the practical experience of the drops, and the sight of the actual explosions in the minds of military commanders, still left a powerful impression. This was confirmed by LeMay's memo to Spaatz in 1947 which it clearly stated that fission bombs, in sufficient numbers, would likely be a key weapon in any war.[79]

At the end of 1946, American conventional armed forces had declined hugely in scale to 1.5m service personnel, compared to 12m at the end of the war; and spending had been reduced by Truman from $90bn to $11bn as the peacetime Administration struggled with deficit matters.[80] Further, only half of the atomic converted 'Silverplate' B-29s were available and the actual number of working nuclear devices at the end of 1946 stood at just 7 Mark IIIs.[81] As 1947 dawned,

[78] Gilpin, *American Scientists*, pp. 56 – 57.See also Stephen Wertheim, 'Instrumental Internationalism: The American Origins of the United Nations, 1940–3', *Journal of Contemporary History* (February 20, 2019) for a view that internationalism played a role in transforming American power into a format that could underpin American supremacy.
[79] Curtis LeMay, 'The Final Evaluation Board Report for Operation Crossroads', June 30, 1947, quoted in Steven Ross and David Rosenberg*, The Atomic Bomb and War Planning*, *Vol.9* (Garland, 1989), p. 47.
[80] Harry Borowski, *A Hollow Threat*, (Greenwood Press, 1982), pp. 92 – 94.
[81] Rhodes, *Dark Sun*, p. 282.

therefore, the apparent power of America, in part conventional and in part resting on the perception of nuclear weapons, was far less than might have been assumed. Scientists in America also became increasingly aware that they would not receive any internationalist and scientifically helpful communications from their peers behind the new Iron Curtain. Indeed as Gilpin again expresses it, "the Czech coup, the Berlin Blockade, and the onset of the Cold War made it evident to most scientists that the conflict between East and West was increasingly over the political future of Europe and Asia."[82] Nuclear military science would continue to be shaped by the forces of geopolitical difference.

The new structures created by the McMahon Act – including the JCAE and GAC – nevertheless started to function.[83] The new AEC commissioners visited Los Alamos in early 1947 and their subsequent briefing of Truman, on 3 April, must have been a very painful experience for all concerned. The wartime glow of nuclear success ended in the Oval Office on that day.[84] The news that America did not have a 'stockpile' as Truman, and Churchill, had been proclaiming was a genuine shock. There was no 'vault' at Los Alamos as the AEC painfully discovered during their New Mexico visit. What Truman clearly heard was that the cupboard was empty when he was told "we don't have weapons."[85] It is clear that both in conventional terms and in the number and deployment effectiveness of its few nuclear weapons, America was in a surprisingly poor military position two years after the end of the war. These weaknesses in defence capability would

[82] Gilpin, *American Scientists*, p. 63.
[83] Joint Committee on Atomic Energy (McMahon was the minority leader and Hickenlooper its first chairman) was Congress's overseeing body. The General Advisory Committee (GAC) was the science group giving advice to all bodies and comprised: Conant, Fermi, Rabi, Smith, Seaborg and Oppenheimer who was elected chairman on 3 January 1947 at its first meeting. They both sat below the overarching Atomic Energy Commission (AEC), which in turn reported directly to the President.
[84] David Lilienthal, *The Atomic Energy Years, 1945 – 1950. The Journals of David E. Lilienthal, Vol. 2* (Harper and Row, 1964), p. 165.
[85] Jacob Wechsler interview by Rhodes, June 3,1994 in Rhodes, *Dark Sun*, p. 284.

create the need to act to protect American interests. The forthcoming Modus Vivendi debates with Britain, their wartime ally of just 24 months earlier, would show just how forcefully they would indeed act.

On the other side of the Atlantic in the latter part of 1946, British sentiment towards America was also far from positive, at least in military circles. The sense of estrangement was palpable as Truman and Thomas Dewey's, the Republican Presidential candidate in 1948, pronouncements on the Palestine negotiations upset figures like Air Marshal Slessor. As the latter put it "we are still, after seven years of it, having a toughish time in England….and when a bunch of American politicians at election time sit back 5000 miles away from the problem and lecture us as imperialists and tell us what we ought to do without doing a dammed thing to help us do it, we are gradually tending to go mad about it. And that's a very bad thing for the future of the world."[86] The British military's interest in nuclear affairs in the later 1940s was also low key. As Richard Moore points out "after the Bikini tests, the Royal Navy's knowledge of atomic weapons appears to have stood still for some time" at least until 1949, and he ascribes this to "the lapse in atomic exchanges with the Americans during these years."[87] Nevertheless, an Air Staff Operational requirement document for the necessity of a fission bomb was issued in April 1946. Also, later in 1946, the Air Ministry produced a specification for a bomber to carry the nuclear payload - what became the 3 V-bombers. This is an example of where technical development would be shared between the military and science in the development phases of invented and proven weapons.

These were but first steps. The sense of Britain as a small island, potentially in range of Soviet aircraft that might soon become nuclear armed, together with the

[86] Slessor to Major George Elliott, 7 October 1946, AIR 75 / 107, TNA.
[87] Moore, *The Royal Navy*, p. 50.

'bomber will always get through' mentality, was growing in prominence. Even at this early post-war state, it was suggested that Britain's counter-offensive capability would rest in the air, with long-range missiles replacing missiles over the longer term.[88] By March 1947, the British Joint Planners (JPS) had also started to integrate the future possession of atomic weapons by multiple states into its thinking, but concluded that simply possessing stocks on each side would not produce a desire for nuclear war.[89] In April 1947 it was accepted that strategic bombing was still the main feature of British war plans against the Soviet Union.[90] Again we see a similarity with military thinking in America at this time. The difference was that even a weakened America could strike first, potentially with atomic power, while Britain could not yet predict when it might have such a capability.

At the geopolitical level, January 1947 saw Britain re-open the question of its nuclear relationship with America. British diplomat Roger Makins, then the Deputy Chairman of the Combined Policy Committee (CPC), asked Acheson about sharing information about reactor design.[91] Acheson's immediate response was that any concession would require the abrogation of the Quebec Agreement veto. Acheson then advised the AEC Chairman, David Lilienthal, and Marshall about this request, and the existence of Quebec, and a can of worms was duly opened.[92] The reaction was, perhaps predictably, tumultuous. Not only did the world's pre-eminent power actually not have strength to the level expected, as

[88] Confidential Annex to COS (47), 1 January 1947, DEFE 4/1, TNA.
[89] JP (46), 164 (Final), 31 March 1947, DEFE 6/7, TNA.
[90] COS (47) 79 (Revise), 21 April 1947, DEFE 5/4, TNA. Clark and Wheeler have also pointed to the growth of the concept of deterrence to a new prominence in military thinking in the immediate post-war years: Ian Clark and Nicholas Wheeler, *The British Origins of Nuclear Strategy 1945-1955* (London: Oxford University Press, 1989), pp. 66 - 90.
[91] The Combined Policy Committee was a product of the Quebec Agreement.
[92] Richard Hewlett and Francis Duncan, *Atomic Shield, 1947/1952* (Pennsylvania: Pennsylvania State University Press, 1969), p. 274.

the events of the year were demonstrating, but in fact the country was apparently not even completely self-determining (given the terms of the Quebec Agreement) when it came to use a fission weapon. The briefing of the full JCAE on 5 May 1947 by Lilienthal created “considerable shock” and focused many of its members on the need to gain ore supplies sufficient to provide for America’s nuclear independent security.[93] The stage was set for the final squaring away of the wartime unofficial agreements and a crystal clear public statement of the Anglo-American relationship at this time. The resultant accord - the Modus Vivendi of 1948 - represented the highest level Anglo-American agreement between Quebec and the MDA, and therefore demands to be fully understood.

The JCAE were told on 5 May 1947 that the British knew the fundamentals of how to make a fission bomb. They demanded to be fully briefed on the history that led to this shocking position. Acheson gave them the background on 12 May 1947 and “sought to impress upon the minds of the members of JCAE a favourable view of past Anglo-American atomic cooperation.” Supplies of raw material were the main American problem, he said, and “almost everyone realised that the United States needed some agreement with the British to increase the American share of raw materials in the Combined Development Trust (CDT).”[94] Once again it can be seen that it is in a different domain – in this occasion resource planning – that Britain and America were linked. This was distinct from active political collaboration. The juxtaposition between the perceived all-conquering strength of America with the realisation of nuclear weakness, as shown by the lack of actual weapons found at Los Alamos and now

[93] Lilienthal, *The Atomic Energy Years*, pp.175 - 176 and p.182.
[94] Botti, *The Long Wait*, pp.29 and 31. The CDT was formed in 1944 between Britain and America to monitor and control raw materials relevant to nuclear weapon manufacture.

the reality of raw material needs, was stark.[95] It was a perfect storm calculated to get nationalist Congressmen riled, and so it did. Republican Senator Bourke Hickenlooper, reflecting the views of many startled Congressional leaders, wrote to Marshall in August 1947 saying the present situation and relationship with Britain was intolerable. He then specifically linked the required changes to the withdrawal of financial assistance to Britain.[96]

It was at the direct, and multiple, prompting of Hickenlooper that the American Chiefs soon decided that their military requirement for nuclear weapons was now 150 Nagasaki type weapons with the aim of hitting 100 different Soviet urban locations.[97] The total nuclear stockpile requested here was still a very modest three megatons – less than a quarter of the yield of a single hydrogen bomb just ten years later. This again reflects the magnitude of the change that fusion would create on systemic pressures. A key meeting was held between those aiming to keep aid and nuclear affairs separate – Lovett and Forrestal – and the lead senators – Hickenlooper and Vandenberg – on 16 November 1947 at the Pentagon as the Marshall Plan, which would provide assistance to Europe, was approaching in Congress. The power of the latter two is evident, not only in the later statement of their utterances but also that, when Lilienthal finally produced a settlement paper on 26 November 1947 it reflected almost exactly what the Congressman had wanted.[98] The British veto had to go, ore stocks were to be shipped to America. These were primarily to be from the Belgium Congo but topped up from British reserve stocks should that original source not furnish an

[95] In his journal Lilienthal wrote – "were considerably shocked to learn that we have so little in this country in the way of raw materials", Lilienthal, *The Atomic Energy Years*, p. 182.
[96] Hewlett and Duncan, *Atomic Shield, 1947/1952*, p. 275.
[97] Hickenlooper to JCS, 1745/7, Enclosure C and JCS 1745/5, October 1947, Joint New Weapons Committee, RG 218, National Archives, Washington D.C..
[98] Arthur Vandenberg, *The Private Papers of Senator Vandenberg*, (Houghton Mifflin, 1952), p. 361.

output of 2,547 tonnes.[99] In return, limited information on designing uranium reactors would be given to Britain plus some work on fundamental physics. Certainly nothing concerning Bomb making was offered. This position was endorsed by the full JCAE on 5 December 1947 and Lovett's cable to the American ambassador in London immediately after the meeting showed just how wider policy was now subordinate to nuclear priorities.[100] A few days later on 17 December 1947, the American Joint Chiefs of Staff (JCS), also somewhat conveniently, reconfirmed that their fission weapon demands would mean that the nation needed virtually the world's supply of uranium ore. Again Hickenlooper's hand can be seen here, although the evidence is not definitive.[101]

The Modus Vivendi was signed in a low key ceremony on 7 January 1948 at which the spy Donald Maclean was present. Maclean was initially Second, then First, Secretary at the British Embassy in Washington between 1944 and 1948. His presence at the signing was in his role as the British Secretary to the Combined Policy Committee, the body formed at Quebec. He was therefore a participant at this key post-war Anglo-American strategic moment and later made available details of his knowledge of the event, but not any technical information, to his Soviet handlers. Maclean, accurately, summed up the deal as "you know this is hardly an agreement among people who agree, it's an agreement among people who disagree."[102] Britain thereafter started shipping their own supplies of uranium together with the whole output they received from the Belgium Congo to

[99] Botti, *The Long Wait*, p. 34.
[100] Quoted in Verne Newton, *The Cambridge Spies* (Madison Books, 1984), p. 64 – "further aid to Britain….should be conditional on Britain meeting our terms in respect to allocation of atomic raw materials".
[101] See JCS 1745/7, December 17, 1947, in Ross and Rosenberg, *The Atomic Bomb and War Planning*, Vol. 9, p. 221.
[102] Newton, *The Cambridge Spies*, p. 180.

America.[103] Under Clause 6 all sharing of information had to be approved by the re-affirmed CPC on which America had an effective veto, but also only if it was acceptable under "the laws of the respective countries" i.e. McMahon. A recipe for stalemate, was ratified here.[104]

In her assessment of the Modus Vivendi, Gowing argues that it represented the true state of post-war atomic relations, and that it confirmed that atomic energy remained the big exception to the cooperation that she noted in other areas and mentioned above.[105] She touches upon the calculating side of the American superficial desire to reach an agreement, and rightly points out that access to resources and the formal abrogation of the Quebec veto was their sole motivation. In fact Gowing states that "in the long history of strange atomic agreements, the modus vivendi emerges as the strangest of them all."[106] But she does not link American hard headed selfishness at this point with their actions in any previous agreements. Additionally Gowing goes on to quote Cockcroft at this time as saying "perhaps the greatest advantage of co-operation comes from the interchange of ideas with an independent group of scientists."[107] This once again supports the argument that cooperation actually only occurred at that level until it was forced to change by the geopolitical pressures of 1957 - 1958. In the meantime, as Gowing states, by the end of 1948 Anglo-American nuclear relations "were in the familiar state of suspended animation."[108] This was stalemate by another name.

[103] Paul, *Nuclear Rivals*, p. 109.
[104] For the full text of the Modus Vivendi see, *FRUS*, 1948, General; the United Nations, Volume I, Part 2, pp. 683 – 685.
[105] Gowing, *Independence and Deterrence, Vol. 1*., p. 242.
[106] Ibid, p. 254.
[107] Ibid, p. 264.
[108] Ibid, p. 273.

In an interesting insight into what American governmental officials were truly thinking at this time, the subsequent statement to the Joint Congressional Committee on Atomic Energy on 21 January 1948 by Robert Lovett, the Under Secretary of State, was very open about the Modus Vivendi's favourable status towards America. He stated "in fact I believe that we have achieved more than we might have expected before talks begun" and that the British had been sent back mid-negotiation with reality ringing their ears. Such realities they then accepted completely upon their return.[109] In respect of America's autonomy to use the fission weapon, "all embarrassing political provisions such as in the case of the bomb have been eliminated", he said. Lovett then goes on to explain that American legal opinion regards the Modus Vivendi as an "informal arrangement" which does not require treaty or Senatorial approval. America again seems to have used the same trick as in the wartime years. Lovett further describes such informality as positive - "this device seems to suit your (Congress') book". He ironically contrasts it with "those mysterious under-cover arrangements of no definable status under which our atomic program was run during the war." This seems like a posthumous tribute to the de facto success of America's wartime President, and it certainly confirms that America was still moving in the same direction and using very similar devices.

Lovett then admits that any future pattern of interchange of information "seems to be heavily loaded in our favor" and that "we stand to learn more than we give." Nothing had changed here, then. All of the flows of information, Lovett affirmed, "would promote the national security of this country in the terms of the Atomic Energy Act of 1946."[110] He also acknowledges that giving up energy stocks "must

[109] 'Foreign Policy Aspects of United States Development of Atomic Energy', *FRUS*, 1948, General: United Nations, Vol. 2, pp. 677 - 798.
[110] Ibid, *FRUS*, p. 690.

have been a hard decision for the British" because "I believe that we all know just how difficult it must have been since uranium has come to have such a symbolic value, bound up with national prestige."[111] It feels as if the Americans were celebrating a kind of victory especially over Britain through these negotiations. The balance of power realities were being recognised explicitly by the American government – America was top nuclear dog and a logic of stalemate in Anglo-American nuclear affairs was very firmly in place.

From now on, indeed it could be said from as early as the Tehran Conference in 1943, any dependency was of Britain on America, not the contrary. From early 1948, and during the period leading up to the RDS-1 test in August 1949, there were many developments and changes in the world's nuclear system.[112] However the position of stalemate and lack of partnership in Anglo-American would remain the same.

[111] Ibid, *FRUS*, p. 691.
[112] RDS-1 was the code name given by Russia to its first successful nuclear explosive test device. It exploded on 29 August 1949. In America it was referred to as 'JOE-1'.

The Berlin Airlift to RDS-1

In Berlin in late March 1948 a senior conference, involving Eisenhower, the JCS and Forrestal, was held at which the briefing was given by General Nichols, formerly Groves' deputy and now Head of the Armed Forces Special Weapons project. The question of the possibility of escalated conflict with Russia provoked the meeting and nuclear power was the principal issue. The question was asked whether America was in a position to deliver any nuclear weapons; the answer was "we were not."[113] The lack of effective fission weaponry was thus already affecting America's ability to act. America was woefully ill-prepared for nuclear warfare, and they knew it. By contrast, the Soviet Union's post-war nuclear activity continued to be energetic and culminated with the final assembly of a production reactor at Chelyabinsk-40. This was completed at the end of May 1948, with full criticality being achieved on 10 June of the same year.[114] Soviet development was moving rapidly and this contrasted with the slow development of military thinking, capability development and planning in America.

Official discussions about forming a western military alliance took place on 6 July 1948 in Washington just as the airlift to assist Berlin, following its enclosure by Soviet forces, started to gather momentum. The airlift lasted for almost a year and was ultimately a successful operation that kept Berlin supplied and free from Soviet occupation. The crisis in Berlin created similar, but rare, momentum in the Anglo-American nuclear field. Sixty B-29s were sent to East Anglia, also in July 1948, with the implied threat that they could carry nuclear weapons, although this was not actually the case. It has been argued by Jones that Attlee had previously harboured significant concerns that it was America who was the principal British

[113] K.D. Nichols, *The Road to Trinity* (Morrow,1987), pp. 260 – 261.
[114] David Holloway, *Stalin and the Bomb* (Yale: Yale University Press, 1994), p. 186.

foreign policy concern, armed as they were already by nuclear weapons rather than a Soviet Union which had yet to be seen to be aggressive prior to 1948.[115] The 1948 Berlin Crisis and the Czech coup of the same year changed Attlee's view. When asked by a later interviewer what was the turning point in his foreign policy he replied "the Berlin airlift. I think that was the decisive thing."[116] As Attlee also later commented "it was a case where one had to take unpleasant decisions – realistic decisions."[117] The immature British nuclear system was thus penetrated by this first nuclear overseas deployment of America in one of those 'unpleasant decisions'. The perception was that the atomic front line had jumped the Atlantic and now nestled in the English countryside. The reality was that no actual nuclear bombs could be deployed from East Anglia, and neither were the Soviets capable of nuclear attacks on that area at this time.

By 1948 British military figures were starting to see America as indispensable in a future nuclear conflict, with Slessor stating that "the British military had already acknowledged that Britain could not fight another world war without the United States – especially a world war fought with atomic weapons."[118] American scientists paid a visit to Britain's new research facility at Harwell on 30 May 1948 and this formed the basis of the realisation by them that Britain was on the right path to a fission weapon. Back in America, discussions followed concerning the possibility of technical assistance to Britain's nascent programme. However these were soon curtailed.[119] The long term and consistent line of American foreign

[115] See Jones, *The Official History*, p. 17 for this argument.
[116] Francis Williams, *A Prime Minister Remembers* (William Heinemann, 1961), p. 172.
[117] Ibid, p. 171.
[118] 'Some British Strategic Problems', a lecture by Sir John Slessor at US National War College, April 1948 in Sir John Slessor, *The Great Deterrent* (New York: Frederick A. Praeger, 1957), pp. 78 – 80.
[119] Memorandum of Meeting by Carpenter, August 12, 1948 and Memorandum by Bush, August 12, 1948, S/AE Files, *FRUS*, 1948, 1, pp. 750 – 752.

policy – to keep distance from Britain in nuclear affairs - was once more re-affirmed. Lovett told Sir Oliver Franks, the new British Ambassador, at the end of September 1948 that America would not even give Britain information on basic metallurgy of plutonium at this time.[120] Also Truman's election victory over Dewey on 2 November 1948 meant that American policies were likely to remain in the existing state of stasis for some time to come. What could Britain realistically do in terms of its long held aim of nuclear partnership with America, with the issue of ore supplies settled by the Modus Vivendi and its science lagging behind? The answer - "Franks sensibly agreed that Britain could wait."[121]

The perceptions of the fission bomb as somehow separate to normal weapons was amplified by Lilienthal in 1948 during the Berlin Airlift, when he stated that the bomb was "not simply another weapon but an instrument of destruction which carried the widest kind of international and diplomatic implications."[122] Fission's potential difficulty to act a practical weapon starts to be seen here. As part of the September 1948 issuance of National Security Council Policy Paper 30 (NSC30), America nevertheless looked to integrate nuclear weapons into its wider defence strategy. The military were authorised to plan to use nuclear weapons against the Soviet Union, but that the decision to use them would always rest with the Chief Executive. This policy was a rarity, had many gaps and, as Rosenberg has pointed out, it "remained the sole general NSC statement on U.S. policy for atomic warfare approved by the President through at least 1959. NSC-30 did not even begin to address what conditions might justify the use of the atomic bomb, what objectives were to be sought through its use, or what targets it might be

[120] Memorandum for File by Arneson, Washington, September 22 and 27, 1948, S/AE Files, *FRUS*, 1948, 1, pp. 766 - 775.
[121] Memorandum of Conversation by Lovett, Washington, November 16,1948, S/AE Files, *FRUS*, 1948, 1, pp. 781 – 786.
[122] Diary entry 21 July 1948, Walter Millis (ed.), *The Forrestal Dairies* (New York, 1951), p. 461.

used against."[123] There was an underlying concern, implicit in these early (pre-Korean War) instructions, that the military needed to confine itself to the specifics, such as target selection, and that the responsibility for use had to be taken with the biggest possible picture, even involving a moral dimension, in mind.[124] This 'moral dimension', taken up after the war by Oppenheimer and others, was also shared by some in the military, including Field Marshal Wavell, who saw that man had not yet developed the wisdom to use the weapon wisely. Its misuse might end civilisation was this old soldier's view.[125] And all this was before the step change of fusion.

The announcement of a British military nuclear programme was typically covert – just a planted question and an oblique reply in the House of Commons in May 1948.[126] This low key approach was not based on security concerns alone. The wartime nuclear alliance had yielded very little of significant practical use to the British nuclear military programme, and thus progress had been far from rapid. It did not warrant publicity, therefore. Jones has agreed with Gowing's view that "in so far as basic 'know-how' went, the British were well equipped for the construction of the atom bomb" but that there were "still huge challenges to overcome….such as the processing of fissile material and the engineering of components to extremely fine tolerances."[127] Thus the knowledge extraction process, designed by TASTC, had ultimately been limited in its success. Nevertheless this was the sole advantage for British scientists over their Soviet

[123] Rosenberg, 'The Origins of Overkill', 13.
[124] 'United States Policy on Atomic Weapons', NSC 30, September 10, 1948, FRUS, 1948, I, General; The United Nations, Part 2, p. 628.
[125] Diary entry 7 August 1945, Penderel Moon, (ed.), *Wavell: The Viceroy's Journal* (London, 1973), p. 162.
[126] Nicholas Wilkinson, *Secrecy and the Media: The Official History of the United Kingdom's D-Notice System* (London, 2009), pp. 222 – 224.
[127] Gowing, *Britain and Atomic Energy*, p. 267.

peers and with the significant disadvantage of a lack of priority. In fact it took William Penney until November of 1948 to even formulate his plans for this endeavour. He then set out that an industrialisation approach – perhaps echoing his knowledge of the vast wartime American production effort – would be required. His aim was to eventually be able to produce 50 bombs a year and be able to satisfy the vague British Chiefs of Staff (COS) plan to have 200 weapons ready, but not until 1957.[128] Britain also lacked the key resource of plutonium and this only came just in time for the tests of 1952. There were staff shortages that would have been very unfamiliar to people like Groves during 'Manhattan'. The British atomic industrial programme became a frantic race against time.[129]

In February 1949, Acheson met with Truman to try to gain his agreement to open some form of nuclear dialogue with Britain.[130] The result was not decisive action but the establishment of a Special Committee to the National Security Council, with Acheson, Forrestal and other senior State and National Military Establishments representatives participating, including Eisenhower.[131] The Special Committee's Report, of 2 March 1949, is important because it became the official policy of the second Truman Presidency.[132] Its aim was very realist in nature – to achieve maximum American security and strength and solve the raw materials problem (that only America had). No political aims for the generation of stronger British / American ties were involved. The report concluded that, in practice, the British programme should be submerged into the American in return

[128] Penney to Portal, TS 20/2, 10 November 1948, AB 49/26, TNA.
[129] Gowing, *Independence and Deterrence, Vol. 2*, pp. 72-76 and Humphrey Wynn, *RAF Nuclear Deterrent Forces* (Seven Hills Books, 1997), p. 33.
[130] Botti, *The Long Wait*, p.50.
[131] Memorandum by Souers, Washington, February 10, 1949, S/AE Files, *FRUS*, 1949, 1, pp. 429 – 430.
[132] Memorandum by Souers, Washington, March 2, 1949, S/AE Files, *FRUS*, 1949, 1, pp. 443 – 461.

for full cooperation in the nuclear field. However it begs the question – why would cooperation actually be required if there was only one programme, no doubt run by Americans under McMahon? Further, it demanded that a 20 year pact must be signed by Britain when it relocated all nuclear facilities to North America and that there was to be no sharing of information, even to the British Commonwealth allies. Finally it stated that America should gain 90% of all raw materials. Thus, raw material aside, the boundaries that the American nuclear system wished to set were tightening, not looking to open up for genuine cooperation.

The 1949 report was the first of many suggestions for 'cooperation' that America dreamt up in these years: they were all equally implausible and simply reflected the massive imbalance in the nuclear systems of Britain and America at this time. Some historians have nonetheless concluded that such initiatives were positive and Botti, for instance, argues that "prospects between the administration and the British now appeared promising."[133] However even this one-sided proposal ran into opposition from the JCAE and Congress, when it was suggested as a course of action. At a meeting at Blair House on 14 July 1949, and just days before RDS-1, Truman met with Johnson, Eisenhower, Lilienthal and key Congressional figures including Hickenlooper, McMahon and Vandenberg.[134] The Administration argued in favour of a British dialogue, but the Congressmen passionately argued that Britain was dependent on America so there was no value to giving them any American nuclear knowledge. This has strong resonances of the 'wartime use' policy associated with James Conant. It also underscores the consistency in America's policy towards Britain. The most that the Congressmen would consider, and in return for effectively a dismantling of

[133] Botti, *The Long Wait*, p. 52.
[134] 'Record of Meeting at Blair House', Washington, July 14, 1949, SCI Files, *FRUS*, 1949, 1, p. 482.

the British programme, was the earmarking of some bombs for British use.[135] In fact the primary reason that the Administration used here to justify its actions was simply the need to continue to secure raw materials for themselves. There was, as yet, no deeper incentive for change.

With the lure of boosting raw material stocks being a strong one, the Administration decided it would push ahead anyway with negotiations despite the strength of Congressional feeling against British agreements. Consequently it held one further meeting with the JCAE on 20 July 1949 in order to forge a more attractive package for sale to Britain.[136] Without the President or Vice President attending, the Administration was not able to deal with the strength of JCAE opposition which primarily based itself on the lack of legal authority that the President would have to conduct such negotiations because of the McMahon Act. Thus Botti confirmed that "the President and his advisors abandoned the comprehensive plan."[137] This ignores the fact that such an American initiative was unworkable from the outset. It was continued evidence that a logic of stalemate was present – American internal controls and British backwardness made any balancing of affairs impractical in 1949.

Just prior to the revelation of RDS-1, the Soviet's first fission weapon test, America had 100 - 150 fission bombs most of a power-equivalence similar to the Hiroshima device.[138] If this stockpile kept growing in quantity and explosive power, and if delivery systems were perfected, America would have been able to sustain a dominant world role. That would only be the case, of course, if the

[135] Ibid, pp. 483 – 484.
[136] Record of Meeting with JCAE, Washington, July 20, 1949, S/AE Files, *FRUS*, 1949: 1, pp. 490 – 498.
[137] Botti, *The Long Wait*, p. 55.
[138] US Department of Energy, Declassified Stockpile Data, 1945-1994, accessed at https://www.osti.gov/opennet/forms.jsp?formurl=document/press/pc26tab1.html.

atomic arms race continued to have just one power. Interestingly, and in August 1949 just prior to the news from the Soviet Union, Lilienthal already had started to use the term “system”, in an international context, to describe the network of nuclear arrangements that he believed would be needed to maximize American nuclear efforts.[139] So, while the nuclear environment was not yet providing the level of pressure that would create America’s need for the MDA, the language of nuclear social affairs was maturing.

One of the consequences of the ‘Sandstone’ nuclear tests of 1948 was that the United States Air Force decided that it needed assistance with the development of a programme of monitoring and detection.[140] The advice about these detection efforts stemmed from the new Office of Atomic Testing (AFOAT-1) and the AEC at that time regarded this as being an undeveloped field and not a new technology and thus, using such a rationale, it proved possible to finesse around the Atomic Energy Act.[141] These developments in radiological detection of atomic air bursts were loaded onto ‘sniffer’ flights and Britain was brought into this programme. Britain started conducting such flights over the North Atlantic in April 1949 and shared their results. This was another small step in the linkages between Britain and America – the eventual, permanent softening of the boundaries of the Anglo-American systems were preceded by many, lesser interactions.

It was one of the American flights, over the Kamchatka Peninsula on 3 September 1949, which first discovered abnormal levels of fission-derived atomic particles in the atmosphere. The evidence of the extraordinary leap that the Soviets had

[139] Memorandum by Webb, Washington, August 19, 1949, S/AE Files, *FRUS*, 1949, 1, p. 519.
[140] The ‘Sandstone’ tests of April – May 1948 resulted in the complete modernisation of all fission core structures. This created the potential for a far more efficient use of fissile material, which in turn would allow the production of a greater numbers of bombs, and also the development of smaller warheads that would work with missiles.
[141] Rhodes, *Dark Sun*, p. 369.

taken the previous month was only detected in this fashion. It was advantageous that the decision to involve Britain had been taken as the air mass moved westwards, and the findings were able to be verified in what is probably the first true example of co-operation between the nuclear systems of the two nations. Thus a British Halifax on the evening of 10 September 1949 verified that Russia had indeed entered the fission weaponry age and years ahead of intelligence predictions.

The implications of this analysis were simply not believable in the American Department of Defense and Truman would not overrule it. So America turned to his former driver of atomic delivery once more. Vannevar Bush was asked to run an AEC Expert Investigative committee into the validity of the new detection evidence. This small group also included Penney in a continuation of the wartime style assistance of British experts to America. It reported on 19 September 1949 and re-confirmed the technical findings: the Soviets had exploded a fission bomb.[142] Truman was still uncomfortable announcing the news as he personally remained sceptical that the Soviet Union had the wherewithal and capability to deliver on such a development and so quickly.[143]

However in the face of mounting confirmation, the President had no choice. The world was informed of the test, not from Moscow but by the Truman White House, on 23 September 1949.[144]

[142] Lilienthal, *The Atomic Energy Years*, p. 569 and Rhodes, *Dark Sun*, p. 372.
[143] Herbert York, *The Advisors* (W.H. Freeman, 1976), p 34.
[144] Truman statement, 23 September 1949, accessed at https://digitalarchive.wilsoncenter.org/document/134436.pdf?v=5ff33129481c51af49c602a780127ec7

The psychology of America would now have to adjust to the reality of a shared nuclear world.

Fusion Decision and Fission Failure

The shock of RDS-1, as Gilpin has pointed out, "thrust scientists back into a generating role as they debated and then put forward the essential nature of developing a weapon of a new order, so that American superiority could be retained."[145] This chimes with the argument made earlier in this thesis, that it was science which would take a leading role when a new class of weapon was being investigated. RDS-1 caused consternation amongst American scientists in particular because of the perception that a war, waged by the weapons that they themselves had invented, was now closer.[146] The difference between fission and fusion conceptualisation was, however, that while they were of an order of magnitude different and required new technical approaches, they both fitted into the existing stable of weapons of mass destruction. It was not surprising, therefore, that, as Gilpin suggests, both politicians, through Strauss at the AEC, and the scientists, through Alverez and Wendell Latimer at Berkeley, came to the conclusion at the same time that fusion weapons were essential.[147]

American science has been characterised as being split into two schools of thought in the late 1940s. The first has been termed the Control School which Gilpin says "continued to believe that one could continue to approach the problem of atomic weapons as one solves a problem in science….. rationalism is most pronounced in the thinking of the control school scientists."[148] The second was the Containment School which "maintained that the Cold War had originated with the aggressive policies of the Soviet Union which was motivated for ideological

[145] Gilpin, *American Scientists*, pp. 81 – 83.
[146] Minutes, 16th Meeting of the General Advisory Committee to the U.S. Atomic Energy Commission, September 22-23, 1949, held at Los Alamos National Archive, New Mexico, RG 326, National Archives, Washington D.C..
[147] Gilpin, *American Scientists*, p. 83.
[148] Ibid, p. 67.

and nationalistic reasons to dominate at first Western Europe and then the world."[149] This second group, which included the majority of politically active scientists, also had a far more positive view towards aligning American defence objectives with those of Europe. The fusion debate expanded these existing divisions in American science, and their arguments were further intensified because American science felt squeezed by the emerging military-industrial complex of the Cold War. The existence of these Schools reflected the policy debates of the time, and are a mirror that reflects the uncertainties at the political level.

