This is an amended version of a paper presented at a two-day conference at Portsmouth Naval Base in July 2018 organized by the National Museum of the Royal Navy to mark the 50th anniversary of entry into service of the Royal Navy's Polaris submarine fleet that took over national nuclear deterrent duties from Bomber Command of the Royal Air Force.

I was one of several people invited to speak to the conference. Other speakers included:

Dr Richard Moore, King's College, London, and Official Historian at AWE, Aldermaston.

Professor Nigel Biggar, Regius Professor of Moral & Pastoral Theology at Christ Church, Oxford.

Professor Paul Cornish. University of Cambridge.

Dr James Jinks. Queen Mary, University of London.

Dr Andy Corbett. Defence Studies Department, King's College, London.

Professor Lord Hennessy of Nympsfield. Queen Mary, University of London.

Dr Jonathan Aylen. Manchester Institute of Innovation Research, University of Manchester.

Dr Peter Burt, NIS.

Paul Ingram. Executive Director, British American Security Information Council, (BASIC).

Commander Rob Forsyth, Royal Navy (Retd).

Brian Burnell 10 April 2019

THE ROAD TO TRIDENT

Polaris, PIP, Chevaline A different view of history

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There are several histories of the Chevaline saga that culminated in a British decision to purchase Trident. Some produced professionally by writers trained in university schools of international relations, carefully written to be politically neutral, and overly focussed on international relations between Britain and the United States, while failing to address fundamental questions about the nature of Polaris and what it was designed to do.

This account is more polemical with a greater focus on domestic politics. Written by someone who lived through the entire Cold War. First as an infant bombed out of home by the Luftwaffe, then as a junior design engineer working enthusiastically on Britain's first nuclear weapons, Blue Danube, Red Beard, Violet Club (the Interim Megaton Weapon), the Christmas Island H-bomb test devices and similar weapons at the beginnings of nuclear deterrence. Then active in domestic politics, chairing or serving on Labour Party nuclear policy committees, and later with Quaker support as an elected officer of CND. At different times, on both sides of the fence. That doesn't make this account better than a more academic one, just different.

It begins by focusing on the military characteristics and capabilities of Polaris, the intentions of its designers and first purchasers, the US Navy, then proceeds to consider why the British purchased it, and the suitability of Polaris for the tasks demanded by the British. It finally considers the domestic political scene of the mid-1960