On 7 October 1949 Ernest Lawrence and Luis Alvarez (Lawrence's protégée) called a meeting with Teller and other leading figures at Los Alamos to pull together an update on how far fusion theory had progressed over the four years since Hiroshima. Concerns over tritium production and the sheer calculatory tasks ahead were expressed, but these were counterbalanced by Teller's optimism that a 'computation' machine could be built. This positivity was taken by Lawrence and Alvarez to Washington the next day, and in a series of meetings with senior AEC Technical Directors and members of the JCAE – including McMahon – they discussed involving Canada (but not Britain) in the new production process, given the former nation's resource wealth. Lawrence, perhaps having learnt what was effective in consensus building from his wartime experience, also threw in incendiary concerns about the Soviets potentially 'leapfrogging fission to fusion' and also that he had heard that Britain had already set up a committee and may even be ahead.[150]

[149] Ibid, pp. 69 - 70.
[150] William Borden to JCAE files, 10 October 1949, JCAE Classified Document No.66, RG 128, National Archives, Washington D.C..

JCAE members also started to debate the practicalities of fusion. There were concerns from those, like Vandenberg, who saw the logistical arrangements for delivery as being challenging.[151] However, despite additional resistance to such weaponry from Lilienthal, Lewis Strauss, an influential member of the AEC, proceeded with drafting a thermonuclear memorandum for Truman which he gave to Sidney Souers, a fellow AEC member. Truman himself was unaware of the existence of the potential for a fusion weapon as late as 6 October 1949, the date on which Souers briefed him.[152] Souers gained the response that they should "go to it and fast" in respect of fleshing out whether a fusion bomb could be achieved.[153] This has echoes of the briefings of Roosevelt by Bush that bypassed official cabinet channels at that time. However America still had not yet taken a formal decision to build a fusion weapon.

As part of the consensus-building undertaken by Lawrence and Alvarez they also met Nichols. He agreed to approach the JCS in advance of their joint meeting with the JCAE on 14 October 1949, with a view to establishing the military requirement for fusion weapons. It is important to appreciate that no such requirement existed at this time. With a new category of weapon there could be no military requirement. Thus science, following the political decision to assign resources, would then be in the lead. In fact, the JCS session on 13 October 1949 very neatly encapsulates the exact state of the process at this moment. When asked why he had not recommended fusion weapons before, Nichols replied to Omar Bradley that "well, General, the reason I haven't been around is that before the Russian explosion, I was under the impression that it would be difficult to

[151] Rhodes, *Dark Sun*, p. 388.
[152] Rhodes, *Dark Sun*, p. 381.
[153] Sidney Souers Oral History Interview, 16 December 1954, p. 1f, Sidney W. Souers Papers, Truman Library, Independence, Missouri.

organise a real effort at Los Alamos. There weren't enough scientists to work on it."[154] Few resources had been assigned, so the essential consensus could have been generated in science. Moral concerns, expressed by those such as Conant and Lilienthal, had so far played a prominent part in retarding this necessary funding and the generation of the necessary consensus over fusion. There was, in their minds, a difference between the exigencies of an existing wartime situation and developing next generation weapons when the world was at peace.[155] RDS-1 was now changing such views by making existential threats a valid consideration even during peacetime. This was an important moment in the social threat of the fusion bomb – a war was not required to create such profound concerns. In fact it would be the scale of the *perception* of the next generation weapon, rather than an actual conflict, that would most have relevance to the move to the sharing arrangement of the MDA.

As momentum started to build around the necessary American scientific consensus, and with post-McMahon structures already in place, the final component in the fusion bomb decision was the emergence of a military rationale for an upgraded nuclear weapon. In the General Advisory Committee meeting on 29 October 1949, Bradley still had trouble articulating what military purpose the fusion bomb could have. He was left stating that its only advantage would be psychological.[156] The response to Norstad's question, of what could be done with the weapon, was thus "no answer" according to Lilienthal's contemporary recollection. Lauris Norstad was a leading Air Force general who would become Supreme Allied Commander in Europe in 1956. The final GAC report therefore

[154] Sloan Foundation, *The H Bomb Decision*, 1982, pp. 104 – 107, quoted in Rhodes, *Dark Sun*, p. 387.
[155] Hershberg, *James B. Conant*, p. 476.
[156] Lilienthal, *The Atomic Energy Years*, p. 581.

recommended actually not pursuing a fusion bomb programme.[157] Once again it was Bush who was asked to become involved. He was tasked by Truman with finding a way through the impasse between those members of GAC and AEC who favoured a moralistic rejection of the development path, and those who favoured America adopting the best defence available. Bush's advice, based on his experiences with Roosevelt, was that the negative recommendation of the GAC "would fall of its own weight."[158]

The critical path to the fusion bomb continued when, on 22 December 1949 and after another deadlocked meeting this time of the smaller Special Committee established to find a solution, Lilienthal met Bradley and explored what the 'psychological-only' value really meant. In that meeting Bradley showed that the military were gradually coming to the understanding that, actually, multiple fission weapons did not secure the defence of America. What secured it was the effect of having the *best* weapons available in order that both sides would be "beat up" in any conflict – in effect, mutually assured destruction.[159]

As David Lilienthal later remarked, the advocacy consensus both scientific, military and political in nature and in favour of fusion weaponry was now so great that opposition was as pointless as trying to "say "No" to a steamroller."[160] Morality, to the extent that it was present in the thinking of decision-makers was trumped by the security imperative. The JCS summed this up as: "it is folly to

[157] GAC 29-30 October 1949 reports: reproduced in Glenn Seaborg, *Journal of Glenn T. Seaborg, 1946 – 1958, Vol 3* (Lawrence Berkeley Library, 1990), p. 317.
[158] Sloan Foundation, *The H Bomb Decision*, pp. 75 - 77.
[159] Lilienthal, *The Atomic Energy Years*, pp. 616 – 617.
[160] Lilienthal, *The Atomic Energy Years*, p. 633.

argue whether one weapon is more immoral than another….in the larger sense it is war itself which is immoral."[161]

The progression in the thinking on the potential new weapon was finalised in the JCS response to the GAC report of 13 January 1950 – "it is necessary to have within the arsenal of the United States a weapon of the greatest capability, in this case the super bomb….it might be a decisive factor if used properly."[162] Clearly 'properly' could mean actually using it, but it also had a deterrent component; such a perceptual component of fusion weaponry would be a key element in understanding systemic pressures as the 1950s progressed. With the emergence of the argument for the acquisition of the 'best' weapons, military logic was now added to the developing scientific consensus on fusion feasibility, and consequently a positive recommendation for progression was passed by the Secretary of Defense directly to Truman. Again the similarities with Bush's direct contacts with Roosevelt are striking.

In the Special Committee meeting of 31 January 1950, Truman cut any further debate and concluded – "let's get on with it", he ordered.[163] The President then announced this step publicly the same day, perhaps unwisely given the paucity of science development. A decision had been taken: fusion weaponry would be industrialised first in America. The 'quantum leap' would be taken. It was this leap that would create greater systemic pressures within the nuclear world and which, in turn, would act to bring Britain and America's nuclear systems closer.

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[161] Bradley/JCS memorandum, January 13, 1950, *FRUS*, 1950, National Security Affairs, Foreign Economic Policy, Volume 1, pp. 503 – 511.
[162] 'JCS response to GAC: Request for comments on military views of members of the General Advisory Committee', January 13, 1950 in Thomas Etzold and John Lewis Gaddis, *Containment: Documents on American Policy and Strategy, 1945-1950* (Columbia: Columbia University Press, 1978), pp. 368 – 373.
[163] Sidney Souers Oral History Interview, December 16, 1954, p. 8, Truman Library.

While America moved to build a fusion device, fission was being shown to be ineffective as a practical weapon. The Korean War was the 'hot' conflict in which fission's limitations were exposed. As the situation in Korea deteriorated, and American forces were pushed back to Pusan, the nuclear option was considered seriously at the military and then at political levels. Following his visit to the country by Vandenberg, the Army Chief Of Staff, a requirement was raised for nuclear capable bombers to be transferred closer to Korea. On 30 July 1950 Truman authorised the move of 10 nuclear capable B-29s and their weapons, but again without their cores, to the island of Guam.[164] In August 1950 Truman also re-convened the NSC Special Committee on Atomic Energy, which would include the Secretaries of State and Defense and the Chairman of the AEC, precisely to try to address the politico-military strategic divide in American thinking.[165] The same structure had been used in 1949 over the fusion decision, showing equivalence in Presidential thinking over these two matters.

This body would be informed by the debates and investigations that occurred during 1950, in both Britain and America, over the effectiveness of fission bombs in such a regional conflict. Studies by the US Air Staff in Washington and by the Head of the US Air Force Psychological Warfare Division both came to the conclusion that fission weapon deployment was 'undefendable'. This was both because of the casualties that would be inflicted on the South Koreans and because of the loss of support such actions might generate across Asian allies. Additionally, a major worry was that, should the bombs prove to be less than decisive, some of their deterrence 'magic' might be eroded.[166] That would have

[164] JCS 87570 to CINCFE, July 31, 1950, Truman Library, Independence, Missouri.
[165] Doris Conduit, *History of the Office of the Secretary of Defense, Vol. II: The Test of War, 1950-1953* (Washington D.C., 1988), pp. 29 - 30.
[166] Lloyd Gardner, *Approaching Vietnam: From World War Two through Dienbienphu, 1941-1954* (New York, 1988), p.106

created a significant risk for the West, whose defensive posture relied upon the deterrent effect of the Bomb on the Soviets superior conventional forces. The British COS came to the same conclusion at almost exactly the same time.[167] This pattern of similarity in development thinking, albeit from different perspectives, would mark the whole of Anglo-America nuclear progress between 1945 and 1958. The COS believed that the reasons for dropping fission weapons would be unsound given the resultant impacts on the world power balance and the potential to escalate to general world war. The Chiefs argued that Britain would be especially vulnerable in such a scenario. In America, it was the Congress that was ultimately influential in nuclear decision making, and its wider feelings of concern mitigated against nuclear deployment requested by Generals Twining, McArthur and others.[168]

In February 1950, Los Alamos had started to gear up to implement Truman's fusion decision and appointed what became known as the 'Family Committee' to lead thermonuclear research. The difficulties faced were set out by Teller in a 72 page review in February 1950.[169] The two principle fusion bomb layering design options – known as classical Super and the 'Alarm Clock' – were still in their infancy. Indeed the 'Alarm Clock' design would be so heavy that it would not fit inside an aircraft and would therefore have to be delivered by ship. There was to be no concession on the huge size of the devastation that was to be the aim. Additionally, the utilisation of valuable fissionable stocks for thermonuclear experimentation, combined with reductions resulting from Hanford's conversion to tritium production, would retard the fission based weapons programme. There

[167] Confidential Annex to COS (50) 97th Meeting, 28 June 1950, DEFE 4/32, TNA.
[168] Taft to Bishop, July 19, 1950, Box 914, Robert Taft Papers, Manuscript Division, Library of Congress.
[169] Edward Teller, *On the Development of Thermonuclear Bombs*, LA-643, February 16, 1950, Chuck Hansen Collection, Georgetown University, Washington D.C...

had been such an effective consensus produced in Washington concerning the need to gain thermonuclear capability, in order to be a step ahead of the Soviets, that the NSC Special Committee recommended an all-out programme on 9 March 1950 and this was rubber-stamped by Truman the next day. America had, it has been estimated, 298 engineered, levitated composite core weapons versus the five RDS-1 plutonium bombs in the Soviet's hands.[170] America now committed – perhaps even gambled – on the science of fusion.

In terms of what the utility of fission weapons may have been, it is important to note the effects of the massive American campaign of fire and napalm bombing that annihilated most of the Korean cities – including Pusan. Even these raids did not have a decisive effect on the war.[171] This supports the argument made here, and observed at the time by Oppenheimer, that fission weapons in their current guise were essentially impractical and ineffective, and unlikely to deliver a different result to that of the massive conventional bombings.[172] As Rhodes summed matters up "the weapons on which the United States had gambled its security in the years immediately after the Second World War had turned out to be notably useless when war tested the new conditions of the atomic age."[173]

[170] Chuck Hansen, *The status of the H bomb Program, January 1959*, (unpublished MS, 1994b) p. 19, quoted in Rhodes, *Dark Sun*, p. 421.
[171] Bruce Cummings, *The Origins of the Korean War, Vol. 2* (Princeton: Princeton University Press, 1990), pp. 755 – 756.
[172] Robert Oppenheimer National War College Lecture, September 1, 1950, Oppenheimer Papers, Library of Congress, Washington D.C.
[173] Rhodes, *Dark Sun*, p. 452.

Anglo-American Relations from RDS-1 to January 1952

Despite the significant events of RDS-1, the fusion decision process in America and fission's failure to be a practical weapon option in Korea, in practice very little immediately changed in terms of the relationship between the emerging Anglo-American nuclear systems. This lack of change continues to support the view that a systemic stalemate existed in transatlantic nuclear affairs, at least before 1952. As Botti observes "even after news of the detonation of the Soviet atomic bomb stilled congressional protests….American policymakers could not find sufficient common ground with the British to forge an agreement. In 1950 they were not inclined to, nor would the JCAE let them, try again."[174] Thus, despite the boost to concerns that a fission weapon being available to a hostile power had given, the external pressure was not yet great enough to counterbalance the longstanding American belief that it should exclusively dominate in nuclear affairs.

The issue of the post-RDS-1 nuclear relations of America and Britain had been discussed directly by Attlee, Bevin and Acheson in London in May 1950. Though informal, this exchange continued to reveal the complete impossibility of engagement in a meaningful way between the nuclear systems of the two states, at least before Britain's programme became more mature. Acheson was asked directly by Attlee as to whether he had a solution to the dilemma of how to achieve nuclear partnership – Acheson replied that he honestly did not. Makins, also present, then suggested that the two countries proceed in the one area that both countries needed each other – exports of raw materials. Acheson agreed to look favourably on British requests provided they were made covertly via the standard

[174] Botti, *The Long Wait*, p. 62.

channels of the British Embassy and not as a 'political' request.[175] The need from Britain was now for 505 tons of enriched U^{235} and 1.5 tons of Kell-F. Arriving at the time when both the break out of the Korean War was driving positive sentiment towards allied co-operation and also, importantly, after the 8 August 1950 doubling of requirements for atomic weapons by the American JCS, this request was treated sympathetically. In fact, in September 1950, the American archives reveal that "Bradley responded (to Dean) that strictly from a military point of view complete cooperation with the British would be highly desirable."[176] However military needs were not national policies. Even with such influential support, no Anglo-American partnership emerged at this time – the gradual relative equalisation of Britain and America's nuclear development had not yet occurred.

For some in the American Administration in summer of 1950, Britain was a declining force and not just in atomic terms. For instance, in discussions with Nitze, "Mr. Byroade, in referring to the problem of relations with the British, suggested that perhaps the most important aspect was to get the British to recognise that they had lost their old position of power and would have to face up to a changed status in the world. Unless such a re orientation occurred, was it possible ever to establish sound relations with the British?"[177] However it was those same British who had, and within 48-hours of the start of war in Korea, placed the British Pacific Fleet at the disposal of the American Navy. When the

[175] Memorandum of Conversation by Acheson, London, 16 May 1950, S/AE Files, *FRUS,* 1950, Volume 1, pp. 559 - 562 and Andrew Pierre, *Nuclear Politics*, pp. 122 – 123.
[176] Minutes of Meeting of U.S. Members of CPC, Washington, 7 September 1950, S/AE Files, *FRUS*, 1950, 1, pp. 572 – 575.
[177] Paul Nitze was an American politician and future U.S. Secretary of the Navy, and Director of Policy Planning for the U.S. State Department. He is best known for being the principal author of NSC 68 in 1950. Henry Byroade was Head of Office of German Affairs at the State Department at this time. United Kingdom of Great Britain and Northern Ireland, *FRUS*, 1950, p. 1630.

United Nations Security Council went on to approve direct military intervention to save the South of Korea, but the British COS resisted any ground involvement, it was Britain's leaders, Attlee and Bevin, who joined forces to overcome qualms and committed two infantry battalions. Such British enthusiasm to make a contribution was in part to retain a role as a military stakeholder. By sending troops, the Labour leaders argued that Britain might be able to exert some influence over American decision-making on the war.[178] This was the same 'influence' argument utilized to justify expanding Britain's nuclear forces later. The underlying reality is clear – Britain was weak and increasingly dependent on America. It had to find a way to shore up its own defences, and relying on American power was the only viable solution. This was at the time that Britain was still without a fission bomb of its own. The need to keep any form of influence was even more vital to those, such as Lindemann, who argued that without the new bomb, Britain was "a second-class nation armed with inferior weapons". He continued that any chance of overturning the McMahon Act and restoring meaningful atomic collaboration "with the United States will vanish unless we have something of our own to show".[179] The essence of this argument would be borne out by the fact that the equalization of technical progress, complemented by changes in American geopolitical alignment, led the way to the MDA in 1958.

Such British aid to America in the Korean War increased the prospect of escalatory action from the Soviet Union, at least in the minds of some. In the August of 1950, Churchill expressed this worry as that the existing American bases in Britain would be "the bull's eye of any Soviet target, should they decide

[178] Sean Greenwood, *Britain and the Cold War, 1945 - 1991* (Palgrave, 1999), p.85; Gill Bennett, *Six Moments of Crisis, Inside Foreign Policy* (Oxford: Oxford University Press, 2013), p. 15.
[179] Lindemann note, August 1950, CHUR 2/28 (images 192-193), CCA.

to make war."[180] Such concerns also underpinned Attlee's urgent visit to Truman following 30 November 1950 Presidential utterances about possible atomic bomb use in Korea. Slessor was also unsettled by what he saw as American unreliability following its Korean reverses.[181] Indeed such thoughts, after being endorsed by the COS on 1 December 1950, formed the brief used by the Prime Minister in Washington.[182] That brief confirmed Britain was not only concerned about Far Eastern relations but was minded to protect its vulnerability to Soviet attacks in the event of escalation leading to a general war. The geopolitical nuclear world can be seen to be growing in complexity here – the consequences of one theatre were being directly linked to existential threat in another. Britain was not the only European nation that was now being drawn into the nuclear net. The French, during talks with Attlee and Bevin in early December, also expressed worries about their own vulnerability.[183] The world was changing.

In Washington the four days of Anglo-American meetings in November 1950 produced, as usual, very little. The most illuminating moment was when a harassed Truman came close to assuring Britain, and Canada, that America would consult before any use of the nuclear bomb.[184] This approach strikingly echoes the tactics of Roosevelt when pacifying Churchill during the war. Similarly the reassurances given by a President were later rescinded by senior officials. No such undertaking was included in the post-summit communique. Attlee rarely met Truman and was handled in a similar style to Churchill before – promises and no action, but with less warmth. America would not give up its nuclear

[180] Churchill to Attlee, 4 August 1950, CHUR 2/28, CCA.
[181] See Slessor's Personal Letter to George Elliot, New York, 18 October 1951, AIR 75 / 105, TNA.
[182] See the Confidential Annex to COS (50) 191st meeting, 1 December, 1950, DEFE 4/38, TNA.
[183] Notes of Meeting, Attlee, Bevin, Pleven and Schuman, 2 December, 1950, F1027/6G, FO 371/83019, TNA.
[184] Record of Meeting: Truman and Attlee, 7 December, 1950, ZP3/3, FO 371/124949, TNA.

prerogatives for anybody – it was content within its secure nuclear system at this time. This was a recipe for continued stalemate.

The sense that Britain was failing to make sufficient progress in the critical area of nuclear defence, post RDS-1, is shown in Lindemann's correspondence with Churchill from the summer to the autumn of 1950. He ascribed delays to red tape and Labour policy.[185] But when Churchill raised the nuclear matter directly with Truman, he received as crushing a reply as Truman had delivered to Attlee in 1946. America was clear that nuclear policy was none of Britain's business and that debating the matter might "ruin my whole defense program….your country's welfare and mine are at stake in that program."[186] Nothing could be clearer: you have no role to play in the American nuclear programme. The logic of stasis continued, under the Truman administration at least.

Churchill was also disturbed by what he saw as the Attlee government throwing away the hard won treaties of the war. In a letter of December 1950, Attlee had advised Churchill about the existence of the Modus Vivendi, though only some considerable period after it was signed. He continued by paying tribute to Churchill's efforts in securing the Quebec Agreement but argued that Churchill should concede that its demise reflected the new, post-war reality. He ended by saying that future negotiations were imminent and "on this we are awaiting fresh American proposals which are in the course of preparation."[187] Britain would have to wait many years for any such a meaningful proposal.

[185] Lindemann to Churchill, 23 July and 1 August 1950 in CHUR 2/28, and 2 October 1950, CHUR 2/26, CCA.
[186] Churchill to Truman,10 and 12 February 1951 and Truman to Churchill, 16 February 1951 (delivered 26 February 1951), CHUR 2/28, CCA.
[187] Letter from Attlee to Churchill, 2 - 3 December 1950, CHUR 2/28/121-124, CCA.

The issue of security failings needs to be addressed in any history of post-war Anglo-American atomic relations. Lindemann later attributed the relative speed in the production of a fission weapon by Russia to espionage during the war, evidenced by the subsequent spy scandals that emerged, especially that of Karl Fuchs.[188] This contemporary fixation with reasons for Anglo-American estrangement may be the foundation for what could be termed the 'spy school of explanation'. Botti, for instance, describes the Fuchs affairs in cataclysmic terms – "in January 1950 disaster struck…within the administration….sentiment for cooperation vanished."[189] A similar view is put forward by Danial Lomas who believes that high profile lapses "served to undermine American confidence in British post-war security, moving Britain's goal of accessing US atomic secrets further away."[190] The revelation that Fuchs was a spy, while serving at Los Alamos during the war in particular, has thus been stated as being a significant factor in Anglo-American estrangement.

Other historians have taken a different view. Some, such as Rotter, have argued that this underplays the efforts of those in the Soviet Union, including Kapitsa and Khariton, who did much to generate domestic atomic knowledge within their own country after the war.[191] Gowing says Fuchs' assistance to the Soviets would have cut weeks or months, not years off their programme, and that "we do not know exactly what difference Fuchs made to the Russian effort. Fuchs himself

[188] Lindemann, *Hansard*, House of Lords, 5 July 1951.
[189] Botti, *The Long Wait,* p. 61.
[190] Danial Lomas, *Intelligence, Security and the Attlee governments, 1945-51: An Uneasy Relationship?* (Manchester: Manchester University Press, 2016), p. 149.
[191] Rotter, *Hiroshima*, p. 242.Peter Kapitsa worked at the Cavendish Laboratory before returning to the Soviet Union before the war. He was eventually awarded the Nobel prize for physics in 1978. Yulii Khariton was a leading Soviet nuclear physicist.

was extremely surprised that the Russian bomb explosion had taken place so soon."[192] Fuchs' help ended in 1948 in any event.

Other historians have pointed to atomic information that was publicly available as being key, including the Smyth Report of 12 August 1945 which was semi-technical but conveyed meaning by what it omitted. This has been described by Michael Gordin as "crucial for the Soviet program."[193] He goes on to point out that a major post-war factor was that the Soviet Union knew that a Bomb was viable. It was now just a case of putting the pieces of the puzzle together from whatever source they came.[194] The Soviets always spent time checking anything received from outside and so "in the end it is not clear that using American espionage data saved any time for the Soviets."[195]

As Gordin also points out that, in terms of the nationality of spies, it was "not just the British: the Rosenbergs were arrested, tried and sentenced….on April 5, 1951."[196] Evidence that security matters were indeed common between nations can also be seen from the June 1950 Anglo-American-Canadian security conference, which looked to ensure comparability of standards, harmonise procedures and enforce previously agreed rules on security.[197] Thus security concerns were not just a Anglo-American phenomenon. It seems that Gowing's downplaying of the Fuchs case was on the mark, and that spies alone were not sufficiently influential to bear responsibility for the stalemate of transatlantic affairs in the immediate post-war years.[198]

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[192] Gowing, *Independence and Deterrence, Vol. 2*, p. 150.
[193] Gordin, *Red Cloud at Dawn*, p. 99.
[194] Ibid, p. 137.
[195] Ibid, p. 153.
[196] Ibid, p. 280.
[197] Minutes of Meeting of U.S. Members, Washington, 25 April 1950, S/AE Files*, FRUS*, 1950, pp. 547 – 558.
[198] Gowing*, Independence and Deterrence, Vol. 2*, pp. 145 - 149.

Anglo-American military engagement was suffering from this stalemate. Despite the warm personal relations that existed between the senior officers on both sides, stemming from joint wartime experiences, there was little of any value shared between them. There is thus little to support arguments that advocacy coalitions of officers, alone, changed nuclear policy.[199] For instance, Slessor, now Chief of the Air Staff, led a British delegation to Washington in January 1951 where, in meetings with Bradley, the dangers facing an estranged Britain and America were discussed. The minutes of the meeting record that "he (General Bradley) agreed with Sir John Slessor on the potential danger of the current situation to Anglo/U.S. solidarity and that this was perhaps the most serious thing of all." Clearly these wartime comrades recognised, but could not resolve, current transatlantic estrangement. This was also mention of losing in Korea which Bradley stated in this meeting was "ultimately inevitable".[200] Tellingly, though, there was no discussion of a nuclear attack mentioned anywhere in these minutes. Economic sanctions on China were seen as the way forward should the U.N. forces have to pull out and Korea lost.

When Slessor returned from another visit to Washington in May 1951, he even wrote to Makins about the separated state of the two nations at this time saying that "no-one who knows the United States at all well can fail to be struck by the fact that at this moment, May 1951, misunderstanding, suspicion and dislike of the British is more deep and wide than at any time in the last 10 years". He suggested that employing "better PR and an information officer being appointed in America to counter act bad press. But just a personal view."[201]

[199] Ball, 'Military Nuclear Relations', 439 - 454.
[200] Minutes of a Meeting in Room 2 C 923, Pentagon, 15 January 1951, AIR 75 / 108, TNA.
[201] Sir John Slessor, 'Spreading the British Point of View in America – A Note to Sir Roger Makins in Whitehall', 15 May 1951, AIR 75 / 108, TNA.

Slessor's further comments, made just a few months later, continue to reveal the deep-seated military dislocation between the powers and the lack of military-military special linkages. He stated that Britain was very concerned about the absence of any information that the British government possessed about "the U.S. strategic air plan" and that "the United Kingdom is not an American aircraft carrier conveniently situated off the coast of Europe". He pointed out that "the Joint Chiefs should know that we are getting extremely impatient at this endless stonewalling in Washington on this subject". Slessor also confirmed that American policy to keep all valuable information within its own nuclear system was not new. He continued "we need not weary you with a record of the various reasons which have ever since been put forward for not facing up to this issue. We would remind you, however, that having made no real progress whatever either in joint discussions between Air Marshal Lord Tedder and General Bradley, or during the Prime Minister's visit to Washington, COS (51) 106 was produced in February of this year (1951) and discussed with the Prime Minister, the Foreign Secretary and the Minister of Defence at two meeting at No.10 Downing Street on 6th and 20th March" but "that was 5 months ago". He concluded, perhaps optimistically, that "this is clearly not a situation in which a matter of such vital importance can be allowed to remain any longer."[202]

Anglo-American stalemate was thus across all areas, while the separation of their nuclear systems was reaching its most defined point. As Gowing summed matters up, "by the summer of 1951 no progress whatever had been made towards (atomic) collaboration."[203]

[202] Sir John Slessor, 'Suggested reply to Telegram ELL 118 from ACM Elliott in Washington', sent to Joint COS 20th August 1951, AIR 75 / 108, TNA.
[203] Gowing, *Independence and Deterrence, Vol. 1*., p. 303.

The summer of that year in America saw further internal debates within the American nuclear system but with a familiar result: no change. The Secretary of State, Dean Acheson, who was initially in favour of consulting with Britain, had to bend to the view that America should not have any restrictions placed on its military, and specifically nuclear military, decision making. This was regardless of the location of its forces in England.[204] Thus when the Britain tried again to open a dialogue once more, on 11 September 1951, it would be met with a continued stonewall response at both the political and military level. Attlee was under pressure in the Commons to declare that Britain had the right of veto over American bombers, it was explained by Franks and Morrison to Acheson and Jessop. It does not seem unreasonable that Britain wished to understand the circumstances a foreign power may initiate war from its territory, thus attracting reprisals from a foe onto its own people. However Acheson refused to give ground. On 13 September America remained steadfast in its unwillingness to enter into any form of dialogue that might restrict Presidential autonomy, even in the face of bald British requests to give something to the Foreign Secretary that could be used in Parliament – an expression of intent to consult, even. The answer was, again, 'no'. The only offer was talks to discuss talks – a tactic familiar from the wartime repertoire of delaying tactics – and that Attlee could say that America and Britain had talked about world situations before and would do again.[205]

On 17 October 1951 Britain was forced to simply state that America would not be able to use British bases without consent. Some historians have seen this as right of consultation. It was, in fact, a last resort statement by a government under

[204] Memorandum of Conversation by Ferguson, Washington, 6 August 1951, S/AE Files, *FRUS*, National Security Affairs, Foreign Economic Policy, Volume I, pp. 875 – 880.
[205] Memorandum by Nitze, Washington, 13 September 1951, S/AE Files, *FRUS*, 1, pp. 883 – 890.

intense pressure and without any real chance of success should the American military personnel, on closed bases, be given an order by Washington to attack.[206] By the end of 1951 the archival evidence shows that America continued to reject completely any form of agreement with Britain over nuclear affairs.[207]

The post-war Labour government had been in domestic difficulties since the February 1950 election.[208] The result of that election had been a major swing away from Labour, with the government's majority being reduced from 146 to 5 and with the party losing a total of 78 seats. The government was now at the mercy of Parliamentary tactics and back bench opinion to a far greater degree; and yet the economic and geopolitical pressures were increasing. Following heated debates over financial priorities, and in particular the health service, between Gaitskell, the Chancellor, and leading left-winger Aneurin Bevan, the latter resigned on 23 April and was joined on the back benches by other important figures, including Harold Wilson and John Freeman. Due to this instability, Attlee was eventually forced to call a second election in October 1951. It was not well-timed. The Liberal Party, who had fought many seats in 1950, put up far fewer candidates and this, together with favourable boundary changes, resulted in a second Churchill administration with a majority of 17.

While British domestic politics became increasingly fractious, the British atomic programme had been driven forward and had moved to a new site at Aldermaston

[206] Gowing, *Independence and Deterrence, Vol.1*, p. 318 and Kenneth Harris*, Attlee* (Orion, 1995), p. 289 gives this impression. Botti. *The Long Wait*, p. 86 is equally assertive that no such right existed.
[207] Memorandum of Conversation by Arneson, Washington, 18 October 1951, S/AE Files, *FRUS*, 1, pp. 891 – 894.
[208] For a discussion of various reasons for the timing of the election see Peter Clarke, *The Cripps Version, the Life of Sir Stafford Cripps* (London: Allen Lane, 2002), p. 52, Ben Pimlott (eds.), *The Political Diaries of Hugh Dalton* (London: Jonathon Cape, 1986) and Nicklaus Thomas-Symonds, *Attlee – A Life in Politics,* (I.B. Tauris, 2010).

in Berkshire.[209] In 1951, the science staff moved in and the work at the Royal Arsenal in Woolwich was run down. The concentrating of mental activity, together with the breadth of skills needed, was being emulated in Britain almost a decade after the American process had followed a similar path at Los Alamos. Yet another similarity between the British and American nascent programmes was the level of secrecy that was deemed necessary by the very top of government. Attlee required the programme to be "super-secret."[210] This did not help with the procurement of needs as there was no 'wartime logic' that could be used as a generic excuse for the huge sums being demanded of government. It also meant that, as with Truman succeeding Roosevelt, when Churchill did resume power in 1952, there was a lot of catching up for him to do with nuclear progress over the intervening years. However the new resources were sufficient to allow the cautious Penney in the summer of 1950 to be able to predict a British nuclear test for the summer of 1952.[211]

By May 1951 planning for the fission test, named Operation Hurricane, was in full swing and the question turned to a suitable location. On 2 August 1951 Britain requested to use an American test site for their first detonation. The response, on 24 September 1951, which was approved by Truman, suggested in effect that Britain hand over their test to America and that just a few scientists, such as Penney, would be permitted to attend. As Botti puts it, the administration thought that the British would swallow their pride.[212] Once again, American dominance and a sense of the differential in the maturity of the two programmes allowed this

[209] Penney quoted in Michael Howard, 'The Explosive Secret', *The Sunday Times*, 8 December, 1974, p. 38.
[210] Hennessy, *Cabinets and the Bomb*, p. 59.
[211] Portal to Elliot, 10 August 1950, AB 16/1132, TNA.
[212] Draft Memorandum by Acheson, Washington,10 September 1951, S/AE Files, *FRUS*, 1951, 1, pp. 755 – 769. Botti, *The Long Wait*, p. 75.

complete misreading of what Britain might be prepared to accept. This disparity would now start to close and the relationship of the respective countries nuclear systems would alter.

In the meantime, and when Churchill finally came to power on 25 October 1951, he "insisted on full cooperation and reciprocity in the conduct of the test (with America) or nothing at all."[213] He got nothing at all. It was thus immediately clear that wartime heroism did not cut any nuclear ice just half a dozen years later. Churchill then appointed his son-in-law, Duncan Sandys, as Minister for Supply. Sandys would be a key figure across the 1950s in Anglo-American nuclear affairs and his observations will be insightful in the coming chapters. Progress in atomic affairs had been rapid since Churchill was last in power. Lindemann briefed the Prime Minister in November and urged him to approve the tests before heading to America. Lindemann stated that Britain was "much more likely to get American cooperation in the future if we show we are not entirely dependent on them now."[214] Churchill was actually reluctant to press ahead for reasons, as Ruane has argued, based on his view of the American commitment to Britain that he still believed existed after the wartime agreements.[215] He may well have accepted that the Quebec Agreement was not in force, but Churchill's essential belief was that America owed Britain a debt and this could be repaid through atomic cooperation.

Lindemann continued his consistent call for the preservation of a British nuclear programme later in November. Lindemann argued that "if we are unable to make the bombs ourselves and have to rely on the American army for this vital weapon

[213] Guildhall speech in *The Times*, 10 November 1951, quoted in Farmelo, *Churchill's Bomb*, p. 6.
[214] Lindemann to Churchill, 13 November 1951, PREM11/292, TNA.
[215] Ruane, *Churchill and the Bomb*, p. 232.

we shall sink to the rank of a second class nation, only permitted to supply auxiliary troops like the native levies who were allowed small arms but not artillery."[216] By using colonial imagery in this way, Lindemann may have intended to appeal to Churchill's understanding of Britain's imperial military structures. Such a relationship would no doubt have been a highly unappealing prospect to a Prime Minister who fought at the battle of Omdurman, perhaps alongside such native levies. He also made an urgent plea for confirmation that Australia should be the location for 'Hurricane'. But until there was Prime Ministerial approval, preparations would remain on hold. Churchill queried the sum involved - £100m.[217] However, when contrasted with the $2bn that has been estimated that 'Manhattan' cost the Americans, it seems like a relatively good deal. Churchill was startled, and then possibly impressed, that Attlee could have juggled the figures so as to avoid the attention of Parliament. The similarities of elitist control of the nuclear emerging programme in Britain, with that of Roosevelt's America, are very clear. In any event Churchill soon decided that Britain needed to push ahead after such expenditure levels and he agreed to the tests when pressed once more by Lindemann.[218]

The new Prime Minister then hurried over to see the President of the United States. Farmelo sees Churchill's main priority as being "to persuade the Americans to repeal the McMahon Act."[219] And yet, when he was asked to provide an agenda for the forthcoming session, atomic energy was placed very

[216] Lindemann to Churchill, 21 November 1951, PREM11/292, TNA.
[217] Churchill to Sir Edward Bridges, 8 December 1951, PREM 11/297, TNA - "if the United States could be brought to honour its wartime undertakings, Britain could have security not only in depth but on the cheap".
[218] Lindemann to Churchill, 14 November 1951, PREM 11/292, TNA (with Churchill's handwritten positive endorsement of the test location proposed).
[219] Farmelo, *Churchill's Bomb*, p. 383.

near the bottom.[220] It therefore feels that this trip was more about trying to re-affirm a bond rather than deliver specifics. This fits with the argument of this thesis that Churchill had a far shrewder understanding of Britain's relative weakness than has been previously assumed. In terms of the possible welcome that might await Churchill, Truman had been briefed that Britain and Europe held a different, and greater, level of concern given their proximity to the Soviet threat.[221] The President was also subject to internal pressures and these required him not to be generous towards America's former ally (and rival).[222] In the end Truman maintained the now standard policy of keeping the American nuclear system separate from Britain's. When Churchill asked about American nuclear intentions in Korea, the response that Churchill received reflected the view of the American Chief of Staff, Bradley, who said, somewhat ambiguously, that any nuclear action was "entirely theoretical".[223]

Certainly the dialogues with Truman were stark in comparison to the indulgences of the Roosevelt days. Often cut off abruptly when he strayed into relationship territory, Churchill was simply offered a visit to America's top secret Strategic Air Command (SAC) as a 'gift' to take home. Indeed Lindeman and the British team found the administration extremely keen to adhere to the McMahon Act in all nuclear dealings.[224] Churchill succumbed to accepting vague words over the matter of control of American bombers in Britain. Indeed, the only difference with Churchill's wartime 'agreements' was that these words were now made public.[225]

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[220] 'Subjects for discussion at Washington', November 1951, CAB 21/3058, TNA.
[221] Bohlen Memorandum, 5 December 1951, RG59, Box 2911/641.61/12-551,National Archives, Washington D.C..
[222] American press comment, 27 December 1951, FO371/97593/22, TNA; Young, *Last Campaign*, p.72 and Ruane, *Churchill and the Bomb*, p. 237.
[223] Memorandum by Acheson, January 6, 1952, *FRUS*, 1952-1954, Western Europe and Canada, Volume VI, Part 1, pp. 744 - 745.
[224] Lindemann to Churchill, 7 January 1952, PREM11/291, TNA.
[225] Paul, *Nuclear Rivals*, pp.189-194; Truman-Churchill communiqué, January 9, 1952, *FRUS*, 1952-54, Western Europe and Canada, Volume VI, Part 1, p. 837.

As Ruane observes, “the President and his team had stuck to their pre-planned strategy of courteous inflexibility, but while Churchill had been moved by the courtesy, Antony Eden was 'horrified' by the inflexibility.”[226] Perhaps Churchill understood once again that words, alone, were the best that he was going to get. As Macmillan said “they are polite [and] listen to what we have to say but make (on most issues) their own decisions.”[227] Nothing had changed here since the inception of militarised fission.

As a sop to his reputation, Churchill was allowed to receive his briefing from SAC on 18 January 1952, but this handed Britain next to nothing of true value. The British Prime Minister was impressed by the magnitude of SAC’s organisation but experts, including Air Marshall Sir William Elliot who accompanied Churchill, saw through the charade. They appreciated that America still was not going to give anywhere near the genuine military data that many, including Slessor, had been demanding. Overall the Department of Defense (DOD) was adamant that there was to be no sharing on detailed military planning. Effectively any changes would have to await further legislation, and this meant after the elections of late 1952.[228]

One major consequence of the Korean War was as its trigger in an upsurge in proposed defence spending on both sides of the Atlantic. In terms of America’s military nuclear programme, Truman approved the AEC’s plan to double expenditure on capital projects – including the two heavy-water reactors in South Carolina in June 1950 at a cost of $250m, and in October Truman approved three more.[229] As Britain's contribution to the defence of the West, the Labour

[226] Ruane, *Churchill and the Bomb*, p. 242.
[227] Macmillan, 17 January 1952, *Diaries*, p.133.
[228] Memorandum by Arneson, Washington, 15 January 1952, G/PM Files, Lot 68D349, ‘Truman-Churchill Talks’, *FRUS*, 1952-54, Western Europe and Canada, Volume VI, Part 2, pp. 846 – 848.
[229] Rhodes, *Dark Sun*, p. 447.

government had agreed in October to a substantial £3,600 million defence programme, a figure upped in January 1951 to £4,700 million and spread over three years. At the same time America began working to convert the North Atlantic Treaty into a fully-fledged defence organisation, to confirm General Eisenhower as NATO's first supreme commander in Europe (SACEUR) and to commit to the defence of Western Europe by placing American ground forces in West Germany.

In 1952 the scale of American investment in nuclear weaponry grew yet further and by mid-January 1952 the influential NSC had approved a 5 year, $5.5bn programme to increase American fissionable material and grow stockpiles. This was passed by Congress on 21 January 1952.[230] Though driven initially by the exigencies of the Korean War, the growth in the size of the American science-military complex was a key part of the logic of beneficial combinations that would result in the 1958 MDA. In the meantime, and while fission bombs remained relatively small scale weapons, there would be no motivator for America to change her policy towards Britain. But as the nature of the weaponry moved to fusion, and with the improving Soviet ability to deliver these after Sputnik, change would be forced on America's established geopolitical policies.

By early 1952 the logic of stalemate, driven by systemic separation, a lack of a nuclear threat to America itself and in the absence of any equivalence in the British programme, had been maintained for seven years. That would now start to change. The first turning points were the British fission test, the American fusion equivalent and the British 1952 Global Strategy Paper. These preceded

[230] Memorandum for the President, Washington, 17 January 1951, PSF subject File, *FRUS*, 1952-1954, 2, pp. 851 – 858.

the election of Dwight Eisenhower as American President. It is to these events in 1952, key signposts on the way to the MDA, that we will now turn.

British Fission, American Fusion and the GSP

Scientific developments in both Britain and America in the early 1950s, coupled with worldwide strategic and geopolitical change, would form the platform for the acceleration of Britain and America towards the MDA. Once again, similar forces would be experienced on both sides of the Atlantic, albeit within their differing environments.

Financial pressures were also pronounced. As Eden said in the Cabinet, in June 1952, defence policy was "placing a burden on the country's economy which is beyond the resources of the country to meet". He continued that defence should be given the "maximum possible effort" while "inconspicuously we can transfer the real burdens away from our own to American shoulders."[231] Such a dubious geopolitical aim, perhaps prefigured as far back as Tehran in 1943, would have to be translated into an acceptable political and strategic expression. An established vehicle in fact already existed in the form of the concept of using nuclear development to 'gain influence' with America.[232] The latter had a long pedigree but it would now also be reflective of a different, simpler truth – that Britain desperately needed any form of nuclear relationship with America, given the stresses of the purse and rising external threats. 'Influence over American thinking' was actually becoming a euphemism for British weakness and a growing realisation of dependency. As Slessor put it in March 1952, ""unless we can do something to improve this position we shall continue in the foreseeable future to

[231] C (52) 202, 'British Overseas Obligations', 18 June 1952, CAB 129/53, TNA.
[232] For the acceptance of this a British strategy see Jones, *Official History*, p. 24 and John Young, *Winston Churchill's Last Campaign: Britain and the Cold War, 1951-1955* (Oxford, 1996), pp. 79 - 80.

depend on the Americans, not only to win a war, but to stave off our own early defeat."[233]

Such financial concerns were not unique to Britain. America's own military thinking, what would come to be called Eisenhower's 'New Look', was similarly driven by an inability to afford the ballooning costs of mixed conventional/nuclear military capability. American defence costs would take up over 60% of federal spending in Financial Years 1953 and 1954 and with projections that it would remain at over 50% for the rest of the decade.[234] Financial pressures were experienced on both sides of the Atlantic with the same consequence - a re-think of military strategy. This causes a temptation to see these processes as being causally interlinked in some way. In fact they were acting in parallel, but separately, but emanating from the same logic of nuclear military affairs. Below we will dismiss claims that Britain's Global Strategy Paper would somehow change the track of development in America.[235]

The previous chapters have shown how immediate post-war military reality, in both Britain and America, could be described as one of the continuance of existing military ideas, even in the shadow of the new weapon. Nuclear weapons were perceived as being akin to their predecessors and were there to be used in 'wars'. Missile development was still in its very early phase. In early 1952, however, British thinking started to become more refined and related to the emerging problems of the nuclear age. With the benefit of hindsight, General Sir Frederick Morgan, Controller of Atomic energy at the Ministry of Supply, used the

[233] Slessor, Draft Framework, Undated but attached to a 3 March 1952 note, Air 75 / 118 Point 11, TNA.
[234] Condit, *Test of War*, p. 535.
[235] Slessor claimed the connection between the nuclear policies of the two countries in his 1962 book, *What Price Co-Existence?* (Cassell and Co.,1962).

phrase “a process akin to that known as a Dutch Auction” to sum up the 1948 assessment of atomic bombs needed by the COS, and that it was done in a way that “has never been keyed in any definite way to any plan or strategy or tactics.” He continued, “this is in a way understandable since we know that the atomic bomb, ever since the original handling of the publicity concerning Hiroshima and Nagasaki has been regarded as a political far more than a military weapon.”[236] Clearly a more sophisticated approach was now required. So how could matters be improved for Britain? One obvious option was American coordination but, as we have seen, that door had been resolutely closed all along. How could a voice be heard when the listeners didn’t want to hear, now cowed by the stringent penalties of the McMahon Act?[237] The only available option to Britain at this point was to continue to press on alone.

In 1952, and in terms of new thinking, Jones has said that “the dominant voice among the Chiefs of Staff was Air Chief Marshal Sir John Slessor.”[238] Slessor had, a year earlier, already recognised the internationality of strategy when he said that “there is no such thing today as *British* strategy – the C.O.S. review of global strategy written in April 1950 was from an Allied (N.A.T.O.) point of view” (my italics).[239] In the same lecture, Slessor said that the overall policy of the Alliance was to ensure the abandonment by the Soviet Union and China and their satellites of further military and ideological aggression, which was very similar to the broadening aims of the American NSC 68 of April 1950.[240] This supports the

[236] Morgan letter to Penney, 29 February 1952, AB 49/26, TNA.
[237] See, Slessor, ‘Cable from U.K. Delegation Lisbon to Ministry of Defence, London’, TOO 092030, 9 January 1952, TNA -“Elliott shares my view that it would be a tactical mistake to take Bufton with you. His very title is enough to give Vandenberg an attack of the McMahon jitters”. Communication was thus being stifled by the American legal position.
[238] Jones, *Official History*, p. 21.
[239] AIR 75 / 118 ‘Notes for Lecture at I.D.C. and J.S.S.C. – 1951’ Point 3, TNA.
[240] Ibid, Point 33 and see ‘A Report to the National Security Council – NSC 68’, April 12, 1950, President secretary’s Files, Truman Library, Independence, Missouri. Lay’s earlier note gives excellent evidence of the nature of the existential and worldwide struggles in which America now

view that nuclear strategy was international in its nature and consequences, even if strands were developed individually by nations.

Slessor's correspondence also reveals the pressures that the formation of strategy faced from the financial concerns of the new Conservative government. In a note from the incoming Prime Minister to Slessor, on the eve of the key Lisbon NATO conference of early 1952, Churchill said that the British (Attlee) agreed contribution of £4,700m "will now have to be spread over a longer period."[241] Slessor's reaction to this suggestion, that Britain should cut back and focus more exclusively on defending itself, was that this could "make Eisenhower chuck his hand in" and that consequently "anything the P.M. can do…to get the Americans to do more for the defence of the U.K. will be more than welcome."[242] This was a year before Eden's earlier remarks but Slessor was already on a similar page.[243] Dependency on America was very real. This was the motivation that would drive Churchill (and, later, Macmillan) to try to draw Eisenhower, unsuccessfully at first, into a fruitful dialogue. Such failure, reflecting the long term American policy of separation, would only serve to reaffirm Britain's nuclear isolation before 1958.

Slessor's later comments on the Lisbon Conference are perhaps revealing of what was in his mind as he entered the 1952 Global Strategy Paper (GSP) debates. He said that he only agreed to the huge scale of conventional forces proposed with his "my tongue in my cheek because I knew perfectly well that

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felt engaged with the whole of the 'non-free' world, see 'Report to the President Pursuant to the President's Directive of January 31, 1950', in *FRUS*, 1950, Volume I, p. 236.

[241] Note from Prime Minister, 13 December 1951, AIR 75 / 118, Points 5 and 9, TNA.

[242] Note to Secretary of State from Slessor, 12 December 1951, AIR 75 / 118 , Points 1 and 6, TNA.

[243] Eminent historians have seen Slessor as a key figure in nuclear strategy at this time, hence the focus in this chapter. See Michael Howard, Sir John Slessor and the Prevention of War, *Royal Air Force Journal*, no.19 (1999), 23.

there was not the remotest chance of the NATO Allies being able to build up anything approaching that strength – or (just as important) facing the continuing costs, in what we foresaw would be a long cold struggle. And so it turned out."[244] This has a tinge of retrospective self-justification about it, but nonetheless it is probably true to say that the chief architect of the GSP had already decided that a new path to defence was required. It would require far longer timescales also.

The 1952 British Chiefs of Staff Global Strategy Paper has been described in very positive terms by several historians. Baylis and MacMillan have said the GSP remains "perhaps the best-known, the most often discussed, and also the most highly regarded defence document of the post-war period."[245] Ronald Lewin regarded it as "the most important strategic review since 1945 and set the tone of British defence doctrine (if not entirely of practice) during the next decade."[246] More recent commentators have, alternatively, pointed to the Sandys 1957 Defence Paper as the first true, post-war defence review.[247] Moore sees the 1952 GSP as being as a direct result of when "the burden of Korean War rearmament began to tell on the British economy, and pressure grew for a truly inter-service review of strategy."[248] It is thus important to form a judgement on its impact.

The COS met between 28 April and 2 May 1952 at the Royal Naval College, Greenwich, in order to focus on the task at hand. The resulting Paper put deterrence, in the absence of effective defence options against aerial attack, at the heart of its thinking. In contrast to the huge commitments of Lisbon, the GSP

[244] AIR 75 / 79 Speech at 'Christian Encounter' Meeting, Liverpool, 11 November 1964, TNA.
[245] John Baylis and Alan Macmillan, 'The British Global Strategy paper of 1952', *The Journal of Strategic Studies*, Vol. 16. No. 2 (June 1999), 202.
[246] Ronald Lewin quoted in Vincent Orange, *Slessor – Bomber Champion* (London: Grub Street, 2006), p. 213.
[247] For a recent re-evaluation, see Claire Taylor, *A Brief Guide to Previous British Defence Reviews*, Standard Note: SN/IA/5714, House of Commons Library, accessed at http://researchbriefings.files.parliament.uk/documents/SN05714/SN05714.pdf.
[248] Moore, *Royal Navy*, p. 65.

looked to develop atomic options which it believed would be more economic and better reflect Britain's resource capability. The resultant Paper also looked to establish a twin approach whereby the actual capability of Britain's forces would also act as the deterrent – a double benefit. The slight problem with this was that Britain did not, in 1952, have an atomic force of its own. It was also still ignorant of SAC's targeting plans. The GSP therefore had to try to develop a capability which was, as Ruane has accurately summarised, "independent of but dovetailing with the US arsenal."[249]

Slessor thought atomic war would not be followed by military activity, whereas the First Sea Lord, Admiral Rhoderick McGrigor, thought surviving forces would continue to fight a 'broken-backed' war. The concept of a limited nuclear war, based on atom bombs such as those used at Hiroshima and with relatively limited stocks available, was the background to the thinking of the Chiefs at this time. The announcement of the American fusion test of 1 November 1952, less than 6 months later, would make the GSP immediately of a previous era. The Chiefs stated that the aim of Britain's nuclear strategy should be to have a genuine deterrent, but one that also aimed to retain 'influence' in Washington. Ruane sees this as the essence of the review.[250] However Britain had never previously possessed, and certainly before 1958 would not gain, any nuclear 'influence' in Washington. Churchill's very limited visit to SAC was a recent example of just how little Britain saw of American strategy and operational reality at this time. At best, Britain could look but not touch: no 'influence' existed, just a desperate need for support.

[249] Ruane, *Churchill and the Bomb*, p. 252.
[250] Ibid, p. 252.

Ruane also rightly points out that, in the subsequent debates on the Paper, both the Chiefs and the Prime Minister had significant concerns over American behaviour.[251] The fear was that America would succumb to the temptation for a favourable 'hot' war, rather than the stresses of a long 'cold' one. However it would not be British influence that would address this concern, but Eisenhower's own policy. Moore seems to agree with Baylis and Macmillan as he describes their assessment of the GSP as very balanced and quotes their overall view that continuity was a key element of the GSP.[252]

The GSP was approved by the Cabinet's Defence Committee on 9 July 1952 and formed the background to Britain's defence strategy for the mid-1950s. Following this approval, Slessor made a trip to Washington about which there has also been considerable debate. Botti maintains that Slessor's trip was exclusively to try to persuade the Americans that a radical change in strategy was needed.[253] He also argues that Bradley, because he was not an airman, was not convinced that atomic attacks would be decisive and that thus adopting a new strategy was premature.[254] Jones sees the rebuff that Slessor undoubtedly received as being the result of the recent and successful growth in the American stockpile of fission weapons. This bred a confidence in the power of the status quo, he states.[255] Andrew Johnson makes the case that those who saw Slessor's visit and subsequent influence on American 'New Look' strategy as being significant are primarily British.[256] He, while noting that he is American, takes a contrary view.

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[251] 'Defence Policy and Global Strategy' (GSP), D(52)26, 17 June 1952, and Defence Committee meeting, 9 July 1952, D(52)8th meeting, CAB131/12, TNA.
[252] "Those familiar with the secondary literature will find no major surprises in the 1952 Global Strategy Paper" in Baylis and Macmillan, 'The British Global Strategy', 200 – 226.
[253] Botti, *The Long Wait*, pp.105 -109.
[254] Ibid, p.107.
[255] See 'Memorandum by the Secretary for Defense', May 16, 1952, *FRUS*, 1952-1954,National Security Affairs, Part 2, p. 935.
[256] Johnson argues that the British historians who hold a positive view concerning Britain's influence on American strategy include John Baylis, Ian Clark and Nicholas Wheeler, in Andrew

He argues that, while there was some sympathy for such an air-led policy within the American air force, in other respects it is impossible to trace a causal line between the GSP and the 'New Look'. This supports the view of this thesis that development sequences were similar across the Atlantic, but that they were achieved separately. It was precisely because of these segregated paths that Johnson concluded "the British could not have decisively influenced American strategic thought; and second, that whatever separated the two governments in 1952 continued to separate them in 1953."[257]

A further factor in play, as 1952 headed towards the autumn, was the increasing imminence of the Presidential election. Decision-paralysis emerged as the election date drew near. The Truman presidential tenure had seen nuclear military affairs move from an actual deployment of a single weapon, through years of lack of interest and distrust, to the assessment of fission as an impractical war weapon in Korea. It would be wrong to blame the outgoing President exclusively for failings in American nuclear affairs. At core, the lack of American clarity in nuclear policy derived from the fact that the nuclear world itself was not yet mature. The transition, from the conventionality of fission to the existentialism of fusion, was only just beginning.

American progress towards the step change in nuclear warfare – the industrialisation of the fusion weapon - was remarkably swift once the decision to build had been taken, with science taking the necessary lead. In March 1951 Teller and Stanislaw Ulam added a crucial further scientific idea which increased the efficiency of the burning process. It was called the 'sparkplug' and featured

Johnson, 'Mr. Slessor Goes to Washington: The Influence of the British Global Strategy Paper on the Eisenhower New Look', *Diplomatic History*, Vol. 22, No. 3 (Summer 1998).
[257] Ibid, 397.

the positioning of subcritical U^{235} at the point where the implosion waves would meet. This would be compressed to super-criticality and effectively added a second fission explosion into a staged process. This was written in a previously classified scientific paper, entitled *On Heterocatalytic Detonations I. Hydrodynamic Lenses and Radiation Mirrors,* and published by Teller and Ulam on 9 March, 1951. The exact amount of contribution provided respectively from each scientist, to what became known as the "Teller–Ulam design", has since been a subject of debate.[258] The new design was presented at the GAC meeting at Princeton on 16-17 June 1951 and was seen by all present as a feasible solution. However when Bradbury appointed leading American physicist Marshall Holloway to lead the thermonuclear programme, on 17 September 1951, Teller resigned the next day in a clash of personalities. Even without one of its creative geniuses, Los Alamos was still able to press ahead rapidly with development work. Once again it was science as a whole, not any one individual, which would carry forward the necessary progress.[259]

Just a few days after Teller's resignation, the Soviet Union tested 'Joe-2' at Semipalatinsk on 24 September 1951. It was a lighter 'Fat Man' design with a levitated core and was followed soon after, on 18 October 1951, by 'Joe-3', an air-dropped implosion device with a composite core. The Soviets were showing that they were also developing fast.[260] Despite such progress, the establishment of the Theoretical Megaton Group (also known as the 'Panda Committee') by Holloway at Los Alamos kept America ahead in the race to fusion and it met for

[258] Though parts of this work still remain secret, see a discussion at http://blog.nuclearsecrecy.com/2012/02/22/weekly-document-15-the-infamous-teller-ulam-report-1951. This gives a sense that today we are still living in the shadow of the nuclear world created in the 1940s and 1950s.
[259] Arthur Norberg*, Interview with J. Carson Mark* (University of California, Berkeley The Bancroft Library, 1980c), p. 45.
[260] Rhodes, *Dark Sun*, p. 482.

the first time on 5 October 1951. The group chose liquid deuterium as the best fuel for thermonuclear explosions, despite it being harder on the engineering side. A date of just over a year ahead was agreed for the first fusion test. This gave just enough time to make design changes that would lead to the successful radiation-channel design. The 1952 experiments were codenamed ‘Ivy’, set for November of that year and involved two tests in the South Pacific.

These tests marked the time at which the ‘old guard’ from the first, fission phase of American weaponry were replaced with fusion advocates. The increasingly sceptical Oppenheimer was not reappointed to the GAC when his term finished on 8 August 1952. He was seen by the White House as a non-believer in fusion power and his reputation was starting to be questioned.[261] James Conant was also not reappointed. Vannevar Bush was specific and, as usual, accurate about the changes that the fusion weapon would bring about. He saw that the new weapon would be “a turning point” into “a disagreeable type of world”, one in which there was no space between the powers because of the scale of the effects of the fusion weapon.[262] The days of individual, perhaps targetable and containable, single fission weapons were about to pass and a new, integrated and socialised, fusion world was about to emerge from the tests held in the South Pacific. To complete the sense of the change of an era, Senator Brien McMahon died of cancer at the very early age of 48, on 28 July 1952.

‘Mike’ exploded on 1 November 1952 with a breadth of three miles (Hiroshima’s had been one-tenth of mile) and the effects of the heat that recreated the centre of a star even produced a new element – fermium. The yield was estimated at

[261] Sidney Souers Oral History, 16 December 1954, pp 9-10, Truman Library, Independence, Missouri.
[262] Vannevar Bush, Testimony to the United States Atomic Energy Commission, 1954b, p. 562, Library of Congress, Washington D.C..

10.4 megatons. It is important to note that Britain was not informed in advance, or even immediately after, this test – the communication boundaries of the transatlantic nuclear worlds were closed. A new order of magnitude in weaponry was initiated here. The scale of the change was immediately recognised by those involved. Herbert York, the new Director of the Livermore Thermonuclear Test Facility in California, said that the limits of the fission weapon had been brushed aside and that the new science allowed man "to build bombs whose power was boundless."[263] A new scale of threat was unleashed that would necessitate new geopolitical arrangements. The MDA would be one of the results half a dozen years later.

The third significant event of 1952 was Britain's growing technical maturity. In that year Britain exploded its first fission bomb. In another similarity of technical and scientific development between Britain and America, even before it reached fission, Britain was investigating fusion. In March 1951 a report was issued by Cockcroft's sub-committee that set out a whole range of different designs, although concluding that a maximum of two designs could be simultaneously pursued.[264] Cockcroft confirmed that a fusion bomb might be possible in Britain, one of the earliest official mentions of the new weapon and some 3 years before the option surfaced at the political level.

Operation Hurricane exploded Britain's first fission bomb at 9:15 am local time on 3 October 1952, inside the hull of HMS Plym in the Monte Bello islands of Australia. Britain had now achieved entry level membership of the nuclear club. Gowing estimated that this had been achieved at a cost of only 1% of the defence

[263] Chuck Hansen, *April 1952: the AEC reports to the President*, 1994d, p. 4 quoted in Rhodes, *Dark Sun*, p 511.
[264] Sub Committee on the Strategic Aspects of Atomic Energy, 1 March, 1951, DRP/8/51, TNA.

budget, which was amazing value.[265] Jones correctly points out that the British atomic test, while technically a milestone, "did not offer the UK a capability that made any appreciable strategic difference."[266] Militarily it simply was not that useful. Fission was about to become a second level weapon and without an effective deployment capability. Lorna Arnold also points to the fact that it was not until October 1956 that a Valiant aircraft, equipped with a Blue Danube bomb, made an actual test of the new weapon at the Maralinga test range in Australia.[267]

The British explosion of October 1952 is also typically not seen as key or important in the American history of atomic development. For instance, Richard Rhodes' seminal work, *Dark Sun*, gives it seven lines only; and Botti, usually enthusiastic on such steps, does not directly attribute any reaction from America in connection with this test.[268] This indifference in the historiography, and the lack of an actual response from America to the test, continues to provide evidence that refutes the view of those, such as Ruane, who repeat Churchill's aspiration that 'Hurricane' would be the key that could unlock American doors, apparently slammed shut by spy scandals.[269] All this was, of course, dependent on a successful test. It did go well, but the evidence is that Britain's relationship with America did not similarly explode into life.

The election of Dwight Eisenhower as the 34rd President of the United States on 4 November 1952 would influence Anglo-American nuclear affairs in the coming years. As a retired General, one who specialised in coordination, he had different and more 'weathered' views than those of the domestically schooled Truman.

[265] Gowing, *Independence and Deterrence, Vol. 2*, pp. 37 and 56.
[266] Jones, *Official History*, p. 25.
[267] Arnold, *Britain and the H-Bomb*, p. 71.
[268] Rhodes, *Dark Sun*, p 502 and Botti, *The Long Wait*, p. 107.
[269] Ruane, *Churchill and the Bomb*, p. 249 and see also Churchill's words in Cabinet on the subject at 93 A(52)1st meeting, 26 March 1952, CAB134/734, TNA.

Almost immediately, Churchill's tendency to look west was re-ignited. His support for the GSP's British centred defence strategy seemed to waver.[270] There seemed the prospect that a voice could now be gained in America, given the wartime associations. Perhaps the stonewalling and lack of communication of America with Britain could be reversed.[271] Churchill even blocked suggestions that the plutonium capability of Britain be expanded while he mulled over the possibility of America providing such a resource.[272] Once again, though, Britain was not in fact seeking true 'influence' over America – the experienced new Prime Minister would have had doubts over such a grand aim – what was needed was simple support. Lindemann also now forcefully pointed out that the time had long passed when Britain should wait for full American cooperation. He made plain that Truman and his teams had been unhelpful and there was no logical indication that Eisenhower's would be different. Britain had to continue to press on alone.[273]

The actual level of influence Britain had with America at this time can be judged from the 'titbits' that it was able to acquire through operational contacts. These were highly prized as a result of their scarcity. Moore has pointed to December 1952, for instance, when a British pilot, who had had been flying American Navy Banshees, gave feedback on the techniques for delivering first generation atomic weapons such as the TX-7 and TX-8. Only in this way did Britain manage to gain limited insights into such matters as the weights and external characteristics of these weapons in the years before the 1954, when the revision of the McMahon Act made such generalised information legal.[274]

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[270] Churchill to Defence Committee, 11 December 1952, CAB131/12, D(52)12th meeting, TNA.
[271] PUSD paper, 6 November 1952, FO371/125009/4, TNA.
[272] Defence Committee, 11 December 1952, CAB131/12, D(52)12th meeting, and D(52)51 and 52, 6 and 8 December 1952, TNA.
[273] Lindemann to Churchill, December 1952, PREM 11/561, TNA.
[274] See Moore, *Royal Navy*, p. 100 and OAW/P (52) 10, 24 December 1952, AVIA 65/1147, TNA.

The years from Hiroshima to 1952 saw the world move from short-lived American atomic monopoly into a world in which other powers possessed nuclear capabilities. Science had once again made a new level of weapon available. Fusion power would deepen and extend the threat that existed across the world from the militarised atom. A resolution to the geopolitical consequences of these changes would now be required.

Part Four

Nuclear Pressure, Geopolitical Change and the Anglo-American Mutual Defence Agreement, November 1952 to August 1958

The signing of the 1958 Mutual Defence Agreement by Britain and America ended a separation at the governmental level that had effectively existed since the inception of militarised nuclear affairs. Such an association was in stark contrast to the previous and active American policy of nuclear non-cooperation with Britain. The question is, given the established background of estrangement that had consistently existed, what were the reasons for this new need for partnership and why did it manifest itself in 1958?

In Part Three we saw that the years after the Second World War, and up until 1952, were largely ones of stalemate in the transatlantic nuclear relationship. The fission weapon had created insufficient momentum for change in America's pursuit of atomic dominance. However in 1952 technical matters had begun to move ahead with the first successful tests of an atomic weapon by Britain and the initial fusion bomb test by America. The governments of the two countries would come under pressure to adapt and deal with the consequences of evolving fusion weaponry. These developments would lead directly to the MDA between the powers.

The historiography has grappled with these momentous changes and a number of potential explanations have been put forward for the 1958 Agreement. Some, such as Baylis, have focused on the British debate concerning interdependence

v independence as being a key component in any explanation.[1] However this does not address the key question – why should *America* change its existing policy of estrangement? While concentrating initially on military drivers, Jones' British focused official history comes to a similar conclusion after initially suggesting that linkages would await some form of British deterrent. The latter, he argues, would largely be in the form of the V-bombers and thus America "would not be prepared to talk at an official level" until they entered service.[2] Simon Ball has pointed out that most senior British officers actually harboured suspicions of the Americans. These suspicions were manifested themselves in opposition to linkages such as the dual-key Thor missiles offered by America. He notes that this opposition was overcome by the logic that Britain needed American technology to acquire the next generation of nuclear delivery systems.[3]

Jones cites COS sources to show that neither the American nor British military were actually keen to engage with the other. This was because, on the American side, the military advantage was too low and, on the British part, there was a fear that combined strategy would lead to an automatic loss of bomber capacity, as the two forces provided economies of scale.[4] He therefore has to suggest that the transatlantic relationship in the 1950s essentially pivoted on a similar, British, political independence v interdependence conundrum. Once again, therefore, this does not directly address the issue of the American motivation for an atomic partnership. Jones goes on to point out that "it was this imprecise notion of 'independent deterrent influence' that was to form a central feature of the

[1] "At the heart of the 1958 Agreement was the desire on both sides of the Atlantic for an interdependent nuclear relationship", in Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 425 - 466.
[2] Jones, *Official History*, p. 43.
[3] Ball, 'Military Nuclear Relations', 454.
[4] Jones, *Official History*, p. 43 quoting Note 130, COS (57), Item 7, 8 January 1957, DEFE 4/94, TNA.

Macmillan Government's approach to strategic nuclear policy over the next few years."[5] This "imprecise notion" was in fact the blurring of national independence and interdependency for the first time, driven by the new pressures of the nuclear world. Both conditions were desired; neither was possible on its own. In this regard, Macmillan's distilled phrase at this Defence Committee meeting on 31 July 1957, that deterrence rested on whatever "constituted" an effective deterrent, gives the first indication of the new British acceptance of its reduced status in the fusion threatened world.[6] Such a new geopolitical concept over nuclear inter/dependency, along with scientific and technical development, would be the bedrock of the MDA from a British perspective, although it was not America's driver.

Unsurprisingly, given his focus, Jones only briefly mentions the processes going on across the Atlantic, for instance the amendments to the McMahon Act. He describes these processes as protracted and also worrying at times to the British government, lest they once again fail to deliver benefits to Britain.[7] However this does not highlight the fundamental fact of the transatlantic relationship. This was that it would be America, acting in response to the systemic pressures of the nuclear environment, which would decide whether it wished to have a nuclear relationship with its former wartime ally (and when). If it did so, it would certainly not be one of interdependence. In fact dependency alone, of Britain on America, would be the most likely characteristic.

On the American side, for Timothy Botti it was the 1956 Suez and 1957 Sputnik crises that "served as catalysts to persuade President Eisenhower to assume a

[5] Jones, *Official History*, p. 47.
[6] CAB 131 / 18 D. (57) 6th Meeting, 31 July, 1957, TNA.
[7] Jones, *Official History*, p. 115.

vigorous leadership role on forwarding the cause of Anglo-American nuclear co-operation."[8] Botti charts what he sees as further variations in Anglo-American affairs and that the positive intentions of Eisenhower were often checked. He expressed this as "the new objective of nuclear co-operation clashed with the old objective – maintaining the highest possible level of security for American nuclear secrets and preserving American freedom of action on the use of nuclear weapons."[9] There is no mention here of the changes in the scientific, military and political structures of America which will be shown to be an essential aspect of explaining the positioning of the soon-to-be transatlantic partners in a global context.

Again from the American perspective, Andrew Pierre has argued that from the late 1950s Britain often "tied herself to the American order of priorities in research, development and production and in some respects at least became partially dependent on American satellite intelligence, navigation and radio communications systems."[10] The result was the gradual decrease in British atomic, perhaps even political, independence, as Britain realised that the new emerging defensive environment was not one which it could effectively manage on its own. Later, Marc Trachtenberg sees the MDA simply as a part of a complex 'European problem', with America looking to balance demands from Britain with its overall objectives of managing the emerging French nuclear programme and potential German demands to acquire one also. The lack of any 'specialness' in the 1958 agreement is once again strong in the American historiography.[11]

[8] Botti, *The Long Wait*, p. 248.
[9] Ibid, p. 244.
[10] Andrew Pierre, *Nuclear Politics: The British Experience with an Independent Strategic Force 1939–1970* (London: Oxford Univ. Press, 1972), p. 316.
[11] Marc Trachtenberg , *A Constructed Peace: The Making of the European Settlement, 1945-1963*, (Princeton University Press, 1999), pp. 307 - 309.

Some historians have looked at the summitry of Prime Ministers with Presidents in order to find a politically centred explanation for affairs. Baylis puts the diplomacy of Macmillan and Eisenhower in a central role. He also adds the constructivist argument that advocacy coalitions played an important part in changing opinions, one "which was of crucial importance in breaking down the barriers to collaboration which were erected after World War II."[12] In contrast, Ruane has convincingly shown how the Churchill-Eisenhower nuclear diplomacy was never likely to result in substantial progress, given Britain's absence of atomic capability. It was also often a side show to Eisenhower's other agendas such as his 'Atoms for Peace' initiative which seemed highly incongruous to the British.[13] Whether it was Churchill, Macmillan, Eisenhower or others, each only participated for a limited span in events that had roots stretching across twenty years. Only by taking a longer and international view can the role of politicians, important though they might be an individual moments, be accurately assessed.

Moore highlights that the clichés of "Suez, Sandys and Sputnik are commonplaces of post-war strategic history."[14] He himself points to the maturing nuclear world that had long been in the making. Moore highlights a gradual rise in the intensity of nuclear debate and thus "during 1956 and 1957, the public nuclear debate in the UK became much more lively. Andrew Pierre…dates this phenomenon to the aftermath of the Sandys White Paper."[15] These debates were generated by the accelerating technical momentum and systemic pressures of the later 1950s. It is by focusing on such scientific, geopolitical and military interactions that new insights can be provided into why, despite their previous

[12] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 430.
[13] Ruane, *Churchill and the Bomb*, p. 282.
[14] Moore, *Royal Navy*, p. 130.
[15] Moore, *Royal Navy*, p. 130 and Pierre, *Nuclear Politics*, p. 161.

separation, Britain and America came together. The timings of these realignments would explain why it was only in 1957 - 1958 that the atomic relationship between Britain and America started to change. Prior to that, America's nuclear policy towards its former conventional ally would continue to be remarkably consistent.

John Simpson has focused on the technical advances made by scientists, including those represented by the Soviet Sputnik satellite, in forcing geopolitical change.[16] The exact role of science played in the defence structures of the 1950s has been a subject of debate within the relevant historiography. Oreskes has highlighted the important discussion between Paul Forman and Daniel Kevles over whether physicists "had lost control of their discipline."[17] Both writers agreed that things had changed from the pre-war priorities of scientists. Kevles expressed this as that there had been a "transformation of the relationship between science, especially civilian science, and the American state after World War II."[18] What was at issue for them both was the character of that transformation. Foreman suggested that this character was the result of the onset of the Cold War and that physicists became under the thrall of the military. Kevles argued that federal funding of science had still permitted basic research to proceed in a way that science itself dictated. Such differing views will be examined further in this section. They are valuable because of science's fundamental importance to military nuclear development in the 1950s. Science

[16] John Simpson, *The Independent Nuclear State: The United States, Britain and the Military Atom* (London: Macmillan, 2nd Edition, 1986), Note 5, pp. 132 – 134 and Spinardi, 'Aldermaston', 547 – 582.
[17] Oreskes and Krige, *Science*, p. 20.
[18] Daniel Kevles, 'Cold War and Hot Physics: Science, Security, and the American State, 1945 – 1956', *Historical Studies in the Physical and Biological Sciences*, 20 (1990), 240.

can act as a mirror on the broader changes that occurred within American society and government.

As Britain caught up with America technically in the 1950s, it made partnership a more practical prospect. It was as a result of Britain's technical development that Spinardi attributes the first awakening of America to the benefits of deeper collaboration. He dates the start of this realisation to be as late as the autumn of 1957, when a British delegation visited Los Alamos. There, British scientists presented their independent fusion weapon designs to their America's fusion counterparts.[19] The presentation included a new British technique which demonstrated the Teller - Ulam radiation implosion approach in a way not seen in America. The difference was that the British design used a spherical secondary whereas the existing approach was based on a cylinder, and this novel thinking sparked interest.[20] Spinardi argues that this science-led step was the first on the journey which would convince America that sharing with its conventional wartime partner would be in its own interests. As the respective nuclear systems became more balanced, dialogue could occur in the context of a common technical language and in the face of a shared geopolitical threat.

The pressing challenges of emerging nuclear capability, and the strategic issues of the Cold War, would necessitate a new approach in American atomic and foreign policy. The MDA would be the result in 1958.

[19] Spinardi, 'Aldermaston', 547 – 582.
[20] John Baylis, 'The Development of Britain's Thermonuclear Capability 1954-61: Myth or Reality?', *Contemporary Record*, Vol. 8, No. 1 (Summer 1994), Note 43,174

Eisenhower, Massive Retaliation and the Failure of Nuclear Diplomacy

A sense of frustration over the costs and causalities of the Korean War, together with the acceptance by Truman of the stalemate in Korea, formed an influential background to the 1952 Presidential race.[21] Eisenhower put governmental expenditure centre stage in his campaign and suggested that its control could yield lower taxes and an improved economic outlook. With a key component of spending being on defence, the costs of which were now rising steeply, national security policy was thus a natural focus.[22] During the campaign itself John Foster Dulles, a leading Republican who was to become Eisenhower's Secretary of State until April 1959, criticised indecision in Truman's nuclear policy. In June 1952, Dulles wrote that "there is no reason for the degree of political chaos which now involves this subject".[23] He also stated that a strategy of deterrence should be clearly articulated and exactly defined.[24] Defence matters would become a major component of Eisenhower's tenure of the White House as the Cold War seemed increasingly likely to be a drawn out, 'long haul' affair.

The 1952 election of Eisenhower as President would be a symbolic marker of a new era in the development of nuclear military strategy. On its own, his appointment changed nothing of substance in Anglo-American atomic relations. The same differences and distance would prevail regardless that an Anglophile now occupied the White House. It did, however, ensure that the increasing systemic nuclear pressures of the 1950s, that would gradually force Britain and

[21] Jones, *After Hiroshima*, p. 143.
[22] For an analysis of Eisenhower's electoral platform, see Robert Bowie and Richard Immerman, *Waging Peace: How Eisenhower Shaped an Enduring Cold War Strategy* (New York, 1998), pp. 44-45.
[23] See John Gaddis, *Strategies of Containment: A Critical Appraisal of American National Security Policy during the Cold War* (New York, 2005), p. 149.
[24] Michael Guhin, *John Foster Dulles: A Statesman and his Times* (New York, 1972), p. 227.

America together, would at least largely be viewed positively by the American Executive. It would be the maturing nuclear world, and not Presidential words alone, which would stimulate the signing of the 1958 MDA.

The idea of what became known as the policy of 'massive retaliation' is usually traced back to Dulles' speech of 12 January 1954 at a Council of Foreign Relations dinner. However it was prefigured before the commencement of the new Administration. Speaking during the 1952 campaign, in May, Dulles is reported to have stated that aggressors would be subject to retaliatory blows so costly that they would not even consider such actions.[25] It was a new, forceful approach that sought to generate deterrence through a convincing projection of the will to use power, with nuclear force in the vanguard. This was emerging at exactly the same time that the British COS were meeting at Greenwich. It provides more evidence that such thinking simply reflected the technical and military realties of the age, varied only by the unique elements of the national systems.

Historians have remarked on the difference in nuclear policies between the Truman and Eisenhower administrations and point to their varying views on the usefulness of nuclear weapons as a real military option.[26] Contemporary perceptions of the failings of Truman's nuclear policy was demonstrated by the report by the Panel of Consultants on Disarmament in 1953, which referred to its "lack of clarity".[27] The new Executive wanted to see far greater commonality between conventional and atomic weaponry, including the development of a

[25] *New York Times*, May 17, 1952, p. 2.
[26] For example, see Samuel Wells, 'The Origins of Massive Retaliation', *Political Science Quarterly*, 96,1 (Spring 1981) and Jones, *After Hiroshima*, p. 148.
[27] Panel of Consultants on Disarmament, 'Armaments and American policy', January 17, 1953, *FRUS*, 1952-1954, National Security Affairs Volume 2, Part 2, p. 1070.

tactical capability.[28] This aggressive posture was to be backed up by the signal to the military that nuclear weapon deployment would be available to underpin their professional judgement.[29] However no weapons were actually deployed by Eisenhower in Korea. The existing concerns over world opinion were adopted and the same understanding of the limitations of fission weaponry rapidly acquired.[30]

In his first meeting with Churchill on nuclear matters, in January 1953, Eisenhower set the tone that he would use in his dealings with Britain. There was to be no 'special relationship', matters were to be focused on America's specific interests and her broad network of allies was also stressed.[31] Again, when the new President met Eden in March, the same reluctance to acquiesce to British pleas was seen. It was a case of trust me over nuclear matters because I am not able to offer more.[32] Britain was all too soon aware that 'influence' was still going to be hard to achieve – the American government was, once again, far more than just the politic public words of the President.[33] As always, it is to the actions of America that we must turn for a genuine guide for relations with Britain. An example of these was when, in April 1953, Makins sent Dulles a request for 500 tons of uranium ore as their part of the raw material agreement, the AEC simply reduced this by 75 tons in order that it not compromise the American expansion plan. No Eisenhower-inspired sea change in cooperation can be seen here.[34]

[28] Memorandum of discussion at 131st Meeting of the NSC, February 11, 1953, *FRUS*, 1952-1954, Korea, Volume XV, Part 1, pp. 769-770.
[29] Cutler to Wilson, March 21, 1953, *FRUS*, 1952-1954, Korea, Volume XV, Part 1, p. 815.
[30] Memorandum of discussion at Special meeting of the NSC, March 31, 1953, *FRUS*, 1952-1954, Korea, Volume XV, Part 1, p. 827.
[31] Robert Ferrell, (ed), *The Eisenhower Diaries* (London: W.W. Norden, 1983), pp. 222 - 224.
[32] Eisenhower - Eden meeting, 9 March 1953, FO1/39, TNA.
[33] Lindemann to Churchill, 19 March 1953, 31 March 1953, PREM11/561, TNA.
[34] Memorandum for Files by Hamilton, Washington, April 13, 1953, AE Files, Lot 57D688, "CDA-General", *FRUS*, 1952-1954, National Security Affairs, Volume II, Part 1, pp. 1141 - 1144.

Eisenhower set out his defence priorities internally at the 11 February 1953 National Security Council meeting. There was to be a balance between reining in on defence expenditure, while remaining strong enough to deal with Soviet might. It was to be very different to the rapidly increased conventional forces of the Truman years. It would also rely heavily on atomic superiority.[35] Planning would depend more and more on the products of new technology.[36] Later, on 8 June 1953, Eisenhower stated publicly that he believed that the original McMahon Act was now outmoded as the nuclear monopoly was broken. At this time Bradley also asked for a Special NSC Committee ruling that military were exempt from McMahon restrictions, hence permitting greater communications with allies. It was logical to the JCS that American defences were better served if those allies were familiar with the weapons that were being used in their countries and on their behalf.[37]

As before, any such changes to external relationships in nuclear affairs would still require the permission of Congress and the JCAE. In fact the Administration's actual proposal for such change at this time was certainly not as radical as the abolition of McMahon: it was merely to allow for the exchange of low grade information with allies. Nonetheless even this was rejected by JCAE Chairman Cole and Senate Leader Knowland who said that Congressional timetables meant no legislation could be placed forward until at least the start of the next session.[38]

[35] Memorandum of Discussion at 131st Meeting of NSC, February 11, 195, Eisenhower Library, Whitman File, *FRUS*, 1952-1954, National Security Affairs, Volume II, Part 1, pp. 236-237.
[36] Botti, *The Long Wait*, p. 117.
[37] Memorandum by Bradley, July 14, 1953, CCS 471.6 (8-15-45), sec.39, RG 218, Central Decimal File 1951-53, Box 169, Modern Military Branch, National Archives, Washington D.C..
[38] Botti, *The Long Wait*, pp. 116 – 117.

The role of allies was, nevertheless, an important growing component within wider American strategic debates. There were those, such as Oppenheimer, who openly called for greater linkages with Europe. In a July 1953 paper the scientist argued for an increase in ”Western unity in the face of the Soviet threat through greater candour with America's European allies. The first step in this direction would be to include them more in policy formation….Specifically, the United States ought to increase their ability to defend themselves by sharing atomic weapons information with them.”[39] But, as Gilpin has pointed out, the timing for such a shift in the hitherto consistent American policy of nuclear separation from Britain was not good, given the imminent 12 August 1953 detection by America of the Soviet Union’s first fusion test – ‘Joe-6’. After this significant event, Gilpin argues “American policy was thrown into a state of flux and confusion.”[40] It would take time for American policy to assimilate and adjust to the growing nuclear pressures. Later that month, in a letter to the President in a first reaction to this new state of affairs, JCAE Chairman Cole spoke of the need to upgrade defence. Noticeably absent from his list of suggestions was any mention of expanding nuclear cooperation with other states.[41] Oppenheimer and Eisenhower’s pro-ally views on possible solutions were not yet widely shared across American government at this time.

The new Administration’s appointment of key figures, including that of Admiral Radford to be the new Chair of the JCS in August 1953 and General Twining to take over at the Air Force, added momentum to its central foreign policy task, that

[39] J. Robert Oppenheimer, "Atomic Weapons and American Policy," *Bull. Atom. Scl*, Vol. 9, No. 6 (July 1953), p. 203 and Point 2.
[40] Gilpin, *American Scientists*, p. 127.
[41] Cole to Eisenhower, Washington, August 21, 1953, S/S-NSC Files, Lot 66D95, “NSC 151 Memos”, *FRUS*, 1952-1954, National Security Affairs, Volume II, Part 1, pp. 1185 - 1188.

of balancing America's new worldwide commitments with its ability to pay.[42] It was Twining who summed up what became seen as the essence of the 'New Look' – that anti-Communist strength would have to be maintained for a long period, that costs would need to be controlled in order to achieve this goal and that nuclear weapons needed to be central to military and political thinking.[43]

The JCS undertook to create a solution to this financial/military challenge and consequently met on board the USS Sequoia, in a fashion not dissimilar to the British COS's retreat to Greenwich in 1952. They produced a Paper that emphasised the necessity of maintaining forward positions in order to absorb any initial Communist attack, while keeping a powerful reserve in America. This would eventually manifest itself as the overseas deployment of missiles, with the hoped-for benefit that the American homeland would not become a target itself. Such a policy could potentially allow large overseas troop reductions to assist the financial balancing. At the 27 August 1953 NSC meeting, this approach was strongly supported by the Treasury but the implications for American allies were also clear.[44] They would have to shoulder the risks but without the concomitant control. This was the debate that had been ever present in American nuclear military affairs – how to maximise its own advantage while keeping useful allies on side. The provisional text, of what became NSC 162/2, prioritised nuclear weapons but also reflected these concerns about obtaining the consent of allies in the event of a crisis. Once again, American nuclear policy would be a

[42] For his brief to the new team, see *FRUS*, 1952-1944, National Security Affairs, Volume II, Part 1, (Washington D.C.,1954), p. 394, it is here that the phrase "long pull" is first seen.
[43] Twining to Radford, Ridgway and Carney, July 20, 1953, quoted in Robert Watson, *The JCS and National Policy, 1953-1954* (Washington D.C., 1986), p. 17.
[44] Memorandum of Discussion, 160th Meeting of NSC, August 27, 1953, *FRUS*, 1952-1954, National Security Affairs, Volume II, Part 1, pp. 443 - 455.

compromise that reflected of the disparate views of the military and diplomatic elements of the American government.[45]

Duncan Sandys led the early 1953 British Review of Defence Spending and produced a memorandum that gives an insight on defence thinking at this time.[46] In it, Sandys criticised the recent Brook Committee's report which had not been able to reach any firm conclusions over expenditure reductions. He reaffirmed that Britain was simply spending too much and was on track to spend even more.[47] Sandys' solution was that cuts should be proportionate in order to retain the overall shape of Britain's services. He also rated Commonwealth commitments in peace time as the main priority. Sandys then referenced the contemporary anchor of defence policy, the 1952 GSP, and criticised it for creating separate objectives. His suggestion was that they should form a single task, that of preparing for "a major war with Russia."[48]

In contrast to the GSP, the Minister of Supply argued that the nature of Britain as a small island would make the opening, short phase of any war decisive.[49] However even Sandys, the figure who would drive the influential 1957 White Paper, was still not able in 1953 to shrug off the hangover of fission-inspired warfare. He believed that the opening phase of any war would still "last a few weeks" and that some 'broke-back' fighting would still occur.[50] Sandys once

[45] See Eisenhower's dualistic approach, in terms of both endorsing military nuclear strength but with a recognition of the limiting effects of allied partners, in Memorandum of Discussion, 166th meeting of NSC, October 13, 1953, *FRUS*, 1952-1954, National Security Affairs, Volume II, Part 1, 546; and the final 'Statement of Policy by the NSC', NSC 162/2, October 30, 1953, *FRUS*, 1952-1954, National Security Affairs, Volume II, Part 1, p. 593.
[46] Memorandum by the Minister of Supply, D.P. (M) (53) 5, 15 June 1953, DNSD 4/1/1, CCA.
[47] Ibid, Point 1
[48] Ibid, Points 18 – 20.
[49] Ibid, Point 22.
[50] Ibid, Point 23.

again, in his inability to fully grasp total nuclear war (even at the fission level), shows how leaders were still very much 'of their time' in 1953.

In point 32 of his policy memorandum, Sandys made the (correct) assertion that he did not believe that the Soviet Union had the current capacity to attack Britain and America simultaneously with nuclear weapons. However he did not offer an opinion about which country would be the Soviets' main target. He also stated that, because of the mass causalities of any nuclear weapons being dropped on Britain, "it would be unthinkable for any British government to leave to the Americans, or to any other nation, the responsibility for this crucial task of preventative counter-bombing."[51] Later he argued that "the Americans and ourselves have accepted the conception of 'the long haul'….if this view is correct, research and development are more important than ever."[52] Vannevar Bush himself would have been very pleased to hear his wartime conclusions reflected here. Finally Sandys observed that there was "no doubt that the devastating potentialities of the long-range guided rocket, carrying an atomic or hydrogen warhead, are such that we cannot afford to allow the Russians to produce weapons of this kind before us."[53] Sputnik would prove this to be a vain hope.

On 30 October 1953, Eisenhower formally approved NSC 162/2 as a new statement of American national policy and strategy. To meet the new nuclear threats, NSC 162 put massive retaliatory capability and deterrent effect of American offensive striking power at its strategic core.[54] NSC 162 also stated that

[51] Ibid, Point 38.
[52] Ibid.
[53] Ibid, Points 71 – 72.
[54] Report to NSC by Lay (NSC 162/2), Washington, October 30,1953,S/S-NSC Files, Lot 63D351, NSC 162, *FRUS*, 1952-1954, National Security Affairs, Volume II,, pp. 577 - 597.

it saw “nuclear weapons as to be available for use as other munitions.”[55] The nuclear weapon was finally being integrated into American defence capability.

This increasing reliance on strategic airpower and nuclear weaponry meant that widespread overseas bases would be required. It is a mistake to see the growth of nuclear military strategy solely by reference to Britain and America, and their counterpoint with the Soviet Union. For instance, the JCS had made it plain that, as early as November 1953, nuclear weapons needed to be stationed in Asia as part of the projection of American power. At that time they meant in Japan.[56] And in April 1954 Eisenhower sent nuclear components to French Morocco.[57] In May 1954 consideration was being given by the Administration for further deployments to Japan and also to West Germany.[58] The implications for consent from many states, not just Britain, were plain – new forms of worldwide geopolitical relationships were being constructed.

While strategy and systemic pressures were starting to act in a fashion that might bring America and its nuclear allies closer, resource identification provided a retarding effect. On 12 November 1953 the Senate Subcommittee on Minerals heard that plutonium production in the Colorado River Plateau, together with new discoveries across Wyoming, Nevada and Idaho meant that America would no longer need to look abroad for such supplies.[59] As Botti points out ”now that the administration could no longer use joint control of uranium as an overriding

[55] Ibid, p. 595.
[56] See Gerard Smith memorandum for the file, ’Introductions of Weapons into Germany and Japan’, June 18, 1954, ‘NN-Japan, 1953-4’, box 1, Country and Subject Files, 1950-1962, SASAE, RG 59, National Archives, Maryland for a discussion of the need to only send non-core elements due to political sensitivity at that time.
[57] Jones, *After Hiroshima*, p. 222.
[58] Ibid.
[59] Stockpile and Accessibility of Strategic and Critical Materials to the U.S. in time of War’, Hearings by Special Subcommittee on Minerals, Materials and Fuels, 46.14, U.S. Senate, 83rd Congress, 1st and 2nd Sessions, 1954, National Archives, Washington D.C..

reason for improving nuclear ties with the British, cooperation for the common defence and security became the sole theme."[60]

In discussions held in advance of the forthcoming Bermuda conference with Britain and France, on 3 December 1953, Eisenhower again stated that he was very positive about engaging fully with allies, and argued that they had a right to understand the magnitude and numbers of nuclear weapons available for their defence. He also wanted the authority to be able to reveal whatever nuclear information that he chose at summits with other allied states.[61] However there was a considerable difference between making positive, pro-allied noises in the confines of a security meeting and to being able to achieve the support of the JCAE and Congress if such significant changes were actually to be achieved.

The difficulties of operating in an increasingly systemised and integrated nuclear world were highlighted to the President in Bermuda. The Administration clearly received the message that Britain, and France, would be opposed to any widening of the war in Indo-China especially through nuclear means, and that they expected a right of consultation in any potential nuclear confrontation.[62] As Jones states "discussions over the difficulties of maintaining allied solidarity revealed one of the fundamental dilemmas of the New Look".[63] It was this dilemma, effectively how to create new worldwide geopolitical and technical relations that solved the questions of the Cold War, which the MDA would assist in addressing in 1958. In 1953 Dulles observed "our thinking on the atomic

[60] Botti, *The Long Wait*, p. 124.
[61] Memorandum by Gleeson on 173rd NSC Meeting, December 3, 1953, Washington, Ann Whitman File, Eisenhower Library, Abilene, Kansas.
[62] Eden minute for Churchill, PM/53/337, 4 December, 1953, FK1078/8G, FO 371/105540,NA and the American reaction is Memorandum of Discussion at the 174th meeting of the NSC, December 10,1953, *FRUS*, 1952-1954, Korea, Volume XV, Part 2, p. 1654.
[63] Jones, *After Hiroshima*, p. 169.

weapon was several years in advance of the rest of the free world."[64] But that Free World was catching up fast, and its role in America's defence and foreign policy would need to be reflected by a geopolitical realignment.

Arguments of nuclear maturation were used as a tool by Churchill at Bermuda when he stated that a 'Blue Danube' fission bomb had been delivered to RAF Wittering in November 1953.[65] British success in generating such a nuclear capability was then contrasted by Churchill and Eden with concerns over what 'say', if any, Britain would have over America's East Anglian based 'Silver Plate' bombers. As with Roosevelt before him, the pro-British President found himself looking for the perfect innocuous and non-committal expression that might satisfy Britain's concerns, while adhering to American longstanding policy of separation. In the end he stated "certainly there should be consultation on the circumstances in which it [the Bomb] may be used and the targets against which it should be employed."[66] But, as Ruane pertinently points out, "circumstances. That could mean anything - or nothing."[67] Here is where the longer term contextualisation of Anglo-American nuclear relations is so valuable – these words simply reflected a very long held policy and not any change to the previous attitude of detachment. As before, American woolly language had to be accepted by a Britain unable to force anything more concrete or favourable to its position. Churchill would leave Bermuda empty handed.[68]

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[64] Memorandum of Discussion at the 174th meeting of the NSC, December 10,1953, *FRUS*, 1952-1954, Korea, Volume XV, Part 2, p. 1654.
[65] Ruane, *Churchill and the Bomb*, p. 281.
[66] BC(P) (53) 4th meeting, 7 December 1953, PREM11/2856, TNA.
[67] Ruane, *Churchill and the Bomb*, p. 284.
[68] Eisenhower-Churchill Meeting, Bermuda, December 5, 1953, Notes by Strauss, Eisenhower Library and 'Bermuda State Department report', *FRUS*, 1952-1954, Western European Security, Volume V, Part 1, pp. 1767 - 1769.

Bermuda has rightly been characterised as both indicative of the weakness of British influence over America, and also as showing that the main drivers of America's policy conclusions were NSC 162/2 and NSC 151/2.[69] Further, the psychological gulf across the Atlantic was expressed at this time by Everett Gleason, Deputy Executive Secretary of the National Security Council, as "the Europeans thought of the use of atomic weapons as the gateway to annihilation, not as a great new source of defensive strength."[70] The failure of nuclear diplomacy at Bermuda, especially when the individuals involved had such a strong shared past, is also indicative of one thing – that it was not the politicians who were driving nuclear strategy. The strategy was being determined by the development of the weapons themselves and the new geopolitical realities that were being created by them.

Eisenhower and Dulles' thinking continued to bring the massive power of fission and fusion within the orbit of conventional military assets. This was made plain in Eisenhower's diary in December 1953, when the President stated "specifically we have come to the conclusion that the atom bomb has to be treated just as another weapon in the arsenal."[71] The challenge was, as a democracy that averred all first strike options, how could America wield such power? The 12 January 1954 speech by Dulles, containing the famous 'massive retaliation' phrase, was an attempt to address this question. The specific words used were that America would base its defence "primarily upon a great capacity to retaliate instantly by a means of our choosing."[72] Massive retaliation became the expression of the

[69] Botti, *The Long Wait*, p.130.
[70] Memorandum by Gleason, December 11, 1953, (174th NSC Meeting on December 10, 1953), Eisenhower Papers, Ann Whitman File, Eisenhower Library, Abilene, Kansas.
[71] Eisenhower diary, December 6, 1953, DDEL/AWF/International Series, box 3, file 1 quoted in Ruane, *Churchill and the Bomb*, p. 283.
[72] 'Statement on Foreign Policy of Eisenhower Administration', *New York Times*, January 13, 1954.

strategic concept of an overwhelming reaction to any aggression. It was primarily an act of deterrence and, to be effective, had to be highly publicised and believable. Jones has argued that It was calculated to send warnings to China in particular to avoid meddling further in Korea.[73]

As Jones further points out, the "public debates over massive retaliation were conducted in the context of a growing realisation that the advent of the hydrogen bomb, confirmed by the Chair of the JCAE, Sterling Cole on 17 February 1954, was likely to transform the strategic picture once again", and with the potential consequence that it could "make the United States and its allies more immediately vulnerable to devastating attack."[74] The American solution at this time was to accelerate its move to even greater levels of nuclear power for itself. On 1 March 1954 America therefore started the largest, and perhaps the most widely influential, of all fusion bomb tests. Called the 'Castle' series, it again took place in the South Pacific. It marked a further stage in the proof that fusion weaponry worked, that it could be scaled up hugely and that it was a new level of potential human destructiveness. Powered by lithium-deuteride for the first time, the first device, codenamed, 'Bravo', was a portable design that could easily be weaponised and would fit within the unmodified bay of a B-47 aircraft.

In an example of how technical matters can go wrong, this test resulted in the release of two neutrons, instead of the expected single one, from Lithium 7. The outcome was America's largest ever test explosion, at 15 megatons, and the deaths of Japanese fisherman 82 miles away in their vessel, the *Fukuryu Maru*. This incident sent shock waves around the world and, in Britain, would contribute to the growing clamour to end testing and, eventually through organisations such

[73] Jones, *After Hiroshima*, p. 181.
[74] Ibid.

as the Campaign for Nuclear Disarmament (CND), for weapons to be discarded completely. In fact Moore believes it was these domestic concerns, rather than the Soviet Union's test of August 1953, that created a new outlook within America. He also points to the British COS fusion investigation of June 1954 as being the product of the implications of 'Bravo'. The plans for Britain to survive a first wave and be a main support area were now increasingly seen to be untenable.[75] The 'Castle' series showed just how effective, multi-faceted and advanced fusion science was becoming, and also that the bar for credible weaponry was being set at the multi-megaton level of explosive force. The sense of danger that this generated continued to ratchet up the pressure on the systemic political environment. As Gilpin puts it, "the world had now entered the era of Megadeath and thus an unprecedented problem for American nuclear policy had appeared."[76]

While America was exploding fusion devices, Britain was still deciding whether to build them. It would be the logic of systemic change that would drive Britain's decision, not the acquisition of 'influence' over America. Britain conducted these decision-making matters as usual by committee. The new GEN 464 committee, now responsible for atomic decision making and containing the six most senior cabinet ministers only, met on 13 April 1952 with the Prime Minister in the chair. It suggested that the Cabinet should be invited to approve fusion bomb making in Britain.[77] The matter was then discussed further at the Defence Policy Committee in meetings in May and April. Churchill made the very realist argument that "influence depended on possession of force".[78] However this is not the same

[75] Moore, *Royal Navy,* p. 82.
[76] Gilpin, ‚American Scientists', p. 122
[77] GEN 464, 13 April 1954, CAB130/101, TNA.
[78] DP(54)1st and 2nd meetings, 4 and 19 May 1954, and DP(54)1, 13 April 1954, TNA.

as saying that atomic weapons would, of themselves, give Britain any sway over the actions of America. A more pragmatic, cost-driven and maturity based set of arguments were being used here to justify Britain's new fusion programme.

Farmelo has argued that Churchill saw the fusion as a prop for its place in the world.[79] Ruane has further asserted that "it was the Americans, not the Soviets, the British most worried about".[80] This was especially so when the crisis in Indo-China was the centre of contemporary diplomatic activity, he states. His argument is based on concerns that America might use the mid-1950s as a window for the opportunity for a pre-emptive strike on the Soviet Union, with potential disastrous side effects for Britain. But, while it was the case that the JCS did brief the President that a first strike was the logical step to take, there is very little in the way of evidence that America was genuinely preparing such a radical set of actions.[81] Aside from the fact that the stated policy of America, as set out in NSC 162, was for deterrence and retaliatory action only, there appears to have been no majority in Congress for such a unilateral attack. In his National Security Policy statement of 1954 Eisenhower also publicly rejected such a course of action, following NSC discussions in December 1954 at which Dulles had already explicitly "stated that of course we have ruled out preventive war."[82]

Such views also miss the key underlying factor in play in Britain's fusion decision. This was the ever-progressing technical and systemic nuclear environment in which this determination had to be made. It was a case that the new tools, as J.F.C. Fuller characterised them, were available; the question was, could they

[79] Farmelo, *Churchill's Bomb*, p. 426.
[80] Ruane, *Churchill and the Bomb*, p. 311.
[81] Rhodes, *Dark Sun*, p. 563.
[82] Memorandum of Discussion at the 229th Meeting of the National Security Council, Tuesday, December 21, 1954 1, *FRUS*, 1952–1954, National Security Affairs, Volume II, Part 1, Eisenhower Library, Eisenhower papers, Whitman file.

simply be ignored? The answer was, of course, 'no'. America was also dallying with the idea of agreeing a moratorium on testing with the Soviets at this time. This would have locked Britain into a second tier of development.[83] This further spurred on the decision of the summer of 1954 to build a fusion bomb in Britain. Additionally, the June 1954 COS paper made it clear that, in the light of new fusion reality, the Chiefs now agreed that the scenario had now been "completely altered" by this new weapon, and that the fusion bomb was now seen as the key central plank in any credible deterrent.[84] Such deterrence was the only real hope of defence, the Chiefs argued. They recommended pushing ahead with development and for its use to be in the prevention of war. The means of delivering them was also highlighted by them as a vital ingredient.[85] The COS contribution to the British fusion debate was thus to create a consensus around the practical need to acquire it. It was, in fact, the same 'best defence' argument that had previously swayed Bradley about the American decision.[86]

Duncan Sandys' actions can give us an insight into the state of transatlantic nuclear affairs at this juncture for Britain. The Minister of Supply visited guided missile sites in America and held talks in Washington in June 1954. Before he even left British shores, and in a letter to Wilson, Sandys chose to highlight the difficulties of the dollar payments currently required to purchase experimental components. This reveals the continuance of an important theme in the Anglo-American relationship – British dependency on rising American economic and financial power. This would be most overtly seen during the forthcoming Suez Crisis, which will be covered in the next chapter. Sandys also argued that, while

[83] Baylis & Stoddart, *The Nuclear Experience*, p. 63.
[84] 'United Kingdom Defence Policy: Report by the Chiefs of Staff', 1 June, 1954, CAB 134 / 808, D.P. (54), 6, TNA.
[85] Ibid.
[86] See Part Three, p. 253.

smaller, Britain had a worthwhile contribution to make.[87] But he had to acknowledge that "the practical difficulties, as we all know, are real and substantial."[88] *Flight* magazine, on 4 June 1954, reported on Sandys' visit and said that "outside the atomic field, which is governed by the restrictions of the McMahon Act, there exists already a fairly free interchange of information about new weapons projects, but that is not active collaboration."[89] Both these points were fair reflections of the continuing reality of Anglo-American nuclear separation at the governmental level.

The Prime Minister was also in Washington in June 1954. Once again, vital information (from a British perspective), concerning specification of American nuclear devices, was requested in order that the imminent V-force of bombers could be most efficiently constructed. Eisenhower was understanding about such a logical military request and was advised by Strauss that such a flow of information would be possible. In taking such a view, Eisenhower was influenced not by warm memories but the practical considerations of a conflict situation.[90] The former wartime Supreme Commander was taking a macro strategic view once again. The changing geopolitical world of nuclear warfare demanded some measure of interaction with allies, the President reasoned, and so it should be granted.[91] However this was not within his gift as the Congress needed to be consulted and still remained to be convinced. The final communique of the

[87] Sandys to Wilson, 29 May 1954, 'Visit to U.S. Guided Missile Establishments and Washington Talks – June 1954', DSND 4 / 6, CCA.
[88] Ibid.
[89] *Flight*, 24 June, 1954, cutting in DSND 4 / 6, CCA.
[90] Hagerty, June 24, 1954, in Robert Farrell, (ed), *The Diaries of James C. Hagerty: Eisenhower in Mid-Course, 1954 – 1955* (Indiana University Press, 1983), p. 76.
[91] Strauss record of US-UK meeting, 26 June 1954, *FRUS*, 1952-1954, Western Europe and Canada, Volume VI, pp.1096 - 1097.

meeting was thus very discreet.[92] What was actually secured from Congress by the Administration in this matter will also be discussed in the next chapter.

While Churchill may have intimated to Eisenhower in Washington that a British fusion decision had been taken, this was not formally the case. The arguments used in the first of three Cabinet debates over the issue, on 7 July 1954, actually focused on the rationale, not of how to gain 'influence' with America, but on the deterrence, retaliatory and other benefits of possessing the weapon.[93] Having just returned from America, and with his unique experience of Anglo-American affairs at the most senior level, Churchill may well have realised that his continued efforts at attaining some form of voice inside the American government were now finally doomed to failure. The Cabinet debate, on 8 July 1954, lacked a quorum and only generalised support for building a fusion weapon was noted.[94] It was not until 27 July 1954 that the Cabinet formally endorsed the recommendations of its military Chiefs and Prime Minister that a fusion weapon should be constructed.[95]

Britain's move to greater nuclear equalisation with America could move ahead once more.

[92] Joint statement, 29 June 1954, *FRUS*, 1952-1954, Western Europe and Canada, Volume VI, pp.1132 – 1133.
[93] CC (54) 47, 7 July 1954, CAB128/27 and CAB195/12, TNA.
[94] CC (54) 48, 8 July 1954, CAB128/27 and CAB195/12, TNA.
[95] CC (54) 54, 27 July 1954, ibid.

The 1954 Atomic Energy Act, Suez and The Changing Geopolitical World

Eisenhower negotiated with Congress over an amendment to the McMahon Act in 1954 partly in line with his private commitments to the British in June, but also because he wanted legislation that reflected his wider views on nuclear energy. American policy on consultation with its allies was being simultaneously defined in NSC 5422/2. Issued on 7 August 1954, NSC 5422/2 now reconfirmed what had been unofficial Administration policy, largely unspoken under the Truman White House, since the deployment of bombers in Britain in 1948. It stated that, while efforts were to be made to gain allied agreement to act, any reluctance "should not inhibit the U.S. from taking action, including the use of nuclear weapons."[96] This was very much in the same tradition as all American nuclear policy since the beginning of 'Manhattan'. America was free to defend itself how it chose, even if that meant putting allies in danger and without potential prior consultation in extreme cases.

It seemed that, after many years of rebuff, British expectations of the scale of legislative changes in America were going to be more realistic. Makins observed that the new Act "is not going to give us all we would like to have but it was quite likely to give us all we could reasonably expect"[97] The amended Atomic Energy Act was approved by Congress on 3 August 1954. It was a document that foreshadowed the structure of the next, 1958, amendment to this legislation. It requires focus in its own right but, once again, gives evidence that nuclear strategy was a process that evolved gradually. Ruane has commented, perhaps

[96] Statement of Policy by NSC (NSC 5422/2), Washington, August 7, 1954, S/SC Files, lot 63D351, NSC 5422, *FRUS*, 1954, National Security Affairs, Volume II, pp. 715 - 731.
[97] Makins to Caccia, 22 April 1954, FO1/40, TNA.

ironically, that “the Act hardly constituted the restoration of Anglo-American atomic relations as existed during the war.”[98]

Once again this iteration of American nuclear legislation required domestic political manoeuvring to even see it through. By tying the internal/defence elements to political footballs such as the Dixon-Yates contract, a contentious link between the AEC and two private companies, the JCAE was able to secure the number of votes to get the changes to the Atomic Energy Act passed. It is important to note that this amendment had a significant component relating to domestic matters once again.[99] In Section 3 of the new Act, it also focused on the peaceful applications of nuclear energy being available to cooperative nations. Under Section 123, the Act set out the steps that were needed before any such sharing of nuclear information with other countries could take place. Points B and C made this action, no doubt deliberately, a tortuous procedure. Both the Administration and the potential partner state had to negotiate an ‘Agreement for Co-operation’, which would then need approval by several bodies, including the AEC and the President, before it could be submitted to the JCAE for a period of at least 30 days and while Congress was in session. If approved, the Agreement would only have the force of an Executive Order and not be a full treaty of the United States – an important distinction and again reflective of the techniques used by Roosevelt with his agreements. The MDA of 1958 would itself hold bi-lateral treaty status and this put it on a firmer footing than these Atomic Energy Act ‘cooperative agreements’.

[98] Ruane, *Churchill and the Bomb*, p. 319.
[99] For the full text of the 1954 Atomic Energy Act see https://www.nrc.gov/docs/ML1327/ML13274A489.pdf, pp. 15 – 243.

It was Section 144 that specified, under point A, exactly what restricted data could be shared with other nations. This also incorporated Eisenhower's needs for his non-military 'Atoms for Peace' initiative.[100] Point B listed just four areas in which military restricted data could be given to a foreign power – defence planning, training, evaluation of enemy threats and the development of compatible delivery systems for atomic weapons. Under Point C, i, the President could also "exchange with other nations Restricted Data (RD), provided that communication of such RD is necessary to improve its atomic weapons design, development or fabrication capability and provided that nation has made substantial progress in the development of nuclear weapons."[101] This prefigured the 'sufficient maturity' clause that was eventually, and critically from a Congressional approval point of view, inserted into the 1958 Act. Nuclear affairs have a longer pedigree of change than might have otherwise been highlighted. Overall only two of the 28 chapters of the 1954 Act refer to international arrangements or Information flows. Botti summed up the actual deliverables of the Act as "what was remarkable (or perhaps unremarkable) about the Atomic Energy Act of 1954 was how precisely it fulfilled the desires of the Eisenhower administration."[102]

The Act did open the door to intelligence sharing on Soviet nuclear activities, and this continues as an effective link between Britain and America to this day. The external characteristics of weapons data, as promised by Eisenhower, were now available, though the design and manufacture of the weapons themselves were still totally restricted. Reactor information for non-military research purposes

[100] For a British view on Eisenhower's 'Atoms for Peace' initiative see Ruane, *Churchill and the Bomb*, p. 286 and for original documentation see 'Atoms for Peace File', Eisenhower Library accessed via https://www.eisenhower.archives.gov/research/online_documents/atoms_for_peace.html.
[101] https://www.nrc.gov/docs/ML1327/ML13274A489.pdf, pp. 15 – 243.
[102] Botti, *The Long Wait*, p. 140.

could now also be shared.[103] The first results of the pressures of the socialised nuclear world were codified here in 1954. More was to follow as the systems of Britain and America found geopolitical and technical common ground over the coming four years. However, when Edwin Plowden, a highly experienced economic civil servant and industrialist, and Cockcroft arrived in Washington in October 1954 to begin talks on what could now be shared as a result of the amended Atomic Energy Act, the same environment of non-cooperation was still in place, and the limitations on exchange soon explained to them. The new Act was, in the matter of leading edge militarised nuclear knowledge, as unhelpful as the McMahon version of 1946.[104]

Outside these proceedings in Congress, American foreign policy continued in its existing form. This was, in the words of Vice President Richard Nixon in March 1954, "rather than let the Communists nibble us to death all over the world in little wars, we would rely in the future primarily on our massive mobile retaliatory power . . . against the major source of aggression."[105] As Gilpin has argued this was against the will of the majority of scientists and that “with few exceptions scientists of all persuasions rejected the new policy.”[106] This is important because, as John Krige has pointed out, by this time “scientists had become integrated into the apparatus of the national-security state.”[107] The mid 1950s were years of important intensification in the relations between science and the state and these reflected the evolving Cold War geopolitical situation. As the consequences of the new power of nuclear weapons meant that confrontation between East and

[103] Pierre, *Nuclear Politics*, p.159.
[104] Memorandum of Conversation by Raynor, Washington, October 27, 1954, 741.5611/10-2754, *FRUS*, 1952-1954, National Security Affairs, Volume II, p. 1542.
[105] Appu Soman, *Double-edged Sword: Nuclear Diplomacy in Unequal Conflicts : the United States and China, 1950-1958* (Praeger, 2000), p. 39.
[106] Gilpin, *American Scientists*, p. 130.
[107] Oreskes and Krige, *Science*, p. 433.

West became increasing nihilist and technically founded, scientists were melded ever further into the military-industrial processes of America.

The trial of Robert Oppenheimer, in mid-1954, is indicative of the sea change that was underway in American atomic society. It has been argued that "in a very real sense, the Oppenheimer security trial meant the end of innocence for the scientists."[108] A split occurred between those who supported Oppenheimer and those who followed his opponents, such as Teller. The dominance of the power of the state can be seen here as the titan of the Manhattan programme was brought, very publicly, to heel. Gilpin has characterised this as part of a fundamental split that continued throughout the rest of the 1950s amongst scientists. Such a split would manifest itself in policy debates over whether America should develop the next generation of nuclear weapons and whether such development was an asset or a risk for America's own security.[109] The support of its own scientists was now essential if the American state was to be adequately defended in the new, technical age. By 1958 this would be extended to include working with the scientists of another nation - Britain.

In November 1954, Lindemann had been required to prompt the Prime Minister that the unpalatable matter of gaining parliamentary approval for the Cabinet's fusion decision could not be postponed any longer.[110] Harold Macmillan was appointed to handle it and it would take over six months. The British process contrasts strongly with the decisioning of America and Truman's simple one sentence agreement. One element of Britain's initial approach was to evaluate the civil defence aspects of future warfare and, in December 1954, the Strath

[108] Gilpin, *American Scientists*, pp. 133-134.
[109] Ibid, p. 135.
[110] Lindemann to Churchill, 18 November 1954, LIND/J146/36-37, Nuffield College, Oxford.

Committee was constituted in the Ministry of Defence, with a brief to examine the consequences of thermonuclear war.[111] The report of the Committee, issued in 1955, stated bleakly that a nuclear attack would result in up to 12 million British deaths, from which the nation might never recover.[112] The reality of nuclear warfare now became more widely understood and, consequently, of more influence in policy considerations. The Cabinet decision to build a fusion bomb was formally announced in the February 1955 Defence White Paper.[113] It also confirmed that any nuclear attack on Britain "would cause devastation, both human and material, on an unprecedented scale".[114] Jones describes this Paper as "a landmark in British nuclear history for its presentation of the gruesome and fearful results if such weapons were used."[115]

The Paper also referenced the actual delivery of nuclear weapons as being key. However Britain, and its emerging V-bomber force, was in ignorance of American targeting plans. It is therefore clear that, even at this relatively advanced stage of the journey to the 1958 MDA, military nuclear affairs between Britain and America were very separate. In August 1954 Air Ministry plans were still written in isolation from America, and they targeted the bomber force against air bases in the Soviet Union which were selected, solely, because they might be the ones used to launch raids against Britain.[116]

The 1955 Defence White Paper officially introduced a new age of weaponry in Britain with its mention of missiles. It proposed to develop the 'Blue Streak'

[111] Macmillan to Churchill, 10 and 13 December 1954, and with annotation, 12 December 1954, PREM 11/1066, TNA.
[112] DEFE 5/80, COS (57) 278, 18 Dec 1957
[113] CMD 9391, Statement of Defence, 25 February 1955.
[114] Ibid.
[115] Jones, *Official History*, p. 33.
[116] CMS 1721/50/7414, 24 August 1954, AIR 2/15917, TNA.

Intermediate Range Ballistic Missile (IRBM). This weapon had its origins in 1953 when concerns about the vulnerability of aircraft by the mid-1960s were expressed. It had also been based on the original 1954 Ministry of Supply brief and this was channelled by the White Paper into an Air Staff detailed note of August 1955, specifying a capability to carry a 1 megaton warhead for 2000 miles. £50 million was assigned to the development of this proposal.[117] What was eventually produced was a liquid fuelled missile which was flawed as the initiation system was lengthy and thus it was open to pre-emptive attack.

'Blue Streak' garnered considerable support because it was a purely British development. It embodied the 'independence' stream of governmental thinking. As the Air Ministry expressed it when defending the scheme, "we should insist on keeping it in our programme not only because we want it but also because, politically, we cannot afford to be dependent on America for this vital weapon."[118] The eventual solution to the British nuclear strategic concerns, as aircraft increasingly became seen as vulnerable, would be Polaris. This was a submarine-launched, solid fuel IRBM and was successfully tested by the American Navy on 20 July 1960. However, before Polaris would be made available by America and accepted by Britain, it would require the acknowledgement, by both states, that the new geopolitical and technical logic of the Cold War required partnership for optimum functionality. So neither 'interdependence' nor 'independence' would do – the nuclear world would demand a subtle mix of the two.

[117] Wynn, *RAF Nuclear Deterrent Force*, pp. 373 - 375.
[118] Air Ministry Note, 24 January 1957, AIR 2/14712, TNA.

The 1 March 1955 debate on the Defence White Paper was Churchill's last substantive contribution to the affairs of the House of Commons. On Anglo-American relations, the Prime Minister commented that "personally I cannot feel that we should have much influence over their policy or actions, wise or unwise, while we are largely dependent, as we are today, upon their protection. We, too, must possess substantial deterrent power of our own."[119] As such British capability rose, and as its usefulness to America commensurately increased, so it would be more likely to change the state of separateness that had existed since 1941. Churchill won the day in the Commons and, after the subsequent vote of censure was defeated, he was able to crow to his friend, the American President, "considering we only have a majority of sixteen, the fact that the Opposition.... censure was rejected by 107 votes was a remarkable event and entitles me to say that our policy of "Defence through Deterrents" commands the support of the nation.'"[120]

The (still) classified Strath Report of 1955 was the sombre background to the military debate that was unfolding. [121] Despite these glimpses of nuclear reality, the Air Ministry continued to push the argument that Britain had to be seen to be making a contribution to western defence, and the way to do that was by the 'counterforce' strategy of large numbers of the new aerodynamically shaped V-bombers.[122] Vested self-interest was at the fore here. The July 1955 JPS Paper, endorsed by the COS, stated that the bomber force had to be kept very much within financial bounds, and that all delivery mechanisms needed to be placed

[119] Churchill, HCD Vol. 537, cols 1893-1905, 1 March 1955.
[120] Churchill to Eisenhower, 4 March 1955 in Peter Boyle, (ed.), *The Churchill-Eisenhower Correspondence, 1953 – 1955* (The University of North Carolina Press, 1990), p.199.
[121] Lloyd to Eden, 21 April 1955, DEFE 13/45, TNA.
[122] MISC/M (55) 69, 12 July 1955, DEFE 7/963, TNA.

under review.[123] Additionally a view was expressed by the Chiefs that colonial conflicts needed far greater priority as they would not be pursued by any other power on our behalf, unlike a perceived conflict with Russia, where America may be presumed to help.[124] This potential inability to fight a solo nuclear conflict was summed up in the 'cost of membership of the club' view of the then Minister of Supply, Reginald Maudling, in August 1955 when he said "I doubt myself whether there is much wisdom in paying an entrance fee so high that you cannot afford to patronise the bar when you get there."[125] These varying points of view are reflective of the immense debate that was under way in Britain in the mid-late 1950s, and to some extent still continues, concerning Britain's role in the world, its capabilities and its nuclear relationship with America. At that time no governmental nuclear relationship existed, resource sharing had ceased and scientific interchange was minimal. The benefits that would be accorded to Britain by its technical development, and which would create the environment for the MDA to be considered by America, were still a work in progress.

At the National Security Council meeting on 19 June 1955 Strauss, following a visit across the Atlantic, was bragging that America's atomic effort was still "ten times as great" than the British".[126] This perception of enormous disparity would continue to delay any urgency at the American political level to satisfy the emerging military logic for partnership. Further, Eisenhower, in the same NSC meeting, himself confirmed the fact that America had consciously never given any industrialising assistance to Britain. He asked Strauss whether Britain resented that lack, to which Strauss responded that they did not blame the

[123] JP (55) 67 Final, 20 July 1955, DEFE 6/30, TNA
[124] Mauling Letter to Lloyd, 30 August 1955, DEFE 7/964, TNA.
[125] Ibid.
[126] Discussion at the 251st NSC Meeting, June 19, 1955, *FRUS*, 1955–1957, Regulation of Armaments, Atomic Energy, Volume XX, pp. 113 – 115.

present Administration. The President then described British attempts at avoiding errors through American knowledge acquisition as “pitiful”.[127]

One result of such attitudes was the lack of substance in the 1955 ‘Anglo-American agreement on Cooperation’ drawn up to conform with the processes defined in the 1954 Act. No nuclear propulsion information would be included in the 1955 Agreement and yet a comparable agreement with the Canadians on reactor technology was approved.[128] Britain’s relations with America must always be assessed by the light of America’s wider perspective. At this time there was no advantage to America to share key technologies with Britain, so it didn’t happen. The Agreement covered the generic areas permitted by the 1954 Atomic Energy Act and no more – general defence plans, training and evaluation of the potential of possible aggressors and compatible delivery systems information. A civilian element was also included covering matters such as the transfer of heavy water data, but with very prohibitive restrictions. Data could only be shared on the basis of reciprocity. Because Britain had little to share, given the catch up phase it was now in, this clever drafting continued to ensure that little information would head east across the Atlantic once again. Excluded was anything of true military value, including important data on the delivery systems that would be needed to carry atomic weapons or information that could help the costs of the British programme.[129] While Margaret Gowing’s analysis ended in 1952, she assessed the following years in these words - **“**as for the years up to 1955, the British found that the United States attitude on atomic affairs defied rational analysis.”[130] In fact it was entirely rational in the scientific sense of the phrase – based upon a clinical

[127] Ibid.
[128] Brian Buckley, *Canada’s Early Nuclear Policy Fate, Chance and Character* (Quebec: McGill University Press, 2000).
[129] Baylis, *Anglo-American Defence Relations*, pp. 159 – 161.
[130] Gowing, *Independence and Deterrence, Vol.1*, p. 321.

assessment of America's own needs. It might, however, not be said to be reasonable, given Britain's assistance to the wartime American atomic programme.

Late 1955 saw the concept of 'massive retaliation', the foundation of 'New Look', starting to be undermined by the realisation that America's current primary nuclear weapon capability, fission with the bomber as a delivery vehicle, was a blunt tool. 'New Look' was proving to be an interim policy that had currency only while the Soviet Union was a far less powerful opponent. Then, on 22 November 1955, the Soviets tested a two stage, lithium-deuteride device which yielded 1.6 megatons. In yet another similarity of technical approach, the Soviets had also tested a layer-cake design on 6 November, just in case the more advanced method had failed. The Soviet Union was fast gaining increased equivalency with America in nuclear affairs. The result was the growth of systemic pressures. By December 1955, Dulles was reduced to making distinctions about 'capacity' and 'use' in atomic affairs.[131] The lack of justification for the use of fission weapons in Korea, Russian technical progress and British / European escalatory concerns, all meant that the existing American nuclear policy was increasingly ineffective. Something different would be required.

In March 1956, the American JCS started to upgrade their concerns over the actions of its allies on whose soil their strategic bases were located. If the interests of ally and America did not align there could be problems, the Chiefs warned.[132] With his excellent grasp of wider strategy Eisenhower always understood that, to secure the cooperation of the allies, a greater sensitivity about

[131] 'Text of Dulles speech on Tactic Soviet Now Uses', *New York Times*, December 9, 1955.
[132] Memorandum for Chairman JCS, Washington, 22 March 1956, CCS 381 (Military Strategy and Posture), RG 218, Chairman's File, Admiral Radford, 1953–1957, Modern Military Branch, National Archives, Washington D.C..

their anxieties was needed.[133] With this military move towards partnership starting to gather pace, in April 1956 the DOD sent a draft amendment to the June 1955 Agreement to the AEC permitting the transmission to Britain of nuclear submarine information. The 1955 Agreement had specifically excluded nuclear submarine propulsion from its areas of sharing.[134] They did this without advising the JCAE, which was the correct process. This is a prime example of military necessity, based on scientific progress, forcing the pace of relations. In January 1956 the American Attorney General, Herbert Brownell, ruled that the administration could legally negotiate to transmit such information to the British.[135] However, despite the fact that Eisenhower signed an Agreement with Britain on 13 June 1953 containing the relevant clause, it still had to undergo Congressional scrutiny and this occurred during July 1953.

While a considerable amount of the concerns were articulated in terms of British security failings, the underlying politics were clear – the JCAE, and indeed the wider Congress, were furious and regarded the inclusion of the clause as deception. They demanded that the existing official policy of separation from Britain be upheld and the offer removed from this 'agreement'. For whatever reason, including perhaps that a Presidential election was looming, Eisenhower and the administration hastily backed down. In a letter to Anderson on 3 August 1956, Eisenhower assured the JCAE Chairman that he was postponing implementing the agreement and referring the matter back to the various relevant parts of his government.[136] Britain was back to square one.

[133] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 443.
[134] Baylis, *Anglo-American Defence Relations,* pp. 159 – 161.
[135] Hearings before Subcommittee, Joint Committee on Atomic Energy, 85th Congress, 1958, Joint Committees of Congress: RG 128, National Archives, Washington D.C., p. 516.
[136] Ibid, p. 519.

The June 1956 initiative has been seen as another turning point, the point at which American administration policy sought to assertively pursue nuclear co-operation with Britain.[137] However the facts show that when the American wider government did not support such a move, it simply did not happen. The 1956 fiasco shows that historians need to be extremely clear when they state that 'America' held a certain policy or disposition. 'America' was in fact a governmental complex with Congress, not the Administration, at its heart in formal nuclear affairs. Science, the military, and industrial power, were also important influencing components. Something more powerful would be required to shift the centre of overall American thinking than merely Administration policy.

Such a shift was, if anything, retarded by the looming Suez crisis. This affair would confirm the view of some in America, that Britain was still acting as an imperial power. The 1956 Suez crisis has, as mentioned above by Moore, been grouped with Sandys and Sputnik to form a harmonious sounding triptych to explain why Britain and America came together in 1958. To do so is very misleading. Apart from the superficial misjudgement of focusing just on a single British politician to explain Anglo- American affairs, the three factors contributed in very different ways to transatlantic matters. In the following chapters Sandys and, especially, Sputnik will feature prominently, while it is on the Suez crisis itself that we will now focus. It is not the intention here to analyse the whole nature of the Suez crisis. Rather it is important to establish how this may, or may not, have influenced the development of Anglo-American nuclear affairs.

The Middle East had grown in prominence in British policy thinking since the Second World War and this was recognised by all British political parties. The

[137] Simpson, *The Independent Nuclear State*, p. 119.

growth of the importance of oil to the emerging economies, and also that Russia would look to make gains in the region as Britain pulled back, led Ernest Bevin in 1949 to say "in peace and in war, the Middle East is an area of cardinal importance to the UK, second only to the UK itself."[138] By 1956, Eden was merely echoing the spirit of previous British political leaders when we said that the Middle East was "of the greatest importance for the United Kingdom. We depended on it for our life."[139] One of the principal actors on the British side was the leading Conservative politician, Harold Macmillan. Some have questioned how reliable Macmillan was in any dealings with America, as would be required during the years leading up to the MDA. It has been argued that it "seems probable that Macmillan was not above manipulation of transatlantic affairs for his own ends."[140] And, in the actual Suez crisis itself, Macmillan is quoted as relaying Eisenhower's views, quite erroneously in November 1956, as being "Ike is really determined, somehow or other, to bring Nasser down", when Makins could not recall any such view being expressed by the President.[141] The nature of a key British actor in the Anglo-American MDA of 1958 was thus of someone not adverse to twisting reality when required.

In terms of the importance of the 1956 crisis itself, some historians have seen Suez as a marker in Britain's terminal decline as a Great Power.[142] Others, like Moore, and while describing it as "by far the most traumatic 'post-imperial' experience for Britain", sees an important outcome in its consequences for

[138] 'Bevin Memo', 25 August 1949, CAB 129/36, TNA.
[139] 'Prime Minister's Visit to Washington', 30 January 1956 PREM 11/1334, TNA.
[140] Richard Aldous and Sabine Lee, (eds), *Harold Macmillan and Britain's World Role* (Palgrave Macmillan, 1996), p. 26.
[141] Horne, *Macmillan*, Vol 1, p. 422.
[142] George Peden, 'Suez and Britain's Decline as a World Power', *The Historical Journal,* 55 (December, 2012), 1073 – 1096.

nuclear affairs.[143] He argues that these are twofold – that Britain would need its own deterrent and that local conflicts can lead to wider war. However the true nub of the importance of the Suez crisis to Anglo-American nuclear relations is in its reconfirmation of America's already hugely consistent policy of detachment from Britain. There had always been deep seated suspicions of Britain as an imperial rival and Suez did nothing to ameliorate these concerns. This was plain in the minds of those, such as Assistant Secretary of State Herbert Hoover and Treasury Secretary George Humphrey who dealt with Britain during Dulles' absence in hospital, who both stated publicly that they had a suspicion of Britain as an imperial power.[144]

America was ruthless in stifling Anglo-French actions against Nasser. In nuclear terms, it is the apparent flush of 'remorse and forgiveness' that broke out in 1957 after the event that is often seen as beneficial for Anglo-American nuclear relations. Botti argues, for instance, that "the real turning point in Anglo-American nuclear relations occurred ironically in late October 1956 with the falling-out of the United States and Britain over the Suez crisis and the subsequent decision by Eisenhower to use improved nuclear ties as a way to compensate the British for their deep political and international embarrassment over Suez."[145] Baylis also suggests that "Suez, which was without doubt the lowest point in Anglo-American relations in the post war period, nevertheless produced the conditions for a major surge forward in nuclear cooperation."[146]

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[143] Moore, *Royal Navy*, p. 128. In terms of the importance of Suez, Moore cites William Jackson and Lord Bramall, *The Chiefs: The Story of the United Kingdom Chiefs of Staff* (London: Brassey's, 1992), pp, 313 - 320 and Eric Grove, *Vanguard to Trident* (Naval Institute, 1987), pp. 197 - 209 as being key texts.
[144] Peden, 'Suez and Britain's Decline as a World Power', 1080.
[145] Botti, *The Long Wait*, p. 171.
[146] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 440.

However, the argument that it was technical and Cold War geopolitical developments, not any American retrospective remorse over Suez policy which was the power behind Anglo-American nuclear affairs, is supported by the British ambassador in Washington's comments at the turn of the year. He stated that American acceptance of Britain as a great power, and the possibility of exercising influence on American policy, was actually dependent on exhibiting the capability to possess a military nuclear programme with "megaton as well as kiloton weapons."[147] No mention of Suez here. Arguments for caution over the extent of any actual rift or change in policy on the part of America, even at its darkest moments, can also be discerned from Slessor's later recollection of his meeting with Eisenhower at the White House on 31 October 1956. He recalled that, while Eisenhower's attitude was "one of amazed stupefaction at the rashness of our unilateral use of force" he also vowed that "as long as he was in the White House he would see to it that the alliance came to no harm."[148] This does not suggest deep change, merely a temporary intensification of the separateness of the existing relationship. It is argued here that Suez should not be allowed to cloak the more influential changes that were occurring in the wider nuclear militarised world.

These changes would now be reflected in vigorous atomic policy debates in Britain and America and in the growth of scientific influences, exemplified by the impact of the world's first artificial satellite.

[147] Caccia Telegram to Foreign Office, 1 Jan. 1957, FO 371/126682, TNA.
[148] Slessor, Letter to the Editor of The Times, 14 June 1964, AIR 75 / 79, TNA.

The 1957 British Defence White Paper, Sputnik and the Growth of Big Science in America.

An analysis of atomic science, especially in America, can help to reveal the underlying direction of travel of geopolitical policy. Such an analysis will focus on both the impact of Sputnik and the growth of massive unified science-military-industrial programme in America. Scientists' actions, in forming a part of the new complex, created a heightened awareness of the generalised benefits of amalgamation. This then transferred into thinking in the geopolitical world. It must also be remembered that the MDA is explained by focusing on why the consistent *American* policy of separation from Britain changed, not why Britain desired a partnership, which had largely been ever present since 1941. The answer lies in the new, combinative forces, experienced first domestically and then expressed internationally, that suggested that the nuclear threat could be best ameliorated through alliances. This is different explanation to the existing historiography.

Historians have debated the degree to which American science was the lapdog of the federal government. The discussion between Kevles and Forman, referred to above, focused on whether or not the federal government had supported wider, basic research, as Kevles contended.[149] Kevles took it as agreed that science and any resultant technological progress were not either/or alternatives. He also argued that science was not just there to do the military's bidding.[150] Forman, on the other hand sees American science simply producing "just such a physics as the military funding agencies would have wished."[151] This meant they were tied

[149] See the Introduction to Part Four, p. 295.
[150] Kevles, 'Cold War', 241.
[151] Paul Forman, 'Behind Quantum Electronics, 224 Behind Quantum Electronics: National Security as Basis for Physical Research in the United States, 1940-1960', *Historical Studies in the Physical and Biological Sciences*, Vol. 18, No. 1 (1987), 224.

to the wishes of their military patrons. What is shown here – regardless of which interpretation is the most accurate – is that the two spheres were becoming closer and influencing each other. The growth of linkages between elements of the American state acted as a stimulant for policy change. New weapons forced technology and policy closer just as external systemic nuclear pressures also grew.

Oreskes has pointed out that the core nature of physics had changed to be a more practical, applied subject in America, and that the explanation "may have been that it changed from being dominantly a European activity to dominantly a North American one…. between 1930 and the 1960s."[152] Thus the transition of the leadership in nuclear affairs, set out in Part One of this thesis, was of lasting importance. The subject of physics, and specifically nuclear physics, expanded hugely because it was now critical to the Cold War. And with America being the best funded nation in that conflict, it was logical that physics flourished and evolved there faster and more prominently than in Britain.

In Britain, Harold Macmillan's premiership commenced on 10 January 1957 and is sometimes seen as another key moment in the history of post-war nuclear relations.[153] However, while the influence of key individuals is important, it is vital to situate their impact within the context of the rapidly strengthening forces of the systemic nuclear world. It is the combination of both people and structures that create agency. Ball has argued that "Macmillan was the first Prime Minister to have to deal seriously with the much more difficult problem that the technology of war was becoming too complex and too expensive for Britain to produce at an

[152] Oreskes and Krige, *Science*, pp. 21 - 22

[153] Certainly Baylis, in 'The 1958 Anglo-American Mutual Defence Agreement', 426, gives prominence to relations that flow from Macmillan's actions.

acceptable political and economic cost."[154] The new Prime Minister was urgently searching for a solution to the challenges of the new scientific and geopolitical environment.

As with previous Premiers, one of Macmillan's first acts was to look to America and in particular to his former wartime comrade, Eisenhower, for progress in solving Britain's nuclear dilemma. The President, being an Anglophile as previously noted, was positive about strengthening Anglo-American relations but not just for sentimental purposes. It was becoming clear that Britain could be a valuable ally, as the geopolitical realities of the nuclearized Cold War became clearer, although not the only one. Aldous and Lee have argued that Macmillan saw such diplomatic processes very strongly in person-to-person terms.[155] They further state that the Prime Minister was not above manipulation of emotions in order to get Britain to the front of the American queue.[156] As we have already observed, this was in line with his pre-Prime Ministerial behaviour. As an example of more conventional thinking, Botti has implied that Eisenhower's invitation to Macmillan to Bermuda, on 22 January 1957, was solely the result of the feeling that America should mend fences after its hostile actions towards Britain in the Suez crisis.[157] However it is perhaps more likely that Eisenhower was simply following America's consistent geopolitical policy. Indeed, and regarding Eisenhower's motivation to hold the Bermuda meeting, Matthew Elderfield has argued that "all sources indicate that he thought a revival in relations (with Britain)

[154] Simon Ball, 'Macmillan and British Defence Policy', in Richard Aldous and Sabine Lee, (eds), *Harold Macmillan and Britain's World Role*, (Palgrave Macmillan, 1996), pp. 67 – 96.
[155] Aldous and Lee, (eds), *Harold Macmillan and Britain's World Role*, p. 10.
[156] Ibid.
[157] Botti, *The Long Wait*, pp. 175 – 177.

was in the US's self-interests".[158] Therefore, the proposition that "no altruistic motives of 'owing' anything to Britain, seems plausible."[159]

Further evidence that this top level meeting was a part of a wider coming together of the nations in nuclear defence affairs, can be drawn from the meetings of Sandys in Washington during late January 1957, in which discussions over the locating of 'Thor' IRBMs in Britain were held. America continued to advance matters that were in their overall defence interests and the siting of such weapons in allied territory, including NATO-deployed Honest John and Corporal tactical nuclear weapons, would permit America to wage an interim level of atomic war with the Soviet Union. Until such times as Inter Continental Ballistic Missiles (ICBMs) became viable, this supported the scenario that an escalated conflict could be deflected into a regional level affair, leaving the American mainland unscathed.[160] Ructions such as Suez would not be allowed to get in the way of such key developments. The Eisenhower / Macmillan first meeting needs to be placed in the context of the continuing, and worldwide, changes in geopolitical atomic reality driven by technical and scientific progress in nuclear weaponry. This acted to bring Britain and America closer. America offered 60 missiles to Sandys in January 1957, effectively under dual control as the missiles would be manned by British servicemen but the warheads would remain under American supervision. Such shared defence elements would be a key driver of the MDA.

The summit was dominated by the Eisenhower but "his extensive efforts to revive 'specialness' in personal and public relations was a selfish exercise."[161] Once

[158] Matthew Elderfield, 'Rebuilding the Special Relationship: The 1957 Bermuda Talks', *Cambridge Review of International Affairs*, 3.1, (1989), 24.
[159] Ibid.
[160] Michael Armacost, *The Politics of Weapons Innovation: Thor-Jupiter Controversy* (New York: Columbia University Press, 1969), pp.183 - 185.
[161] Elderfield, 'Rebuilding the Special Relationship', 24.

again an American President was following a consistent policy of keeping Britain close while actually giving it very little. Macmillan, like Churchill and Attlee before him, may have felt that he left with pledges of 'interdependence' ringing in his ears, but this was a chimera created by an American politician who understood well what Britain wanted to hear. Indeed, one might ask which politician was pulling the heart strings of the other most effectively here. Beyond the discussions over a deployment of missiles that met American goals, nothing of substance, once again, changed. Some, like Botti, might believe that "the Bermuda conference amounted to a great stride in the direction of Anglo-American nuclear partnership." [162] But in practice the IRBM deployment had already been agreed and the RAF/SAC liaison was minimal in scale. Hence the actual communique itself was guarded once more.[163] Bermuda reflected the growing American perception that allied interactions could now be increasingly beneficial to America as the systemic nuclear threat grew. As yet, it was sure what it wanted from them beyond being a base for its missiles.

Anglo-American nuclear relations always need to be situated within wider geopolitical developments across the world, and not in an exclusively bilateral fashion as might be suggested by the studies of Anglo-American 'summits'. For instance, 1957 continued to see America hold debates about nuclear deployments in the Far East. Dulles was aware of what he called the "peculiarities of the Japanese picture".[164] This followed the awkward debate in the Japanese Diet in February 1957 during which Prime Minister Kishi mentioned the Allison-

[162] Botti, *The Long Wait*, p. 180.
[163] Dwight D. Eisenhower: "Joint Statement With Prime Minister Macmillan Following the Bermuda Conference.," March 24, 1957. Put online by Gerhard Peters and John T. Woolley, *The American Presidency Project*, accessed at http://www.presidency.ucsb.edu/ws/?pid=11002.
[164] Memorandum of conversation, February 4, 1957, '21.52 Country File: Japan Weapons 1957-1961', box 425, Country Files, SASAE, RG 59, National Archives, Maryland.

Shigemitsu Agreement of May 1955, thus looking to reconfirm Japanese neutrality and absence of nuclear weapons.[165] Kishi soon after made a statement that had very strong echoes of British concerns across the 1950s, that a location (Japan in this case, but equally East Anglia to Britain) would be "indefensible" in any nuclear conflict.[166] Such similarities of response were driven by worldwide threats that affected all countries within the greatly expanding compass of nuclear weapons systems. This was regardless of whether their role was as a passive ally or active partner of America.

Debates over locating 'Honest John' battlefield weapons in Korea were also restarted in early 1957 but were again dismissed, not only this time because of concerns over Asiatic public opinion, but also because there was no intelligence that China was starting to deploy nuclear-capable weaponry in theatre.[167] This was an additional sophistication in late 1950s nuclear strategic debates. As the range of nuclear foes increased, so varying factors such as relative nuclear threat had to be set against earlier worries over local opinion. Finally, America made another nuclear-capable deployment in the Far East when it sent 'Matador' surface-to-surface missiles, armed with the W5 nuclear warhead, an improved version of the Fat Man design, to Taiwan.[168] The nuclear world was growing further and so would the pressures.

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[165] For details on this Agreement, see http://oldsite.nautilus.org/archives/library/security/foia/StateOIR57.html.

[166] Department Office of Intelligence Research, Report No. 7466, April 22, 1957, '21.52 Country File: Japan Intelligence Reports 1957', box 424, Country Files, SASAE, RG 59, National Archives, Washington D.C..

[167] See the initial Pentagon plan – 'Evaluation of Alternative Military programs for Korea', January 14, 1957, *FRUS*, 1955-1957, Korea, Volume XXIII, Part 2, p. 380; and also, 'Comments on 311st meeting of NSC', January 31, 1957, *FRUS*, ibid, pp. 395, 400 and 408 which shows how intelligence evidence of opposition nuclear activity was now an important consideration. China did not in fact successfully test a nuclear device until 16 October 1964.

[168] Jones, *After Hiroshima*, pp. 333 – 334.

In Britain, the 1957 Defence White Paper has, in common with the GSP of 1952, been seen as a point of change in British nuclear affairs.[169] In Part Three, the GSP was argued as simply being an expression of contemporary thinking on nuclear military strategy, one that was part of a process and not radical. So it was with the 1957 White Paper.[170] The White Paper was published on 4 April, 1957.[171] Sandys himself assessed his own work when he told the House of Commons that "some say the policy in the White Paper is revolutionary; others say there is nothing new about it. Both are perfectly correct…what is new is about the White paper is not the ideas that it contains, but the decision that the Government has taken that the time is now right and safe to base decisions upon it."[172]

The *Daily Express* hailed it as a significant change in which the scientist now dominated the soldier, and the *Daily Mail* assessed it as being a great paper of State, while the *Spectator* simply said that Sandys could see what was actually going on.[173] On the outside of government, former senior military figures, like Slessor, stated "the British White Paper on Defence had been described as a momentous shift in policy, a radical change in strategic concept, an "agonising reappraisal"…..so perhaps the first thing that we should say is that it is no such thing".[174] Jones has argued that in fact the most innovative part of the White Paper was that it represented the start of the establishment of the Ministry of

[169] For an assessment of the 1957 Defence White Paper see Martin Navias, *Nuclear Weapons and British Strategic Planning, 1955 – 1958* (Oxford: Clarendon Press, 1991), chapter 5.
[170] Baylis, *Ambiguity and Deterrence*, p. 245.
[171] Defence: Outline of Future Policy, 4 April, 1957, DSND, 6 / 52, CCA.
[172] Hansard HC vol. 568, col 1758, 16 April 1957.
[173] 'The New Men of Power', *Daily Express*, 5 April, 1957, 'Defence Revolution', *Daily Mail*, 5 April, 1957 and 'Glimpse of the Obvious', *The Spectator*, 12 April, 1957.
[174] Sir John Slessor, 'British Defence Policy – Some Personal British Reflections on the Defence White Paper, 1957', dated 1 May 1957 (original typed version in his papers), AIR 75 / 58, TNA.

Defence's dominance of the future outline of defence matters. The Chiefs of Staff would eventually assume an operational, rather than formulatory, role in policy.[175]

In terms of the details of the White Paper itself, Moore has argued that it was the high water mark of 'massive retaliation' in Britain and marked the end of the concept of 1950s broke-back warfare.[176] It was perhaps again in the House of Commons that Sandys put his finger on the key element that the White Paper was trying to address – how to defend Britain in the light of the realities of an increasingly linked nuclear world. And in achieving that goal, to what extent might it be sensible to rely on America? It might be fine now while they had assets in Britain, he argued, but how might this change when "they have developed the 5,000 miles inter-continental ballistic rocket?"[177] This concern was to be heightened later that same year with an artificial satellite's first flight.

The continued relative unimportance of Britain's needs to America can be deduced from their lack of appearance in domestic discussions in early and mid-1957. These mainly featured battles between the old adversaries in nuclear interpretation, the DOD and JCS on the one hand, and the State Department on the other. The former were typically looking to use the annual NSC review process to gain a greater degree of discretion, i.e. delegated authority, in the actual use of weapons and as a matter of course in any conflict. Eisenhower seemed to support the attainment of such clarity.[178] This was directly linked to the geopolitical challenge of the growth of Soviet nuclear power. One of the implications of this changing balance of power was American military concerns

[175] Jones, *Official History*, p. 45.
[176] Moore, *Royal Navy*, p. 129.
[177] Hansard Vol 568, 16 April 1957 quoted in Clark, *Nuclear Diplomacy and the Special Relationship*, p. 15.
[178] Memorandum of discussion at 319th meeting NSC, April 11, *FRUS,* 1955-1957, National Security Policy, Volume XIX, p. 472.

that it could make American tactical threats less believable without conventional forces as an alternative capability. This was because the Soviet Union might take the view that America would not risk escalation over smaller conflicts and thus it might actually be tempted to undertake more such interventions.[179] The resultant NSC policy document has been described as “the apogee of the New Look”.[180]

By the end of the year, the implications of the wider linked world, swept to the forefront of mind by Sputnik’s intervention in early October 1957, would change the tenor of the debate. In the meantime, the American discussions focused on the wording proposed by the DOD in NSC 5707/7, which looked to replace the 1956 NSC 5602/1 by inserting specific references to nuclear weaponry being used, rather than the more generalised term ‘force’, when countering aggression. The American State department had multiple concerns about this change. Firstly they were worried about a move to solely military conditions being the arbiter of nuclear use. They believed that the new language would permit nuclear use at any level of conflict. Also, and with relevance from an allied needs perspective, they were concerned that the military were too keen to transfer nuclear warheads to allies.[181] At the 27 May 1957 NSC, Dulles was still fighting the corner that American internal politics still needed to be in control of nuclear decision making. America was not yet convinced, even in mid-1957, of the need of true governmental nuclear patronships.

[179] Campbell Craig, *Destroying the Village: Eisenhower and Thermonuclear War* (Columbia University Press, 1998), pp. 64 - 65 and Jones, *After Hiroshima*, p. 337.
[180] Byron Fairchild and Walter Poole, *The Joint Chiefs Staff and National Policy, 1957 - 1960*, VII (Washington, D.C., 2000), pp. 16 - 17.
[181] Bowie to Dulles, May 23, 1957, ‘NSC 5707/1 Basic National security Policy’ folder, box 60, Subject Files Relating to National security Policy, 1950-1957, records of the PPS, 1957-1961, RG 59, National Archives, Washington D.C..

The final version of NSC 5707/8 of June 1957 was another masterpiece of compromise.[182] America was to rely on atomic weapons, but not exclusively; she was to consider atomic weapons as conventional, but only from a military point of view; and atomic weapons were only to be used to achieve national, not military, objectives. However it was still a step on the road to establishing that a full range of nuclear capabilities both existed and could be used at an appropriate time. How this new 'fudge' was meant to deliver the significant savings that 'New Look' originally proposed is hard to discern. The major conclusion of this difficult period of intra-administration tussles was that nuclear strategy had to be the responsibility of all sections of the government. It was too broad in its impacts to be left solely to either diplomat or soldier. This reflects the growing linkages of science and the state - a process of nuclear domestic maturation and association was under way in America. This paralleled Britain's growing technical development.

As Jones confirms, the NSC 5707/7 discussions were thus a catalyst for the State Department and the DOD to start cooperating more closely and permanently in nuclear military policy matters.[183] Part of the justification, given by State department officials at the time, was the increasing destructiveness of the new fusion weapon. The implications of weapons technology was starting to affect and re-align internal rivalries within American government and its military-industrial complex. It was argued that the new weapons had made war planning no longer a technical matter that could be handled solely by military figures. The new, more interconnected nuclear world was being recognised, even before the

[182] NSC 5707/8, June 3, 1957, *FRUS*, 1955-1957, National Security Policy XIX, p. 120.
[183] Jones, *After Hiroshim*a, p. 342.

impact of Sputnik.[184] This is not an argument highlighted in the existing historiography. At the next NSC meeting on 25 July 1957, in a move that was both political and also reflective of the merging of nuclear considerations, Eisenhower approved the formal bringing together of the Secretaries of Defence and State to consider implications of the proposed military programme for 1959 while it was still being planned.[185] This was a key step in the American recognition of the benefits of combined thinking.

Following this, and as a result of what State department planning called the "magnitude of destructiveness" of the new weapons and that the effects went beyond "the numbers killed", there were now calls to control, but nevertheless approve, deployment of nuclear capability to allies.[186] This was something that the State department had formally opposed completely, while the military had been in favour. In June 1957 elements within the State department also started agreeing that nuclear weaponry might need to be shared or deployed, but to Korea not Britain at this time.[187] In a methodology that prefigured the MDA, this was to be the delivery systems only, not the warheads. While this did not become official American policy immediately, it is a sign that an internal consensus around the usefulness of alliances was slowly emerging. This was a result of nuclear systemic pressure and would generate the conditions for the Anglo-American MDA of 1958.

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[184] As evidence for this coalescing of nuclear responsibility, see: Smith Memorandum for Dulles, 'The Need for Additional Non-Military Planning in Planning for the Employment of Nuclear Weapons', June 3,1957, and the tactics to achieve it in: Herter memorandum for Bowie, June 12, 1957, 'Atomic Energy – Armaments' both in box 125, records of the PPS, 1957-1961, RG 59, National Archive, Washington D.C.

[185] Memorandum of discussion of 332rd meeting of NSC, July 25, 1957, *FRUS*, 1955-1957, National Security Policy XIX, p. 561.

[186] Bowie to Herter, 'Politico-Military Cooperation', August 3, 1957, box 125, records of the PPS, 1957-1961, RG 59, National Archive, Washington D.C..

[187] Jones, *After Hiroshima*, p. 345.

Anglo-American nuclear relations would also be improved by the British fusion weapon tests being held at Christmas and Malden islands in the remotest Pacific. These tests lasted between May 1957 and August 1958 and would have significance for the generation of scientific homeostasis between Britain and America's nuclear capabilities. The first British 'Grapple' test was in fact a failure as the fusion design did not work. Regardless of this specific outcome, Sandys, for one, was highly relieved at the apparent progress made and wrote to Penney to congratulate him.[188] The test may also have influenced Macmillan's view on the 'independence v interdependence' debate in Britain. At the 31 July 1957 Defence Committee meeting, Macmillan now framed the stance that Britain would adopt in nuclear systems from this point on when he said that "our objective should be to remain a nuclear power and for that purpose we should have within our control sufficient nuclear weapons and their means of delivery to *constitute* an independent deterrent (my italics)."[189] This careful phraseology was the basis of the formula of the MDA – to have enough weaponry to claim a nuclear role, while acknowledging that Britain would not own all the pieces. It is a statement that has endured until the present day.

The urgent need for such an Anglo-American accommodation can also be deduced from the small scale nature of the British nuclear programme. This is reflected in an undated Memorandum by Duncan Sandys, the new Minister of Defence, with date of 24 July 1957 manually crossed out, which contained the preliminary estimates of Service spending 'in line with the Defence White Paper'. Under reference D. (57) 13, fissile material and weapons spending only started to be shown in the FY breakdown for 1958/59 and as being £15m, then rising to

[188] Sandys to Penny, 16 May 1957, DSND / 6 / 1, CCA - "I never had any doubts about your arithmetic; but nevertheless it is a relief to know that it has in fact gone off alright!".
[189] CAB 131 / 18 D. (57) 6th Meeting, 31 July, 1957, TNA.

only £33m by 1962/63.[190] Against the sums spent on 'Manhattan' alone by America, the British programme was not well resourced and thus had to be limited in its ambitions. It did, however, have the advantages of its early conceptualisation under MAUD, and its excellent science base on which to draw.

Dulles attended the NSC on 21 June 1957, and again on 8 August, but it was the military who finally won over the President. A majority on that body made the decision that nuclear weapons were to be deployed to Korea in December 1957.[191] This was further enhanced by the deployment of nuclear warheads in that country, something even beyond the level of the Anglo-American MDA. And, after an agreement of 17 January 1958, additional 'Matador' missiles were also to be shipped east.[192] While the nuclear development of a state like Korea was clearly immensely different to that of Britain, it is important to incorporate the worldwide development of military nuclear strategy in the latter 1950s, if a successful and fully contextualised assessment of the causation of the Anglo-American Mutual Defence Agreement of 1958 is to be made. It was not exclusively a trans-Atlantic affair: it was part of the wider pressures of the nuclear systems of the world.

In August 1957, worldwide socialisation was further strengthened by the Soviet R-7 missile test. This was a powerful delivery system capable of delivering nuclear warheads over long distances.[193] It was completed three years earlier than Sandys had predicted back in 1953. In some respects it is true to argue that the subsequent flight of Sputnik 1 simply made this military-inspired technological

[190] "Minister's Running Folder for July 1957", Undated, DSND / 6 / 3, CCA.
[191] Memorandum of discussion of 334th meeting of NSC, August 8, 1957, *FRUS*, 1955-1957, Korea, Volume XXIII, Part 2, pp. 480 - 489.
[192] Robertson to Sprague, January 8, 1958 and Sprague to Robertson, January 21, 1958, *FRUS*, 1958-1960, Japan, Korea, XVIII, p. 424 and p. 431.
[193] Boris Chertock, *Rockets and People Vol II* (CreateSpace, 2006), p. 347.

leap by the Soviets visible to the wider public when it flew over America on 4 October 1957. It certainly also made it very plain that the world had just shrunk in the face of nuclear military development. The socialised world was now more joined up than ever as a result of this technical advance. It was the case that such new geopolitical realities would re-draw boundaries. 'East' and 'West' became more important than 'Britain and America' in nuclear military terms. The social constitution of space was being changed in a way that also reflected the new realities of pressure. The same pressures would result in the MDA.

While the public impact of the new technology may have been significant, the reactions of governments to Sputnik varied. In Britain, the Cabinet heard from Selwyn Lloyd that it should be seen as essentially a military propaganda exercise and that the implications should be ignored in public.[194] In America, as Botti states, prior to Sputnik missile and defence deployments were not seen as a homeland threat by America.[195] That had to change as "suddenly, the Soviets appeared to be the ones with the superior technology."[196] At the political level, as Gilpin has pointed out in terms of the American response "in the end….following pressures from the Secretaries of the Treasury and of State, the President decided against major innovations in American military policy. The President did not believe the American people would support the needed acceleration in defense spending."[197] So if financial avenues for responsive action were closed, what other areas might be available to a President under pressure to react? The answer was Eisenhower's core skill – the formation of alliances.

[194] CAB 128/31 CC. (57) 72, 8 October, 1957, TNA.
[195] Botti, *The Long Wait*, p. 196.
[196] Ibid, p. 200.
[197] Gilpin, *American Scientists*, p. 172.

Audra Wolfe has seen one of the principal effects of Sputnik to be in the world of science. She states that "it would take the launch of a Soviet satellite to expand funding for science into areas that might bring international prestige as well as military dominance."[198] This is support for the view that 1957 witnessed accelerated change within science and society inside America. Wolfe goes on to describe the nature of post-war American science as "hybrid military-civilian" and "on the eve of Sputnik the United States lacked anything resembling a coordinated science policy….despite the federal government spending over $5bn on R and D in 1957.[199] She then argues that after this decade of uncoordinated growth, Sputnik kicked American science into a more organised, national level debate and policy.[200]

This more integrated and planned organisation of American scientific defence structures was characterised, by Alvin Weinberg, Director of the Oak Ridge National Laboratory in 1961, as "big science".[201] This was the move to huge, instrumentalist orientated research facilities with large budgets and corporate linked structure. Wolfe also agrees that "American science had become big science" by the late 1950s.[202] Consequently there were fears about inadequate scientific manpower resources. With this need in mind, the passing of the National Defense Education Bill in 1958 demonstrated the new importance and centrality of science in American governmental thinking.[203] As science created a momentum around sharing across America's defence and social structures, technical sharing with Britain became a more feasible proposition. It became

[198] Wolfe, *Competing with the Soviets*, pp. 38 - 39.
[199] Ibid, p. 49.
[200] Ibid, p. 33.
[201] Ibid, pp. 40 - 41.
[202] Ibid, p. 30.
[203] Ibid, p. 47.

rational. Indeed, and building on her theme that science was now indicating that something was changing in America, Wolfe points out that, after Sputnik, "what changed in 1958 was the willingness of policy makers to take their (scientists) advice."[204] When this is added to the greater control being exerted over military-science structures by government policy, it speaks of a climate of greater interactivity that would soon be extended to foreign atomic arrangements. Additionally, and as external relations and the battle for hearts and minds became ever more dependent on science, scientific achievement became a central arena in which the battle for supremacy in the Cold War was played out.[205] Externally, therefore, creating alliances with technically advanced nations would also help boost the perceived success of the American way of life in its Cold War worldwide struggle with Communism. Such a reformulation would soon extend to America revisiting its relationship with Britain.

It was against this background of an opening of American minds to the benefits, indeed the necessity, of changing external relationships, that Macmillan wrote to Eisenhower on 10 October 1957. He suggested that Britain and America now pool their efforts in the face of Soviet progress especially in the nuclear field, which the British Prime Minister described as being "the most important problem of our time" in his very prompt communication.[206] Eisenhower's reply, sent just the next day, was still non-committal in nature. No reference to nuclear arms was contained in what might fairly be described as a 'hold off' letter.[207] Indeed views on relationships with allies within the wider American government still remained

[204] Ibid, p. 49.
[205] Ibid, p. 54.
[206] Letter From Prime Minister Macmillan to President Eisenhower, London, October 10, 1957, *FRUS*, 1955–1957, Western Europe and Canada, Volume XXVII, pp. 785 – 786.
[207] Letter from President Eisenhower to Prime Minister Macmillan Washington, October 11, ibid, pp. 1957 and 787.

disparate. Thus while Dulles might suggest internally that the President was ready to go 'pretty far' is seeking a new nuclear deal with Britain, they were still not yet ready to confront the all-powerful JCAE.[208]

The political climate was nonetheless starting to change. From the British angle, and as early as 8 October, Sandys could detect a movement in American thinking. In a memorandum to Sir Richard Powell, the Permanent Secretary to the Ministry of Defence, Sandys forwarded a copy of telegram 2017 from the British Ambassador in Washington with news about the impact of Sputnik. In point 2, Sandys stated "the launching of the Soviet satellite has produced a powerful psychological shock in America; and this is bound to cast doubts in their minds about the wisdom of continuing to refuse co-operation with us in the nuclear field."[209] He asked for views on the Ambassador's suggestion, with which Sandys agreed, that now is "a propitious moment to at least get a partial relaxation of the present restrictions."[210]

Elements in the wider American diplomatic corps were also noticing the start of this re-alignment. Livingston Merchant, the American ambassador to Canada, wrote to the State department, on 19 October 1957, pointing out the fortuitous combination of events that left Macmillan in a good position. However he also cautioned that "the British are asking a great deal of us. I think that we should seek what is of value for us and in their power to give", again a very typical long term American posture of take, not give.[211] Despite this, the Ambassador

[208] Dulles to Merchant, October 17, 1957, the Papers of John Foster Dulles and Christian A Herter, 1953-1961, Reel 6, p.772, King's College, London (hereafter KCL).
[209] 'Minister's Running Folder for October 1957', 8 October 1957, DSND / 6 / 6, CCA.
[210] Ibid.
[211] Memorandum From the Ambassador to Canada (Merchant) to the Secretary of State, Washington, October 19, 1957, *FRUS*, 1955–1957, Western Europe and Canada, Volume XXVII, p. 795.

recommended that a closer relationship should be followed, but only because it was in America's interests as "they (the British) have more to contribute to our own survival than any other nation."[212] No talk of a 'special relationship' here, merely hard headed realism and a recognition that external threats and maturity of development were, inextricably, drawing the powers together. Interestingly this also shows prioritisation in American thinking and perhaps gives a clue as to why, when the MDA was signed, but only with one country, that country was Britain.

Sputnik thus speaks to the growing integration of the military nuclear world. It made the world feel smaller and communities feel closer. Vulnerabilities and concerns were heightened. It was this, rather than contemporary concerns about 'missile gaps', that drove change and the coming together of Britain and America in 1958.[213] Such concerns over such a 'missile gap' were fuelled to a large degree, at least in the public's mind after it was leaked, by the Gaither Report which had been commissioned by Eisenhower into American vulnerabilities, and which reported on 7 November 1957.[214] Fairly doom laden in tone, the Report made comments that Soviet military expenditure would be double that of America's within a decade, that it had enough fissile material for 1500 weapons and that its ICBM rocket programme was significantly ahead of America's. It also highlighted SAC's vulnerability.[215] This was scary stuff, although Eisenhower's reaction, indifference or quiet absorption, have been debated by scholars.[216] It did contribute to the change in the climate of the time, one in which nuclear

[212] Ibid.
[213] For a discussion on 'missile gaps', see Peter Roman, *Eisenhower and the Missile Gap* (Ithaca, 1995).
[214] See especially pages 4 and 5 of the Report. Accessed at https:/ /nsarchive2. gwu.edu//NSAEBB/NSAEBB139/nitze02.pdf.
[215] Ibid.
[216] For the debate see McGeorge Bundy, *Danger and Survival* (Random House, 1998), pp. 334 - 342 as opposed to David Snead*, Gather Committee, Eisenhower and the Cold War* (Columbus OH, 1999), pp. 154 – 158.

sufficiency made a rethink of nuclear strategy, away from the now out of date 'massive retaliation', imperative. Reports like these all added to the sense that something had to change in America's nuclear policy.[217]

When Macmillan arrived in Washington for a hastily arranged conference with the President on October 23, 1957, the British Prime Minister immediately sensed that "American confidence and "cocksuredness" had been shaken by Sputnik."[218] While the atmosphere may have shifted, the domestic politics were yet to catch up. It was still the case, for instance, that the Administration had no wish to "actually turn over nuclear weapons" to Britain or indeed any other power.[219] In assessing the impact of this meeting, it should first be noted that the rhetoric and language were certainly used in a way that indicated greater partnership. For instance, Eisenhower said that the McMahon Act had been a deplorable incident in American history. 'Declarations of Common Purpose' were also produced. The latter smacks of the wartime literature of the Quebec and Hyde Park Agreements with its promises of generalised 'close and fruitful cooperation' which had been, and now were being again, dangled in front of a British Premier but with little of substance to support them.[220]

The actual meetings themselves simply agreed to hold further talks later in the year. Committees were also established. The first, under Powell, looked at weapons systems (including missiles), and the second, under Plowden and Strauss, focused on wider information exchanges. This was not the immediate

[217] See Richard Aliano, *American Defense policy from Eisenhower to Kennedy: The Politics of Changing Military Requirements, 1957-1961* (Athens GA, 1975), p. 54 for a view on how these forces were combining at the juncture, and also Memorandum of Discussion at the 347th Meeting of the National Security Council, Washington, December 5, 1957, *FRUS*, 1955–1957, Regulation of Armaments; Atomic Energy, Volume XX.
[218] Botti, *The Long Wait*, p. 201.
[219] Dulles to Johnson, October 23, 1957, the Papers of John Foster Dulles and Christian A Herter, 1953-1961, Reel 6, pp. 681 – 683, KCL.
[220] Macmillan, *Riding the Storm*, pp. 320 - 323 and Botti, *The Long Wait*, p. 201.

and meaningful connection of two states anxious to resolve an imminent threat after Sputnik. It was a measured response. Dulles summed up the sense when he described the solution to the increasing systemic pressures of the nuclear world as "we must solve these questions, not by creating a supranational organization, but through a consultative process which will permit a high degree of coordination…… all that we believe in can be destroyed if our present system of "separateness" continues"[221] This was describing the requirement for change and the future state which the MDA would effectively solve less than a year later. This move towards alliance, expressed by Dulles on the part of America, is not prominent in the existing historiography.

The Administration eventually decided, as it had done ever since Eisenhower started to look actively at Anglo-American nuclear relations, not to insist on anything that the JCAE would not like.[222] This did not stop Macmillan trumpeting a new doctrine of 'interdependency' when he reported back to the House of Commons on 5 November 1957.[223] However the President had promised no such thing.[224] The underlying process of systemic change would continue at its own pace. This key process, the force that would clear the blockages in Congress towards partnership with relevant allies, was based on the development of nuclear military strategy which continued to accelerate in the latter part of 1957. It is important to note that forthcoming political changes were the product of the technical, scientific and military developments of the previous dozen years. But Carl Durham, the new chairman of the JCAE, could tell now Strauss in December

[221] *FRUS*, 1955–1957, Western Europe and Canada, Volume XXVII, Memorandum of a Conversation, White House, Washington, October 24, 1957, 10:30 a.m., pp. 818 – 820.
[222] Dulles to Quarles, October 25, 1957 and Dulles to Straus, October 25, 1957, the Papers of John Foster Dulles and Christian A Herter, 1953-1961, Reel 6, pp. 674 – 675, KCL.
[223] Macmillan, 5 November 1957, House of Commons, 577, 5th series, p. 37.
[224] Botti, *The Long Wait*, p. 203.

1957 that the wider Congress, and potentially therefore the JCAE, was at last becoming receptive to the implications of the logic of nuclear strategic change.[225]

In terms of such acceleration of events toward Anglo-American cooperation, events in the Pacific, this time as a result of successful British activity, would provide further momentum. The 8 November 1957 'Grapple X' test was a true fusion based weapon, albeit with excessive quantities of enriched uranium being required. This British fusion design was improved in the 'Grapple Y' tests in April 1958, in which the accuracy of the predicted megaton yields demonstrated Britain's accurate grasp of the science involved. Finally 'Grapple Z', using lighter warheads in August and September 1958, rounded off Britain's rise to that of potential nuclear technical partner with America. Britain then ceased atmospheric nuclear testing. Thus it was 'Grapple X' which formed an important key to understanding the 1958 MDA. In fact, as a result of the success of its Pacific nuclear tests, Britain was stronger and more mature in terms of defensive power by the end of 1957, not less, as some who focus on Suez as a determinant of British decline might surmise. Its global reputation and conventional strength may have been seen to erode in the Middle East a year before but, in terms of what really mattered for the defence of Britain in the decades to come, the last months of 1957 were an important step forward. 'Grapple X' had yielded 1.8 megatons and American military and scientists could plainly now see that Britain's nuclear capability was equalising, if not in scale, then at least in nature with America.

It was not a case, as some such as Baylis have expressed it, that simply now "Britain had something to offer" as such; it was that the wider nuclear world was driving realisations to all that new geopolitical arrangements would soon be

[225] Strauss to Dulles, December 10, 1957, the Papers of John Foster Dulles and Christian A Herter, 1953-1961, Reel 7, p. 34, KCL.

required to manage this expanding capability.[226] Indeed this process, this expression of equalisation, resulted immediately in Anglo-American technical talks on 23–24 November and 3–5 December 1957 with progress being made on a wide range of issues. American scientists were now more willing to exchange information on nuclear materials, anti-submarine detection, nuclear warheads, delivery systems, military propulsion and power reactors, defence against ballistic missiles, as well as chemical and radiological warfare, infrared research and thermionic valve research.[227]

This was positive, but it was still short of the agreement required by Congress to actually make significant, governmental and lasting change happen. Additionally, there is evidence that Britain itself was not completely sure what it wanted from a partnership, even at this point. It seems that what would constitute effective closer partnership was still uncertain in the minds of those like Sandys, who now started to contemplate renewed discussions. In a communication on 1 November 1957 to Powell, the Defence Minister still felt it necessary to state that "the first step, before getting down to details with the Americans, is to get clear in our own minds just what it is we should like to secure from this new and closer co-operations."[228]

Clarity on what that arrangement would look like would be provided by the events of 1958. The years up to 1957 had seen the development of the nuclear military world. It had seen America take a lead and then other nations catch up. It had seen the resultant new level of fusion and delivery system capability threaten

[226] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 434.
[227] Telegram by Powell to Hood, Nov. 11, 1957, PRO, PREM 11/2554, TNA; Telegram by Hood to Powell, 15 Nov. 1957, PRO, PREM 11/2554, TNA; Memorandum for the Files by Spiegel, 2 Dec. 1957, Dept. of State, S/AE File (microfiche), frame 20 quoted in Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 456; Melissen, *Struggle for Nuclear Partnership*, p. 45.
[228] 'Minister's Running Folder for November 1957', 1 November, 1957, DSND / 6 / 7, CCA.

even America itself as the nuclear social world matured. It had also witnessed, most recently through the ‘Grapple’ tests, the acceleration of the process of technical development in Britain which paralleled the growth of ‘Big Science’ in America. Britain could now speak the language of militarised fusion on an equal footing with its former wartime ally. It was now time to establish a political and military arrangement that would address the consequences of these new realities.

American Policy, Systemic Pressures and the 1958 MDA

Events such as Sputnik, the development of the science-military complex in America and the British fusion test series all had an equalising effect on the nuclear relations of Britain and America. They built upon the broadening and deepening of nuclear military affairs that was occurring across the world in the later 1950s. This maturing and equalising of military affairs raised systemic pressures and reshaped the geopolitical process. As Rotter has argued, at this time an alliance system emerged which was a reaction to the new "international system that threatened to dissolve the bonds of nationhood."[229] Nuclear military strategy was now central because "scientific curiosity promoted the pursuit; national pride predicted it; the desire for control of one's own security gave it logic and urgency."[230] Rotter also argues, in line with the globalised view of this thesis, that a similar path was subsequently followed by many nations including India, Israel and South Africa. They had differing levels of success but it was the same nuclear prize - apparent protection in a more integrated and threatening world - that they sought. This suggests that we should see the emerging Anglo-American nuclear partnership not as singular to those particular nations, or even because they had won a conventional war together years earlier, but unique to its nature as a solution and as a response to the changing world.

Momentum towards this change in Anglo-American relations was continued by the reports from the groups, led by Plowden and Powell and set up after the Washington conference, which were delivered to their respective heads of government in December 1957.[231] The positive signals contained in these

[229] Rotter, *Hiroshima*, p. 270.
[230] Ibid.
[231] Strauss to Eisenhower, December 19, 1957, AWF, Administration series, Box 4, folder AEC 1957(1), enclosure: Interim Report to the President and the Prime Minister from Strauss, Quarles,

reports, concerning the benefits of nuclear cooperation, persuaded Eisenhower and the American administration that the 1954 Atomic Energy Act must be amended, despite this meaning that Congress finally had to be brought onside.[232]

Eisenhower himself, in his reaction to colleagues, showed that he was in favour of striking a specific arrangement with Britain, but in a controlled fashion.[233] In a memorandum to Dulles on 3 January 1958, the President said that "I think we should look at this very carefully and for my part I should like to see us get a law that would permit the British to have access to whatever weapons information that was necessary (a possible exception would be to give them certain weapons on the theory that these would substitute for any required information)."[234] Consequently, on 27 January, Strauss sent a letter to the Chairman of the JCAE that outlined the Administration's intended changes to the 1954 Act. The wording was vague, no doubt deliberately so, including the use of the phrase 'atomic weapon' to cover the area over which the Administration now wished to the power to exchange information. As so defined, it would cover both fission and fusion weapons.

Matters were simultaneously moving towards improved defence linkages on other levels. On 31 January 1958 Sandys wrote to Defense Secretary McElroy thanking him in profuse terms for 'lending Admiral Rickover' to Britain to give advice on nuclear submarine programmes.[235] Whatever the actual value, such 'sharing' is indicative of the start of the permanent softening of the boundaries of

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Plowden and Powell quoted in Baylis and Stoddard, *The British Nuclear Experience*, pp, 85 – 87; Washington telegram No 2578 to Foreign Office, 6 December 1957, PREM 11/2554, TNA.

[232] Baylis, 'Exchanging Nuclear Secrets', 55.

[233] Memorandum From President Eisenhower to Secretary of State Dulles January 3, 1958 – Memorandum on Letter of Prime Minister Macmillan dated 1/2/58, *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2.

[234] Ibid, Point F.

[235] Sandys to McElroy, 31 January 1958, 'Minister's Running Folder for January 1958', DSND 4 / 6 / 9, CCA.

the Anglo-American nuclear systems. Sandys showed here that emerging submarine warfare contacts were important and valued as part of the growing move towards a formal transatlantic atomic military partnership.

As Jones states, American enthusiasm was not exclusively directed at closer ties with a single country like Britain but, as has been the case before, with its wider network of alliances, including through NATO.[236] Once again it is vital to contextualise Anglo-American nuclear affairs within both American domestic affairs and its worldwide policy. Thus the requested legislative change was not just to affect Britain, but also Canada, Australia and NATO.[237] The new proposed Section 144 would now give the President the power to assist allies to design these 'atomic weapons' themselves. This created the potential for America to effectively guide a partner in the design, development and production of a nuclear bomb. Strauss' proposal was perhaps just an opening gambit, but nonetheless it was a recognition that America could gain benefit for itself by helping nuclear partners. Compared to America's past policy of complete nuclear separation, events were moving rapidly now and in the direction of alliance. In a covering letter, but crucially not in the legislation, Strauss stated that this was intended for power(s) who had made "substantial progress in the development of nuclear weapons."[238] This would be a key phrase across the debates on the 1958 Atomic Energy Act in terms of why an individual treaty on nuclear defence partnership was signed at that time with only one of the above potential partners: Britain.

[236] Jones, *Official History*, p. 101.
[237] Hearings before Subcommittee on Agreements for Cooperation, JCAE, 'Amending the Atomic Energy Act of 1954 – Exchange of Military Information and Materials with Allies', 85th Congress, 2d session, 85th Congress, 1958, Joint Committees of Congress: RG 128, National Archives, Washington D.C..
[238] Ibid.

The proposed amendments also included the ability to sell or loan, to other nations, non-nuclear components of 'atomic weapons' and also make contractual commitments to purchase nuclear materials that it required. This would facilitate the sales and sharing nature of the MDA: it would not be an agreement based on aid or donations. Technical equalisation and shared systemic concerns were driving this process and this was reflected in the principal aim of the amendments which were, said Strauss, to achieve "common defense and security". [239] This was a revealing phrase. It was soon to be accepted that the nuclear systems of Britain and America needed to be aligned because of common defence goals, not because of a 'special relationship' or even because America 'owed' Britain after Suez. It was the rational culmination of systemic pressures. The rationalist logic of nuclear military reality was starting to trump previous foreign policy decisioning.

By 31 January 1958 the Administration were back on the defensive with Congress and Donald Quarles, deputy Secretary for Defense, had to clarify that there were, indeed, distinct boundaries to what would be offered to other nations. He therefore stated that "there is no thermonuclear design that we now either have or contemplate that would be of character that you could transfer under this plan."[240] The removal of fusion from the 1958 amendments to the Atomic Energy Act would just be temporary. Anglo-American technical integration continued after 1958. The MDA was but a stage in that journey.

In Britain, the 1958 Defence White Paper took the view that nuclear sufficiency could exist for a very long time.[241] British capability was seen to be growing, as

[239] Ibid.
[240] Ibid.
[241] Cmnd 363, Report on Britain's Defence, paragraphs 1-13, February 1958.

fusion weaponry became available, although it was not on the scale of American strategic power. It argued that a response to any Soviet attack would involve both nations, although whether that would be 'independent' of each other, or 'interdependent', was not clearly stated.[242] Once again this indicates the coming together of these two terms, by default. The White Paper was also silent on how the substantial force of 100,000 serviceman based in the Middle East would be balanced against the nuclear priority.[243] The nub of the problem, the same one that America and Britain had been seeking to address across the 1950s, was expressed as how, in the face of increasing resource shrinkage, could both the deterrent and conventional world forces be maintained.[244]

Against this concern, Macmillan now believed that the 'Grapple' programme had paid dividends and allowed Britain to "speak with the United States on level terms."[245] 'Level terms' was a fantasy, and the Prime Minister probably knew it given his awareness of military realities. While British progress was important, this was only relevant because they were a part of the growing pressures of threat from the wider, systemic world. This was also not 'great power' driven. Moore says Macmillan "repeatedly questioned the need for atomic weapons….Macmillan could not be accused of clinging to nuclear weapons as a substitute for great-power status."[246] His view is more subtle as he argues that Britain still had belief in itself as a force for good in the world, that it needed to punch above its weight therefore and that its nuclear administrators were trusted, so the outcome in the public mind was that "nuclear weapons felt right."[247] As

[242] Ibid, Paragraphs 28-31.
[243] Cmnd 363, Report on Britain's Defence, paragraphs 38-39, February 1958; Jones, *Official History*, p 107.
[244] Dickson minute for Sandys, WFD/M/289, 20 February 1958, DEFE 24/11, TNA.
[245] Brook minute, 20 January 1958, D1051/4G, FO 371/135632, TNA.
[246] Moore, *Nuclear Illusion, Nuclear Reality*, p. 255
[247] Ibid.

Jones says, the nature of a future relationship with America, by both powers, would depend on "the meaning that was attached to the term 'independence'."[248]

Macmillan was clearly unsure about what, if anything, Eisenhower's intention to amend the McMahon Act might yield.[249] He was also still concerned about the nature of the IRBM deal, saying that British personnel must have operational control as "it is very important to reassure our people that the actual operation of these weapons will be handled by British forces….I realise that this is quite illogical in the light of the present sphere of United States strategic bombers."[250] Eisenhower responded to the Prime Minister's concern by saying that joint operational control of 'Thor' would exist after initial deployment. The President, on 22 February 1958, went on to say that "I would, at the same time, point out that this question of manning is largely a technicality, since your Government and ours would have joint operational control, as they do on SAC bomber bases in the United Kingdom, regardless of whether the equipment is manned by United Kingdom or United States personnel."[251] This would seem to contrast with British concerns concerning the potential for America to unilaterally use their bomber base force from East Anglia in previous years.

At the 27 February 1958 NSC, Dulles now argued that allies needed to be consulted over missile deployments. But, on the wider point of American confidence in the evolving defence relations with allies, he said "we could not stake the security of the United States on missiles deployed and based on foreign

[248] Jones, *Official History*, p 110.
[249] Message from Prime Minister Macmillan to President Eisenhower, London, January 2, 1958, *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2, pp. 795 – 799.
[250] Letter From Prime Minister Macmillan to President Eisenhower, London, February 16, 1958, *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2.
[251] Telegram From the Department of State to the Embassy in the United Kingdom, February 22, 1958, 5:09 p.m., *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2.

soil. We must depend in the first instance on ballistic missiles deployed on U.S. soil or in U.S. submarines."[252] This demonstrates clearly that the MDA was just one part of a wider American defence strategy.

In early 1958, Dulles and the State department continued to evolve their thinking towards a more flexible response and away from 'massive retaliation'.[253] Subsequently, in a discussion between the Secretaries of State, Defence and the JCS on 7 April, 1958, the matter of graduated response was discussed. Dulles was particularly concerned that 'massive retaliation' as a wider strategy was reaching the end of its validity.[254] He was minuted as saying "that Churchill had said that it was our retaliatory power that saved Europe over the post-war years; Mr. Dulles did not think that this would remain true for another decade.....it is State's considered opinion that although we can hold our alliance together for another year or so, we cannot expect to do so beyond that time on the basis of our present concept. Accordingly, we should be trying to find an alternative possessing greater credibility."[255]

Here was a senior Administration figure giving the rationale for geopolitical realignment and the coming together of partners in the nuclear world. A new formal atomic alliance structure was needed, said the Secretary of State. In part this was because "as present leaders drop out in major allied countries, new governments seem bound to be even more sceptical.....America needs something different from what we are doing now."[256] A more complete

[252] Memorandum of Discussion at the 356th Meeting of the National Security Council, Washington, February 27, 1958, *FRUS*, 1958–1960, National Security Policy; Arms Control and Disarmament, Volume III, pp. 43 – 44.
[253] Jones, *After Hiroshima*, p. 363.
[254] Memorandum for the Record, Washington, April 7, 1958, Meeting in the Office of the Secretary of Defense, 7 April 1958, *FRUS*, 1958–1960, National Security Policy; Arms Control and Disarmament, Volume III, pp. 63 – 64.
[255] Ibid.
[256] Ibid.

explanation of why America was moving away from its previous consistent policy of separation is hard to find. It was realist in nature, but it also reflected concerns about the ending of the wartime relationships between individuals. Systems and individuals are together creating agency here. Ultimately, though, such change was the product of the changing nature of nuclear military strategy.

That relationships within the emerging nuclear social world had common characteristics, and were certainly not confined to actions between Britain and America, can be seen in Sandys' dialogue with Paulo Taviana, the Italian Minister of Defence, during a visit to Italy in March 1958.[257] The Italians asked about receiving the benefits of nuclear protection from Britain. Sandys stated that he had to exclude assistance in the co-production and development of nuclear weapons with Italy, and others, because "our attitude on this question was to some extent tied up with the prospects of closer co-operation in the nuclear field with the Americans. The position would become clearer if the proposal to amend the McMahon Act went through."[258] Britain was still keen to cooperate with the production of any non-nuclear weapon or armament, said Sandys. Such a tiered approach to nuclear / conventional relationships would have been worthy of a Roosevelt or a Bush.

This 'independence v. interdependence' dilemma was specifically behind Macmillan's request to Sandys, after the Defence White Paper, for a clear vision of the nuclear field in order to determine "the extent we should apply the principle of interdependence in nuclear weapons."[259] Britain had been alerted, as Jones

[257] Record of Meeting with Taviana, Italian Minister of Defence and Sandys, 15 March, 1958, Rome. , Point 15, DSND 4 / 6 / 11, CCA.
[258] Ibid, Point 16.
[259] Macmillan minute for Sandys, 'Nuclear Armaments', M.73/58, 21 March 1958, PREM 11/2275, TNA.

points out, that "as far as nuclear assistance from the Unites States went, there had already been warnings that the changes to US atomic energy legislations promised by the White House would not allow a completely free transfer of US warhead design, while there would clearly be no provision for the outright supply of complete US warheads to the UK."[260]

As part of this thinking process, and by way of showing some of the transatlantic contacts that were ongoing only months before the MDA was actually signed, Sandys met McElroy in Paris in April 1958.[261] In the record of the meeting contained in his archive papers, Sandys mentioned the concept of 'independence' and that Britain has been trying to establish bi-lateral deals with other countries, including Italy as above, in order to make research and development more efficient. Sandys also stated that Britain and America had cooperated "in the field of scientific research but this had not extended to production, and the United States had been – understandably – reluctant to make herself *dependent* on any of her allies for any major item of military equipment (my italics)."[262] Reflecting the emerging prioritisation, noted earlier, that America was making in favour of technologically equalised states, McElroy agreed "that the idea must be restricted to those countries with the necessary scientific and industrial capacity."[263]

Sandys presented his summary to Macmillan in May 1958, the key time before the MDA.[264] Sandys' Paper was criticised because it omitted details of 'Blue

[260] Jones, *Official History*, p. 110. Brundrett minute to Sandys, FB 183/58, 31 March 1958, PREM 11/2285, TNA.
[261] 'Record of discussion at Hotel Talleyrand, Paris, 14 April, 1958, between the Minister of Defence and U.S. Secretary of Defense', DSND 6 / 37, CCA.
[262] Ibid.
[263] Ibid, Point 6.
[264] 'Nuclear Armaments, a memo by Minister of Defence', 22 May 1958, PREM 11/2285, TNA.

Streak' and because he said that it was pre-occupied with independence.[265] This confirms the centrality of this issue at this time to ministers, however. This Paper was the last British governmental Paper written, concerning military nuclear strategy, while the country was truly still in a true state of nuclear independence. The Paper was considered formally by Macmillan on 5 June 1958 when he said that a mere 50 warheads would probably be sufficient as a deterrent, partly because that number would be affordable. However the Prime Minister used careful words to try distil his, and Britain's, position which he now expressed as "what was important was that *our contribution* to the deterrent must be entirely under our control (my italics)."[266] This would give Britain access to the nuclear club, he said. But what Macmillan pointedly did not mandate was that Britain needed to manage or build every aspect of its nuclear defences. This was in line with his subtle language of 1957.

The door was being opened to the MDA in Britain, just as the nature of changing relationships with allies was also being explored in America. Macmillan also confirmed that, even in a situation where a partnership deal was done with America, Britain would need to continue its own research. The exact scenario of the MDA was now almost in place. It was the solution for both countries to the 'independence/interdependence' dilemma that had existed across the whole post-war period, as all nations confronted the implications of the emerging nuclear social world. As Edward Spiers has put it, "a fundamental paradox was already apparent (in late 1950s). As Britain strove for strategic independence, she was willing to become ever more dependent on American technology."[267] The resolution of this conundrum supports the argument of this thesis that cooperation

[265] Brook note for Macmillan, 4 June 1958, PREM 11/2285, TNA.
[266] Bishop note, 5 June 1958, PREM 11/2275, TNA.
[267] Spiers, 'The British Nuclear Deterrent', p. 157.

in nuclear affairs between Britain and America only occurred when the scientific-geopolitical environment was exactly right. It underlines that no 'special' atomic relationship would have emerged between the transatlantic powers until 1958 as technical maturation did not occur until that time. That maturation, combined with the post-Sputnik pressures and the melding of science with geopolitics both domestically and internationally, now created an environment in which America sought a technical partner. This partnership balanced independence and interdependence by not explicitly choosing either.

On 17 April 1958 former SEC Commissioner Thomas Murray had testified on the subject that had also caused internal tensions within the American government, that of how to use nuclear force in smaller scale conflicts. As a solution Murray suggested Britain should actually be given very small American weapons but that no fusion information should be transmitted.[268] On 14 May 1958 the Administration replied to these concerns in a letter to the JCAE.[269] It argued that denying the sharing of information on weapons, which now had relevance to mutual defence, would be illogical. On the other hand, the Administration argued that actually giving warheads to another nation would be too great a departure from previous foreign policy. By late May the JCAE had decided that it agreed that weapons themselves should not be transferred and that fusion knowledge would also be excluded at the current time. This was only going to be a delay, not a complete embargo. Homeostatic processes would continue to have force

[268] Hearings before Subcommittee on Agreements for Cooperation, JCAE, 'Amending the Atomic Energy Act of 1954 – Exchange of Military Information and Materials with Allies', 85th Congress, 2d session, 85th Congress, 1958, Joint Committees of Congress: RG 128, National Archives, Washington D.C..
[269] Ibid.

after 1958 and America would change legislation to formally permit the necessary level of fusion sharing in less than a year.

May 1958 also saw Dulles restate his new arguments in favour of sharing capabilities for defence with allies "or else they will disassociate themselves from their alliance with us." [270] This is further evidence that the MDA was the product of accelerating American strategic debates based on the maturity of the nuclear world. Dulles even used Britain as an example of how a poor balance in spending between full nuclear and conventional forces could affect the projection of power. He said that "the United Kingdom has recently swung over to reliance on an almost 100% nuclear military capability. We can see the unfortunate results of so complete a reliance in British action in various parts of the world, notably in Egypt …..and if Bevan became Foreign Secretary, we would presumably be ousted from all our missile bases in the United Kingdom."[271] Following such influential support, and expression of the logic in favour of formal nuclear partnership that tied countries, not just administrations, together the momentum behind the legislation became unstoppable.

However the exact nature of the desired relationship was still a matter of ongoing discussion between British ministers as late as May 1958. On 13 May, Sandys wrote to the Foreign Secretary, copying both the Prime Minister and the Chancellor, and referring to a recent Foreign Office Steering Committee "on the effects of Anglo-American interdependence on the long-term interests of the United Kingdom."[272] It is interesting that a senior, and well connected in a

[270] Memorandum of Discussion at the 364th Meeting of the National Security Council, Washington, May 1, 1958, *FRUS*, 1958–1960, National Security Policy; Arms Control and Disarmament, Volume III, pp. 80 – 95.
[271] Ibid, p. 91.
[272] Sandys to FO, 'Minister's Running Folder for May 1958', DSND 4 / 6 / 13, CCA

transatlantic sense, minister like Sandys was forced to state that “we are of course already engaged in fostering co-operation with the Americans in defence research and development, but I do not think that this will lead to any great measure of interdependence in arms production, in the sense that the American services will agree to depend on this country for anything they regard as vital.”[273] Once again here is an expression of the halfway house of the MDA. America would not agree to ‘depend’ on Britain, and yet some form of relationship would be required. The nature of the MDA, just two months away, was being foreshadowed here in Britain, as it was by Dulles in America.

There were also two further indications of the strengthening nuclear military relationships that were occurring in 1958, and which intensified the logic of needing new social relationships to manage them. The first was the deployment of fission weapons to West Germany for use by British Canberras, and also for the first of the MGM- 5 ‘Corporal’ nuclear surface-to-surface nuclear armed missile, which would join the Rhine Army. Sandys wrote a memorandum to Macmillan on 20 May, advising him in this connection that “we have now reached the stage where we must inform the Federal German Government of our plans to provide storage in West Germany for the nuclear bombs for towards the end of the year. These weapons will be supplied by the Americans and will remain formally in their custody.”[274] This was an exact structural match for the MDA, again just two months before its formal signature. This acceptance of a shared nuclear stance maps to the almost contemporaneous comments, expressed above, of American unwillingness to be dependent on Britain. It seems that, while Britain was not required by America as an essential support, the nuclear social

[273] Ibid, Point 2.
[274] ‘Minister’s Running Folder for May 1958’, DSND 4 / 6 / 13, CCA.

world meant that America was being constrained to support Britain as part of its wider defensive strategy. A second example of the rapidly spreading nuclear social world was America's March 1958 request to station a squadron of hunter / killer submarines in a British base.[275] In a memorandum dated 17 May 1958, Sandys, for one, can be seen to support the COS desire to respond affirmatively and he authorised non-committal initial discussions.

Referring to the initiation of the MDA, Gowing stated that "later in the 1950s Anglo-American co-operation was at last re-established and became once more an integral part of the special relationship." She went on to say it will be for a later volume of her work to ascertain the causation of this cooperative partnership.[276] Gowing does not define what 'special' truly meant. The forthcoming analysis of the terms of the MDA will give an explanation of why it was genuinely 'special' which was not because of the signatories, but because of the nature of the deal being done.

The precise details of the future cooperative arrangement between Britain and America was now drawn up. It was agreed that, rather than a full treaty being required (thus needing a two thirds Senate majority) a future Anglo-American deal would take the form of a 'bilateral' treaty which would have the force of law unless Congress passed a resolution against it. This was agreed by the JCAE at the end of May and it set an initial limit of 30 days for Congress to pass a blocking motion. This period was to be extended to 60 days for agreements signed after 01

[275] For the original American request see 14 March 1958 D (58) 4th Meeting, Item 1 and for Sandys' reply see his memorandum dated 17 may 1958, D (58) 29, DSND 4 / 6 / 13, CCA.
[276] Gowing, *Independence and Deterrence, Vol. 1*, p. 312.

January 1959.[277] Effectively this gave a unique and very favourable window for the MDA to be signed in 1958.

As soon as this path was open, Macmillan contacted Eisenhower about setting up meetings to agree the bilateral nuclear deal.[278] It was decided that Plowden would visit Washington on 4 June 1958 and start technical discussions. A last minute hitch was the AEC's action to try to incorporate British domestic nuclear knowledge into the deal given its successful construction of the Calder Hall facility.[279] The DOD was, however, adamant that such a commercial element should not be integrated with what was in essence a military deal. Britain also stood firm and, on 30 June 1958, any attempt to link matters was abandoned by Strauss.[280]

In June 1958, Macmillan had met Eisenhower again and said that the two defence and nuclear cooperation groups, established in October 1957, should be continued and strengthened.[281] Dulles also reiterated the new positive view by America on atomic partnership when "the Secretary stressed that Anglo-American cooperation in the nuclear weapons field is very important and described the amendments to the Atomic Energy Act reported out by the Joint Congressional Committee as satisfactory."[282] The principle of governmental nuclear cooperation between Britain and America was being confirmed here. The

[277] Strauss calls Dulles, May 21, 1958, the Papers of John Foster Dulles and Christian A Herter, 1953-1961, Reel 7, p. 522, KCL.
[278] Macmillan, *Riding the Storm* (1971), pp. 489 - 490 and Memorandum of Conversation by Herter, Washington, May 30, 1958, S/AE File Copy, State department Archives, Washington D.C..
[279] Hearings before Subcommittee on Agreements for Cooperation, JCAE, 'Amending the Atomic Energy Act of 1954 – Exchange of Military Information and Materials with Allies', 85th Congress, 2d session, 85th Congress, 1958, Joint Committees of Congress: RG 128, National Archives, Washington D.C..
[280] Ibid and Dulles call to Strauss, June 30,1958, the Papers of John Foster Dulles and Christian A Herter, 1953-1961, Reel 7, p. 942, p. 932 and p. 916, KCL.
[281] Memorandum of Conversation, Subject: Interdependence: US/UK Relationship, June 9, 1958, *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2, pp. 811 – 812.
[282] Memorandum of Conversation, Subject US-UK Agreement on Nuclear Weapons, June 9, 1958, 3 p.m. MCT MC/10, *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2, p. 817.

involvement of the legislature, and the resultant genuine action, was also now radically different from the previous years of avoidance and separation.

In terms of the exact details, it would be a case of establishing the principle of the need for partnership first; it could be broadened if successful later. On June 30, 1958, the amendments to the Atomic Energy Act of 1954 passed the House of Representatives. The President was authorised under section 6 (amended section 144c) of the act to give restricted data on "atomic weapons" to an ally that had made substantial progress in the nuclear field in order to improve that nation's "atomic weapon design, development, or fabrication capability."[283] This would not include information on fusion, as mentioned above, and effectively helped the quantity, not quality, side of the nuclear equation. There was an apparent contradiction between the terms of section 6 (amended section 144c) and section 1 (amended section 91c). The former said the President could transfer non-nuclear parts of 'atomic weapons' to a developed ally to assist with training and operational readiness. The latter said such transfer could not assist that nation's atomic weapon design and fabrication. It seems, at least as far as both historians such as Botti, and the subsequent operation of the law, that this was likely a drafting error: it was not changed when Eisenhower signed the Act on 2 July 1958 and did not affect the developments that flowed from it.

The following day, 3 July 1958, Dulles and Viscount Hood, British Minister at the Washington embassy, signed the Mutual Defence Agreement between America and Britain.[284] Article 2 dealt with the transfer of information for the development

[283] Public Law 479, July 2, 1958, 85th Congress, 68 Statute 27 accessed at https://www.gpo.gov/fdsys/pkg/STATUTE-72/pdf/STATUTE-72-Pg276-2.pdf.
[284] For the text of the 'Agreement between Government of United Kingdom of Great Britain and Northern Ireland and Government of the United States of America for Co-operation on Uses of Atomic Energy for Mutual Defense Purposes', Washington, July 3, 1958 see Appendix Five.

of defence plans, training and “the development of delivery systems compatible with atomic weapons.”[285] The information that America would supply to Britain about nuclear weapon design would, it was understood, be limited to those systems that were similar to British weapons and not include fusion information at this stage. Article 3 covered the transfer of submarine nuclear propulsion plant and materials and also raw materials that would be transferred as a result for this specific use only, with no financial advantages to Britain. There was also the important condition that no actual weapons were being transferred here, nor non-nuclear components of weapons themselves. This was based on established practice with other deployments that America had already made, described above. The term of the agreement was to be 10 years. It has been renewed every 10 years since.

The Anglo-American Mutual Defence Agreement was officially approved by the full Congress on 30 July 1958. Interestingly, though, there is no mention of the MDA in any NSC meeting records during the remainder of 1958. It seems that the new state of partnership must have been accepted quickly as part of the normal landscape of the evolving nuclear world.[286] Already in July, the British Defence Minister was writing to the Chancellor that he was going to make the fullest use of the information flowing from America now on design information and componentry. Foreshadowing the complexities to come, and on which Britain’s nuclear defence would be built in the decades ahead, Sandys stated “the Americans will presumably not be willing to consider selling us ballistic rockets, even without their nuclear warheads, except with unacceptable political

[285] Ibid.
[286] Editorial Note’, *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2, p. 823 is in fact the only mention of the MDA in FRUS for the remainder of 1958.

"strings"."[287] Such deals over future weapons systems such as Polaris, and later Trident, were for the future, together with the definitions of any 'strings'. However the MDA was the doorway to the future through which such vital Anglo-American defence debates would pass.

Talks on procedures to exploit the new agreement took place in August and September 1958 in Washington and New Mexico. The massive sea-change that had occurred can be seen simply by listing the topics that were now openly discussed between the high level British and American science teams. These included details of nine different American warheads, including three megaton designs, and the British gave details of several of their designs. The report issued after this meeting by the British head of delegation, Sir William Cook, stated that there was "no doubt that our technical achievements in thermonuclear warheads, invulnerability and component techniques, with our resources and timescale, have considerably impressed US delegates and [have] been reason for more forthcoming attitude than formal procedures would dictate."[288] The subsequent report issued by the AEC was also highly positive when it said "'during the first meeting it became obvious that the United Kingdom has achieved an advanced state of weapons research and development in both the fission and thermonuclear fields. Moreover, it appeared that certain advances made by the United Kingdom would be of benefit to the United States."[289]

Thus the MDA was already showing its worth and potential importance for the future of Anglo-American governmental nuclear relations. It reflected the

[287] Memorandum to the Chancellor, D.S. 409, 14 July 1958, 'Minister's Running Folder for July 1958', Point 6, DSND 4 / 6 / 15, CCA.
[288] Telegram Washington to Foreign Office, 25 September, 1958, PRO 371/135506, ZE 13/74, TNA.
[289] Arnold, *Britain and the H-Bomb*, pp. 206 and 208 and see also Fakley, 'The British Mission'.

systemic pressures of the late 1950s, a world in which Soviet nuclear capability now threatened the whole of the West. Cooperative activity, whether within a state or across borders with comparable partners, was the optimum solution. Gilpin has pointed out that, although Britain became the major recipient of the 1958 amendments, “America did offer its European allies intermediate range ballistic missiles (IRBMs), a move which actually ran counter to the Gaither Committee's admonition against dependence upon a vulnerable deterrent such as the type of IRBM offered to Europe.”[290] Britain was not the sole beneficiary of America’s evolving atomic policy, therefore.

The MDA was the product of nuclear affairs stretching back to the inception of practical atomic warfare, as expressed by the ‘Frisch-Peierls’ memorandum in the dark days of 1940. Its value can also be confirmed by its longevity. Most recently re-affirmed by both Britain and America on 22 July 2014, the 1958 MDA still reflects the defence requirements of two nations who are capable of an effective nuclear technological dialogue and are commonly threatened by nuclear enemies. Its uniqueness lays in the continued existence of a treaty that regulates the sharing of technology that is mutually destructive between two sovereign states. It is not in fact the nations, but the nature, that makes the MDA ‘special’.

[290] Gilpin, *American Scientists*, p. 173.

CONCLUSION

“”Anglo-American relations tend to suffer from being talked about too much”

Sir John Slessor, 19 December 1952.[1]

There is little doubt that the MDA of 1958 between Britain and America was remarkable, not least because of the many previous years of atomic estrangement. However it was not unique. America would go on to sign a similar arrangement with France in July 1961.[2] This reflected the same circumstances as applied with Britain – systemic pressures matched with a contemporary shared security alignment and growing French technical competence. The difference was that this ‘Franco MDA’ did not last.[3] It is the enduring nature of the transatlantic partnership between Britain and America which is one of its most noteworthy features.

The technical nature of the partnership is key. This is distinct from the creation of what Margaret Gowing has described as a generic Anglo-American “new very special relationship”.[4] Perhaps, across time, the MDA has given the overall relationship of the two countries a gloss of specialness, while it is actually the atomic formulation of the agreement itself that is remarkable. The implications of this view are twofold. Firstly that the ‘special’ element of the Anglo-American ongoing relationship can, in part, be ascribed to a changeable atomic agreement and not a close association of overall policy. Secondly that the commencement of ‘specialness’, in 1958, was considerably later than is often assumed. To state

[1] Slessor, ‘Note to Secretary of State as CAS’, 19 December 1952, AIR 75 / 107, TNA.
[2] Matthew Grant, (eds.), *The British way in Cold Warfare: Intelligence, Diplomacy and the Bomb* (Bloomsbury, 2009), p. 110.
[3] Ibid, p. 111. The ‘French MDA’ was suspended by America when that country left NATO’s Integrated Military Command in 1966.
[4] Gowing, ‘Britain, America and the Bomb’, p. 137.

that it was founded in the wartime alliance is incorrect. The Anglo-American MDA is also neither permanent nor sacrosanct. Amendments to the needs and capabilities of either power could make a re-signing of the agreement in 2024 uncertain. It would certainly be a major blow for Britain if its access to leading nuclear delivery systems, and other nuclear knowledge that remains secret, was denied.

This final section will firstly reflect on the earlier conclusions of the thesis through the lens of whether these same processes can be seen to continue after 1958. Their continuance, briefly recorded, would add weight to the contention of the arguments being made. Remarks will also be made about possible areas of future research which could be used to further investigate nuclear military relations in differing environments.

A principal tenet of this thesis is that atomic relations between Britain and America were, from the outset, influenced by the interface of science and power. Scientific breakthroughs yielded the opportunity for dominance and this was seized first by America as it consciously strove for an atomic monopoly. This was far earlier than expressed in the existing historiography. Continuing scientific developments impacted geopolitical arrangements increasingly powerfully, both during the Second World War and in the years after it. These changes shaped the post-war landscape of national security. It was only when these changes suggested that alliance, rather than separation, would be in America's interests, that the MDA of 1958 became viable.

The thesis thus implies that the dynamic nature of scientific, military and social developments should continue after 1958. Such dynamism in Britain and America's technical and military arrangements was in fact present almost

immediately after 1958. The original agreement was amended as early as 7 May 1959 in order to give Britain access to non-nuclear components, and to permit the transfer of special nuclear material such as plutonium, HEU and tritium.[5] The MDA has also been shown by historians to be a fundamental future building block for significant intensification in the transatlantic nuclear relationship, including the Polaris Sales Agreement signed on 6 April 1963.[6] Change in atomic relations has thus certainly continued, and taken many forms.

A further argument in the thesis is that only technically balanced and security-aligned nations share such existential knowledge. This was again confirmed in the late 1960s and early 1970s when, because Britain had not yet committed to the post-Polaris generation of missiles from America, the flow of information dried up across the Atlantic.[7] However once Britain recommenced its nuclear development in the 1970s under the 'Chevaline' programme, when it looked to increase the penetrability of Polaris warheads into Soviet defences, data began to be exchanged again.[8] With the decision to purchase Trident, nuclear relations between Britain and America became more stable.[9] Nevertheless the Trident renewal debate continues to bubble in British politics until this day, with its potential threat to continued Anglo-American nuclear relations.

Another conclusion reached above is that America wished to retain as much control over nuclear affairs as possible. Events immediately after the MDA signing confirm this view. Simply stated, America did not wish to pass over anything

[5] Botti, *The Long Wait*, p. 238 and Moore, *Nuclear Illusion, Nuclear Reality*, p. 85.
[6] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 455 - 456 and Jones, *Official History*, p. 444.
[7] Kristan Stoddart, *Losing an Empire and Finding a Role: Britain, the USA, NATO and Nuclear Weapons, 1964–70* (Palgrave Macmillan, 2012), pp. 30 – 36.
[8] Britain's 'Chevaline' programme was aimed at countering improved Russian air defence technology by making Polaris warheads contain several 'penetration aids'.
[9] Baylis, 'The 1958 Anglo-American Mutual Defence Agreement', 456

beyond what it felt constrained to give. The MDA was not the start of a comprehensive nuclear partnership. It was 'special', but it was essentially pragmatic. In fact, America can be seen to have been actively reassessing the merits of its new nuclear ally barely nine weeks after signing the MDA. In debates held within the Eisenhower Administration on 11 September 1958, Neil McElroy, the Secretary of Defense, stated that the British decline in military power was such that "they could no longer be considered a major reliance in dealing with problems around the world."[10] Further McElroy had an interesting observation on how nuclear relations were now important. He stated that Britain's decline, together with Soviet threats, had effectively changed the systemic nuclear world and that "now there was the danger of our becoming isolated not through our own desires."[11] Such later sentiments towards alliance reflect back the contentions of this thesis that the MDA was signed by America as part of its reaction to a changing systemic world; one in which cooperation became advantageous. In short, the MDA was an attempt by America to avoid nuclear isolation in the newly pressured world of the late 1950s, while not placing undue reliance on lesser powers, such as Britain. This cautious posture was continued after the agreement's signing.

The details of subsequent Anglo-American meetings, including those by Duncan Sandys with senior Administration members held in the September and October of 1958 are out of scope of this work. Yet one point made during them does illuminate and support the view that Anglo-American cooperation was a hard won commodity. When Sandys asked Dulles, at their 22 September 1958 meeting,

[10] McElroy, September 11, 1958 in 'Memorandum by the Counsellor of the Department of State (Reinhardt) September 11, 1958', *FRUS*, 1958–1960, Western Europe, Volume VII, Part 2, p. 828.
[11] Ibid.

about buying American missiles if Britain's plans did not deliver their own product on time, Dulles was "not even prepared to express a view at that moment."[12] This continued American reticence over the country's nuclear involvement with Britain, so plentifully seen throughout the years covered here, would take time to evolve to a more naturally cooperative stance.

The development of atomic physics itself has been at the heart of this thesis. The transition of the leadership in this field from Britain, where the Cavendish Laboratory has been recognised by American historians as a place of enormous pre-war intellectual fertility, to America was of lasting significance.[13] America grabbed the chance to use its huge resources of money and material, already activated by the requirement of conventional warfare, to create a new weapon – the fission bomb. After the war, politicians and the military looked to catch up with the implications of the first device, but it proved a blunt tool. It would take further science leadership to move nuclear militarisation to the next level with fusion. This work has examined the argument of the Zuckerman thesis in this regard and found it to be a valid comment on the first iteration of nuclear weaponry – scientists, by default, led because they invented fission weapons. However further stages, and even fusion development itself, were never so purely in the hands of the laboratories as that argument suggests. The implications for the future are plain – scientists will continue to invent new weapons; it is the way in which states react to that which will shape geopolitics in the future.

As a consequence of the forces and depth of nuclear weaponry, American defensive societal structures in the early Cold War became more militarised and

[12] Record of Meeting held at the Pentagon and the State Department, Washington D.C., September 22 to 25, 1958, DSND 6 / 37, CCA.
[13] Rotter, *Hiroshima*, p. 35.

integrated in the face of Communist expansion.[14] Domestic American science derived benefits from combining with other elements of the evolving 'complex'. It was this American internal reconfiguration, boosted by the revelation of Sputnik and the proven advantages of 'Big Science', that gave support to the new view of policy makers, such as Dulles, that external partnerships also had merit. Such relationships had previously been completely excluded by America. It was enforced geopolitical realignment, and certainly not long time British pleas for interdependence, that interested America in signing the MDA in 1958.

In terms of gaining additional knowledge on nuclear militarisation and partnerships, it would make sense to employ process analysis techniques when dissecting the post-1958 growth of the nuclear world. This could, for instance, feature in a comparative process study of America's range of nuclear alliances. These have involved several states including, as alluded to above, France but also Israel, Turkey and others. The common and distinctive elements of each relationship, perhaps seen now through social and systemic process lenses rather than purely those of conventional diplomacy, could be a further insightful project.

The period from 1939 to 1958 was one of profound change for humankind. In amongst the immense upheavals of the Second World War, the Korean conflict and the onset of the Cold War, nuclear military warfare became a reality. It could be argued that it was the latter which was actually the most significant long term event of these years. The consequences of the militarisation of the atom still shape the world. Both historians and scientists have confirmed that the nature of the change brought about was huge. As Richard Rhodes has written, "the

[14] Wolfe, *Competing with the Soviets*, p. 38.

discovery in 1938 of how to release nuclear energy introduced a singularity into the human world – a deep new reality, a region where the old rules of war no longer applied. The region of nuclear singularity enlarged across the decades, sweeping war away at its shock front until today it excludes all but civil wars and limited conventional wars."[15] Additionally, the words of the key players involved in the above story, including Vannevar Bush, Allen Dulles and Robert Oppenheimer were captured in 1952 as recognising that "fundamentally, and in the long run, the problem which is posed by the release of atomic energy is a problem of the ability of the human race to govern itself without war. There is no permanent method of excising atomic energy from our affairs, now that men know how it can be released….in this respect the problem of armaments was permanently and drastically altered in 1945."[16]

Thus this history of the development of early nuclear military strategy, and the role of Britain and America in its creation, is as much about the future as it is about the past. The early twentieth century developments in atomic science, the 'Frisch-Peierls Memorandum', the work at Los Alamos and the Teller-Ulam breakthrough, are all still very much alive and with us today. A final implication of this thesis is that the world needs to continue to find ways of handling the implications of fission and fusion science. The MDA was a part of humankind's attempts to harness and control new weapons of existential power. It should be seen as a stage of a geopolitical and militarisation process that commenced with the advent of fusion weaponry and has continued with the effects of scientific

[15] Rhodes, *The Making of the Atomic Bomb*, p. 587.
[16] 1952 American Panel of Disarmament quoted in Rhodes, *The Making of the Atomic Bomb*, p. 588.

advances in various countries in the present day. North Korea is one example of where this dynamic process is still in play in the twenty-first century.

The MDA did not contradict the above-quoted instructions of America's first President as it is not a permanent alliance. It was 'special', but perhaps just not special in the way that many have liked to claim as the basis of the relationship between Britain and America. In fact, its true uniqueness lies in the fact that it was simply the first emergence of inter-state social arrangements to manage the nuclear realities of the late twentieth century.

Now over a half century later, and while the MDA still endures, the world as a whole is vastly different. The future is highly uncertain – for the MDA, Anglo-American relations and for the changing shape of the nuclear system. One thing is certain, however, Britain has become ever more vulnerable as a result of its place in the evolving world of nuclear weaponry. This is a sombre realisation. Indeed, and while his message was intended to be one of encouragement and consolidation should Britain adopt the Polaris submarine as its deterrent, the words of Senator Henry Jackson in May 1957 expressed this new reality in vivid fashion. Jackson stated that "for the purposes of defense, Britain would no longer be a tiny country….Britain's frontiers would shift from the Hebrides and the Cliffs of Dover – to the far reaches of the oceans."[17]

The change in the scale of risk, created by the nuclear military developments of 1939 – 1958, was indeed huge.

[17] Henry Jackson, 'Speech', 27 May 1957, MB1/I342A, Mountbatten Papers, Hartley Library, University of Southampton.

Appendix 1

The Quebec Agreement of 19 August, 1943.

The Citadel, Quebec.

Articles of Agreement Governing Collaboration Between The Authorities of the U.S.A. and the U.K. in the Matter of Tube Alloys

Whereas it is vital to our common safety in the present War to bring the Tube Alloys project to fruition at the earliest moments; and

Whereas this maybe more speedily achieved if all available British and American brains and resources are pooled; and

Whereas owing to war conditions it would be an improvident use of war resources to duplicate plants on a large scale on both sides of the Atlantic and therefore a far greater expense has fallen upon the United States;

It is agreed between us

First, that we will never use this agency against each other.

Secondly, that we will not use it against third parties without each other's consent.

Thirdly, that we will not either of us communicate any information about Tube Alloys to third parties except by mutual consent.

Fourthly, that in view of the heavy burden of production falling upon the United States as the result of a wise division of war effort, the British Government recognize that any post-war advantages of an industrial or commercial character shall be dealt with as between the United States and Great Britain on terms to be

specified by the President of the United States to the Prime Minister of Great Britain. The Prime Minister expressly disclaims any interest in these industrial and commercial aspects beyond what may be considered by the President of the United States to be fair and just and in harmony with the economic welfare of the world.

And Fifthly, that the following arrangements shall be made to ensure full and effective collaboration between the two countries in bringing the project to fruition:

(a) There shall be set up in Washington a Combined Policy Committee composed of:

The Secretary of War. (United States)

Dr. Vannevar Bush. (United States)

Dr. James B. Conant. (United States)

Field-Marshal Sir John Dill, G.C.B., C.M.G., D.S.O. (United Kingdom)

Colonel the Right Hon. J. J. Llewellin, C.B.E., M.C., M.P. (United Kingdom)

The Honourable C. D. Howe. (Canada)

The functions of this Committee, subject to the control of the respective Governments, will be:

(1) To agree from time to time upon the programme of work to be carried out in the two countries.

(2) To keep all sections of the project under constant review.

(3) To allocate materials, apparatus and plant, in limited supply, in accordance with the requirements of the programme agreed by the Committee.

(4) To settle any questions which may arise on the interpretation or application of this Agreement.

(b) There shall be complete interchange of information and ideas on all sections of the project between members of the Policy Committee and their immediate technical advisers.

(c) In the field of scientific research and development there shall be full and effective interchange of information and ideas between those in the two countries engaged in the same sections of the field.

(d) In the field of design, construction and operation of large-scale plants, interchange of information and ideas shall be regulated by such ad hoc arrangements as may, in each section of the field, appear to be necessary or desirable if the project is to be brought to fruition at the earliest moment. Such ad hoc arrangements shall be subject to the approval of the Policy Committee.

Aug. 19th 1943

Approved

Franklin D. Roosevelt Winston S. Churchill

Appendix 2

The Hyde Park Memorandum 19 September 1944.

An Aide-Memoire of Conversation between the President and the Prime Minister at Hyde Park, September 18, 1944

1. The suggestion that the world should be informed regarding tube alloys, with a view to an international agreement regarding its control and use, is not accepted. The matter should continue to be regarded as of the utmost secrecy: but when a “bomb” is finally available, it might perhaps, after mature consideration, be used against the Japanese, who should be warned that this bombardment will be repeated until they surrender.

2. Full collaboration between the United States and the British Government in developing tube alloys for military and commercial purposes should continue after the defeat of Japan unless and until terminated by joint agreement.

3. Enquiries should be made regarding the activities of Professor Bohr and steps taken to ensure that he is responsible for no leakage of information particularly to the Russians.

Initialled FDR and WSC

Appendix 3

Declaration on Atomic Bomb by President Truman and Prime Ministers Attlee and King.

Washington, November 15, 1945

The President of the United States, the Prime Minister of the United Kingdom, and the Prime Minister of Canada, have issued the following statement:

(1) We recognize that the application of recent scientific discoveries to the methods and practice of war has placed at the disposal of mankind means of destruction hitherto unknown, against which there can be no adequate military defense, and in the employment of which no single nation can in fact have a monopoly.

(2) We desire to emphasize that the responsibility for devising means to insure that the new discoveries shall be used for the benefit of mankind, instead of as a means of destruction, rests not on our nations alone but upon the whole civilized world. Nevertheless, the progress that we have made in the development and use of atomic energy demands that we take an initiative in the matter, and we have accordingly met together to consider the possibility of international action:--

(a) To prevent the use of atomic energy for destructive purposes.

(b) To promote the use of recent and future advances in scientific knowledge, particularly in the utilization of atomic energy, for peaceful and humanitarian ends.

(3) We are aware that the only complete protection for the civilized world from the destructive use of scientific knowledge lies in the prevention of war. No system of safeguards that can be devised will of itself provide an effective guarantee against production of atomic weapons by a nation bent on aggression. Nor can we ignore the possibility of the development of other weapons, or of new methods of warfare, which may constitute as great a threat to civilization as the military use of atomic energy.

(4) Representing as we do, the three countries which possess the knowledge essential to the use of atomic energy, we declare at the outset our willingness, as a first contribution, to proceed with the exchange of fundamental scientific information and the interchange of scientists and scientific literature for peaceful ends with any nation that will fully reciprocate.

(5) We believe that the fruits of scientific research should be made available to all nations, and that freedom of investigation and free interchange of ideas are essential to the progress of knowledge. In pursuance of this policy, the basic scientific information essential to the development of atomic energy for peaceful purposes has already been made available to the world. It is our intention that all further information of this character that may become available from time to time shall be similarly treated. We trust that other nations will adopt the same policy, thereby creating an atmosphere of reciprocal confidence in which political agreement and cooperation will flourish.

(6) We have considered the question of the disclosure of detailed information concerning the practical industrial application of atomic energy. The military exploitation of atomic energy depends, in large part, upon the same methods

and processes as would be required for industrial uses. We are not convinced that the spreading of the specialized information regarding the practical application of atomic energy, before it is possible to devise effective, reciprocal, and enforceable safeguards acceptable to all nations, would contribute to a constructive solution of the problem of the atomic bomb. On the contrary we think it might have the opposite effect. We are, however, prepared to share, on a reciprocal basis with others of the United Nations, detailed information concerning the practical industrial application of atomic energy just as soon as effective enforceable safeguards against its use for destructive purposes can be devised.

(7) In order to attain the most effective means of entirely eliminating the use of atomic energy for destructive purposes and promoting its widest use for industrial and humanitarian purposes, we are of the opinion that at the earliest practicable date a commission should be set up under the United Nations Organization to prepare recommendations for submission to the organization.

The commission should be instructed to proceed with the utmost dispatch and should be authorized to submit recommendations from time to time dealing with separate phases of its work.

In particular the commission should make specific proposals:

(a) For extending between all nations the exchange of basic scientific information for peaceful ends,

(b) For control of atomic energy to the extent necessary to insure its use only for peaceful purposes,

(c) For the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction,

(d) For effective safeguards by way of inspection and other means to protect complying states against the hazards of violations and evasions.

(8) The work of the commission should proceed by separate stages, the successful completion of each one of which will develop the necessary confidence of the world before the next stage is undertaken. Specifically, it is considered that the commission might well devote its attention first to the wide exchange of scientists and scientific information, and as a second stage to the development of full knowledge concerning natural resources of raw materials.

(9) Faced with the terrible realities of the application of science to destruction, every nation will realize more urgently than before the overwhelming need to maintain the rule of law among nations and to banish the scourge of war from the earth This can only be brought about by giving wholehearted support to the United Nations Organization and by consolidating and extending its authority, thus creating conditions of mutual trust in which all peoples will be free to devote themselves to the arts of peace. It is our firm resolve to work without reservation to achieve these ends

The City of Washington, The White House. November 15, 1945.

Signed:

HARRY S. TRUMAN, President of the United States

C. R. ATTLEE, Prime Minister of the United Kingdom

W. L. MacKENZIE KING, Prime Minister of Canada

Appendix 4

Map of the American wartime Manhattan Project Sites

Appendix 5

The 1958 US-UK Mutual Defence Agreement

Agreement between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland for Cooperation on the uses of Atomic Energy for Mutual Defense Purposes

Original Agreement signed, Washington, July 3, 1958

The Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland, Considering that their mutual security and defense require that they be prepared to meet the contingencies of atomic warfare; Considering that both countries have made substantial progress in the development of atomic weapons; Considering that they are participating together in international arrangements pursuant to which they are making substantial and material contributions to their mutual defense and security; Recognizing that their common defense and security will be advanced by the exchange of information concerning atomic energy and by the transfer of equipment and materials for use therein; Believing that such exchange and transfer can be undertaken without risk to the defense and security of either country; and Taking into consideration the United States Atomic Energy Act of 1954, as amended, which was enacted with these purposes in mind,

Have agreed as follows:

ARTICLE I

GENERAL PROVISION

While the United States and the United Kingdom are participating in an international arrangement for their mutual defense and security and making substantial and material contributions thereto, each Party will communicate to and exchange with the other Party information, and transfer materials and equipment to the other Party, in accordance with the provisions of this Agreement provided that the communicating or transferring Party determines that such cooperation will promote and will not constitute an unreasonable risk to its defense and security.

ARTICLE II

EXCHANGE OF INFORMATION

A. Each Party will communicate to or exchange with the other Party such classified information, sensitive nuclear technology, and controlled nuclear information as is jointly determined to be necessary to:

1. the development of defense plans;

2. the training of personnel in the employment of and defense against atomic weapons and other military applications of atomic energy;

3. the evaluation of the capabilities of potential enemies in the employment of atomic weapons and other military applications of atomic energy;

4. the development of delivery systems compatible with the atomic weapons which they carry; and

5. research, development and design of military reactors to the extent and by such means as may be agreed.

B. In addition to the cooperation provided for in paragraph A of this Article, each Party will exchange with the other Party other classified information concerning atomic weapons, sensitive nuclear technology, and controlled nuclear information, including special nuclear materials properties and production or processing technology, when, after consultation with the other Party, the communicating Party determines that the communication of such information is necessary to improve the recipient's atomic weapon design, development and fabrication capability.

ARTICLE III

TRANSFER OF SUBMARINE NUCLEAR PROPULSION PLANT AND MATERIALS

A. The Government of the United States will authorize, subject to terms and conditions acceptable to the Government of the United States, a person to transfer by sale to the Government of the United Kingdom or its agent one complete submarine nuclear propulsion plant with such spare parts therefor as may be agreed by the Parties and to communicate to the Government of the United Kingdom or its agent (or to both) such classified information as relates to safety features and such classified information as is necessary for the design, manufacture and operation of such propulsion plant. A person or persons will also be authorized, for a period of ten years following the date of entry into force of this Agreement and subject to terms and conditions acceptable to the Government of the United States, to transfer replacement cores or fuel elements for such plant.

B. The Government of the United States will transfer by sale agreed amounts of U-235 contained in uranium enriched in the isotope U-235 as needed for use in the submarine nuclear propulsion plant transferred pursuant to paragraph A of this Article, during the ten years following the date of entry into force of this Agreement on such terms and conditions as may be agreed. If the Government of the United Kingdom so requests, the Government of the United States will during such period reprocess any material sold under the present paragraph in facilities of the Government of the United States, on terms and conditions to be agreed, or authorize such reprocessing in private facilities in the United States. Enriched uranium recovered in reprocessing such materials by either Party may be purchased by the Government of the United States under terms and conditions to be agreed. Special nuclear material recovered in reprocessing such materials and not purchased by the Government of the United States may be returned to or retained by the Government of the United Kingdom and any U-235 not purchased by the Government of the United States will be credited to the amounts of U-235 to be transferred by the Government of the United States under this Agreement.

C. The Government of the United States shall be compensated for enriched uranium sold by it pursuant to this Article at the United States Atomic Energy Commission's published charges applicable to the domestic distribution of such material in effect at the time of the sale. Any purchase of enriched uranium by the Government of the United States pursuant to this Article shall be at the applicable price of the United States Atomic Energy Commission for the purchase of enriched uranium in effect at the time of purchase of such enriched uranium.

D. The Parties will exchange classified information on methods of reprocessing fuel elements of the type utilized in the propulsion plant to be transferred under this Article, including classified information on the design, construction and operation of facilities for the reprocessing of such fuel elements.

E. The Government of the United Kingdom shall indemnify and hold harmless the Government of the United States against any and all liabilities whatsoever (including third-party liability) for any damage or injury occurring after the propulsion plant or parts thereof, including spare parts, replacement cores or fuel elements are taken outside the United States, for any cause arising out of or connected with the design, manufacture, assembly, transfer or utilization of the propulsion plant, spare parts, replacement cores or fuel elements transferred pursuant to paragraph A of this Article.

ARTICLE III bis

TRANSFER OF MATERIALS AND EQUIPMENT

A. The Government of the United States shall transfer to the Government of the United Kingdom the following in such quantities, at such times prior to December 31, 2004, and on such terms and conditions as may be agreed:

1. non-nuclear parts of atomic weapons which parts are for the purpose of improving the United Kingdom's state of training and operational readiness;

2. other non-nuclear parts of atomic weapons systems involving Restricted Data which parts are for the purpose of improving the United Kingdom's state of training and operational readiness when in accordance with appropriate requirements of applicable laws;

3. source, by-product and special nuclear material, and other material, for research on, development of, or use in atomic weapons when, after consultation with the Government of the United Kingdom, the Government of the United States determines that the transfer of such material is necessary to improve the United Kingdom's atomic weapon design, development or fabrication capability.

B. The Government of the United States shall transfer to the Government of the United Kingdom special nuclear material, and authorize the transfer of other material, for research on, development of, production of, or use in utilization facilities for military applications, in such quantities, at such times prior to December 31, 2004, and on such terms and conditions as may be agreed.

C. The Government of the United States shall transfer enriched uranium, and shall arrange enrichment and other uranium services for the Government of the United Kingdom, for military purposes, in such quantities, at such times prior to December 31, 2004, and on such terms and conditions as may be agreed.

D. The Government of the United Kingdom shall transfer to the Government of the United States for military purposes such source, by-product and special nuclear material, and equipment of such types, in such quantities, at such times prior to December 31, 2004, and on such terms and conditions as may be agreed.

E. 1. With respect to by-product material, special nuclear material and other material transferred from one Party to the other under this Article, the recipient Party agrees not to use any such material for purposes other than those for which it was received, provided that material which has lost its identity as a result of commingling with other material of the recipient Party may be put to other uses if

the recipient Party retains an equivalent amount of its own material for the purpose for which the other Party's material was received.

2. For material or equipment transferred from one Party to the other Party, the recipient Party shall pay or reimburse, as may be agreed, all packaging, transportation and related costs. Packaging, shipping containers and methods of shipment shall be as may be agreed.

3. Should either Party desire to acquire materials or components for use in the manufacture or in preparation for manufacture of atomic weapons from any source within the jurisdiction of the other Party, the procuring Party shall inform the other Party of the proposed procurement in order that such other Party may determine whether the proposed procurement involves classified information and if so whether the proposed procurement is in compliance with its applicable laws and regulations.

ARTICLE IV

RESPONSIBILITY FOR USE OF INFORMATION, MATERIAL, EQUIPMENT AND DEVICES

The application or use of any information (including design drawings and specifications), material or equipment communicated, exchanged or transferred under this Agreement shall be the responsibility of the Party receiving it, and the other Party does not provide any indemnity, and does not warrant the accuracy or completeness of such information and does not warrant the suitability or completeness of such information, material or equipment for any particular use or application.

ARTICLE V

CONDITIONS

A. Cooperation under this Agreement will be carried out by each of the Parties in accordance with its applicable laws.

B. Under this Agreement there will be no transfer by either Party of atomic weapons.

C. Except where specifically authorized by this Agreement or, as may be agreed for civil uses, the recipient Party agrees not to use the information communicated or exchanged, or the materials or equipment transferred, by either Party pursuant to this Agreement for other than the preparation or implementation of defense plans in the mutual interests of the two countries.

D. Nothing in this Agreement shall preclude the communication or exchange of classified information, sensitive nuclear technology, or controlled nuclear information, which may be transmissible under other arrangements between the Parties.

ARTICLE VI

GUARANTIES

A. Classified information, materials and equipment communicated or transferred pursuant to this Agreement shall be accorded full security protection under applicable security arrangements between the Parties and applicable national legislation and regulations of the Parties. In no case shall either Party maintain security standards for safeguarding classified information, materials or equipment made available pursuant to this Agreement less restrictive than those set forth in

the applicable security arrangements in effect on the date this Agreement comes into force.

B. Sensitive nuclear technology and controlled nuclear information transferred pursuant to this Agreement shall be accorded at least the same level of protection by the recipient party as that accorded to such information by the transferring Party. The Parties shall consult with each other regarding the appropriate protections for such information.

C. Adequate physical security shall be maintained with respect to any source material, special nuclear material and equipment transferred pursuant to the Agreement, and with respect to any special nuclear material used in or produced through the use of any material or reactor so transferred. Such protection shall be commensurate with the importance of the material or equipment involved.

D. Classified information, sensitive nuclear technology, and controlled nuclear information, communicated or exchanged pursuant to this Agreement will be made available through channels existing or hereafter agreed for the communication or exchange of such information between the Parties.

E. Classified information, sensitive nuclear technology, and controlled nuclear information, communicated or exchanged, and any materials or equipment transferred, pursuant to this Agreement shall not be communicated, exchanged or transferred by the recipient Party or persons under its jurisdiction to any unauthorized persons, or, except as provided in Article VII of this Agreement, beyond the jurisdiction of that Party. Each Party may stipulate the degree to which any of the information, materials or equipment communicated, exchanged or transferred by it or persons under its jurisdiction pursuant to this Agreement may

be disseminated or distributed; may specify the categories of persons who may have access to such information, materials or equipment; and may impose such other restrictions on the dissemination or distribution of such information, materials or equipment as it deems necessary.

F. Adequate materials control and accountability shall be maintained with respect to any nuclear material (including source material and special nuclear material) transferred pursuant to the Agreement, and with respect to any nuclear material used in or produced through the use of any nuclear material or equipment transferred pursuant to the Agreement. Each Party guarantees adequate materials control and accountancy shall be maintained so long as such nuclear material or equipment remains under its jurisdiction or control. As may be mutually agreed, the Parties shall consult with each other regarding methods and technology for providing such materials control and accountability.

ARTICLE VII

DISSEMINATION

Nothing in this Agreement shall be interpreted or shall operate as a bar or restriction to consultation or cooperation in any field of defense by either Party with other nations or international organizations. Neither Party, however, shall communicate classified information, sensitive nuclear technology, and controlled nuclear information, or transfer or permit access to or use of materials, or equipment, made available by the other Party pursuant to this Agreement to any nation or international organization unless:

A. it is notified by the other Party that all appropriate provisions and requirements of such other Party's applicable laws, including authorization by competent

bodies of such other Party, have been complied with as necessary to authorize such other Party directly so to communicate to, transfer to or permit access to or use by such other nation or international organization; and further that such other Party authorizes the recipient Party so to communicate to, transfer to or permit access to or use by such other nation or international organization; or

B. in the case of communication of classified information, sensitive nuclear technology, and controlled nuclear information, and access to materials or equipment, such other Party has informed the recipient Party that such other Party has so communicated such classified information to, or permitted access to such materials or equipment by, such other nation or international organization; or

C. in the case of material which has lost its identity as a result of commingling with other material of the recipient Party, the recipient Party retains an amount under its jurisdiction equivalent to that made available to it by the other Party under this Agreement.

ARTICLE VIII

CLASSIFICATION POLICIES

Agreed classification policies shall be maintained with respect to all classified information, materials or equipment communicated, exchanged or transferred under this Agreement. The Parties intend to continue the present practice of consultation with each other on the classification of these matters.

ARTICLE IX

PATENTS

A. With respect to any invention or discovery employing classified information which has been communicated or exchanged pursuant to Article II or derived from the submarine propulsion plant, material or equipment transferred pursuant to Articles III or III bis, and made or conceived by the recipient Party, or any agency or corporation owned or controlled thereby, or any of their agents or contractors, or any employee of any of the foregoing, after the date of such communication, exchange or transfer but during the period of this Agreement:

1. in the case of any such invention or discovery in which rights are owned by the recipient Party, or any agency or corporation owned or controlled thereby, and not included in subparagraph 2 of this paragraph, the recipient Party shall, to the extent owned by any of them:

(a) transfer and assign to the other Party all right, title and interest in and to the invention or discovery, or patent application or patent thereon, in the country of that other Party, subject to the retention of a royalty-free, non-exclusive, irrevocable license for the governmental purposes of the recipient Party and for the purposes of mutual defense; and

(b) grant to the other Party a royalty-free, non-exclusive, irrevocable license for the governmental purposes of that other Party and for purposes of mutual defense in the country of the recipient Party and third countries, including use in the production of material in such countries for sale to the recipient Party by a contractor of that other Party;

2. in the case of any such invention or discovery which is primarily useful in the production or utilization of special nuclear material or atomic energy and made or

conceived prior to the time that the information it employs is made available for civil uses, the recipient Party shall:

(a) obtain, by appropriate means, sufficient right, title and interest in and to the invention or discovery, or patent application or patent thereon, as may be necessary to fulfill its obligations under the following two subparagraphs:

(b) transfer and assign to the other Party all right, title and interest in and to the invention or discovery, or patent application or patent thereon, in the country of that other Party, subject to the retention of a royalty-free, non-exclusive, irrevocable license, with the right to grant sublicenses, for all purposes; and

(c) grant to the other Party a royalty-free, non-exclusive, irrevocable license, with the right to grant sublicenses, for all purposes in the country of the recipient Party and in third countries.

B. 1. Each Party shall, to the extent owned by it, or any agency or corporation owned or controlled thereby, grant to the other Party a royalty-free, non-exclusive, irrevocable license to manufacture and use the subject matter covered by any patent and incorporated in the submarine propulsion plant, spare parts or equipment transferred pursuant to paragraph A of Article III or paragraphs A, B, C or D of Article III bis for use by the licensed Party for the purposes set forth in paragraph C of Article V.

2. The transferring Party neither warrants nor represents that the submarine propulsion plant or any material or equipment transferred under Articles III or III bis does not infringe any patent owned or controlled by other persons and assumes no liability or obligation with respect thereto, and the recipient Party

agrees to indemnify and hold harmless the transferring Party from any and all liability arising out of any infringement of any such patent.

C. With respect to any invention or discovery, or patent application or patent thereon, or license or sublicense therein, covered by paragraph A of this Article, each Party:

1. may, to the extent of its right, title and interest therein, deal with the same in its own and third countries as it may desire, but shall in no event discriminate against citizens of the other Party in respect of granting any license or sublicense under the patents owned by it in its own or any other country;

2. hereby waives any and all claims against the other Party for compensation, royalty or award, and hereby releases the other Party with respect to any and all such claims.

D. 1. No patent application with respect to any classified invention or discovery employing classified information which has been communicated or exchanged pursuant to Article II, or derived from the submarine propulsion plant, material or equipment transferred pursuant to Articles III or III bis, may be filed:

(a) by either Party or any person in the country of the other Party except in accordance with agreed conditions and procedures; or

(b) in any country not a party to this Agreement except as may be agreed and subject to Articles VI and VII.

2. Appropriate secrecy or prohibition orders shall be issued for the purpose of giving effect to this paragraph.

ARTICLE X

PREVIOUS AGREEMENTS FOR COOPERATION

Effective from the date on which the present Agreement enters into force, the cooperation between the Parties being carried out under or envisaged by the Agreement for Cooperation Regarding Atomic Information for Mutual Defense Purposes, which was signed at Washington on June 15, 1955, and by paragraph B of Article I bis of the Agreement for Cooperation on Civil Uses of Atomic Energy, which was signed at Washington on June 15, 1955, as amended by the Amendment signed at Washington on June 13, 1956, shall be carried out in accordance with the provisions of the present Agreement.

ARTICLE XI

DEFINITIONS

For the purposes of this Agreement:

A. "Atomic weapon" means any device utilizing atomic energy, exclusive of the means for transporting or propelling the device (where such means is a separable and divisible part of the device), the principal purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapon test device.

B. "Classified information" means information, data, materials, services or any other matter with the security designation of United Kingdom 'Restricted' or United States Confidential or higher applied under the legislation or regulations of either the United States or the United Kingdom, including that designated by the Government of the United States as "Restricted Data" or "Formerly Restricted Data" and that designated by the Government of the United Kingdom as "ATOMIC".

C. "Sensitive nuclear technology" means any information (including information incorporated in a production or utilization facility or important component part thereof) which is not available to the public and which is important to the design, construction, fabrication, operation or maintenance of a uranium enrichment or nuclear fuel reprocessing facility or a facility for the production of heavy water, but shall not include information designated as Restricted Data by the Government of the United States."

D. "Controlled nuclear information" means information protected by the Government of the United States from unauthorized dissemination pursuant to sections 57.b. or 148 of the United States Atomic Energy Act of 1954, as amended.

E. "Equipment" means any instrument, apparatus or facility and includes any facility, except an atomic weapon, capable of making use of or producing special nuclear material, and component parts thereof, and includes submarine nuclear propulsion plant, reactor and military reactor. 'Equipment' also includes non-nuclear parts of atomic weapons and other non-nuclear parts of atomic weapons systems involving Restricted Data.

F. "Military reactor" means a reactor for the propulsion of naval vessels, aircraft or land vehicles and military package power reactors.

G. "Person" means:

1. any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency or government corporation other than the Department of Energy and the Ministry of Defence; and

2. any legal successor, representative, agent or agency of the foregoing.

H. "Reactor" means an apparatus, other than an atomic weapon, in which a self-supporting fission chain reaction is maintained and controlled by utilizing uranium, plutonium or thorium, or any combination of uranium, plutonium or thorium.

I. "Submarine nuclear propulsion plant" means a propulsion plant and includes the reactor, and such control, primary, auxiliary, steam and electric systems as may be necessary for propulsion of submarines.

J. "Non-nuclear parts of atomic weapons" means parts of atomic weapons which are specially designed for them and are not in general use in other end products and which are not made, in whole or in part, of special nuclear material; and 'other non-nuclear parts of atomic weapons systems involving Restricted Data' means parts of atomic weapons systems, other than non-nuclear parts of atomic weapons, which contain or reveal atomic information and which are not made, in whole or in part, of special nuclear material.

K. "Atomic information" means information designated 'Restricted Data' or 'Formerly Restricted Data' by the Government of the United States and information designated 'ATOMIC' by the Government of the United Kingdom.

ARTICLE XII

DURATION

This Agreement shall enter into force [n1] on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force

of this Agreement, and shall remain in force until terminated by agreement of both Parties, except that, if not so terminated, Article II may be terminated by agreement of both Parties, or by either Party on one year's notice to the other Party.

Notes

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Agreement.

DONE at Washington this third day of July, 1958, in two original texts.

SIGNATORIES:

FOR THE GOVERNMENT OF THE UNITED STATES OF AMERICA:

JOHN FOSTER DULLES

FOR THE GOVERNMENT OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND:

HOOD

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LIND – The Lindemann Papers

Royal Society, London

FS – The Papers of Sir Francis Simon

AE – The Papers of Sir Alfred Egerton

The National Archives, Kew, London

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AM – Records of the Air Ministry

AVIA – Records of the Ministry of Aviation

CAB – Records of the Cabinet

DEFE – Records of the Ministry of Defence

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PREM – Records of the Prime Minister

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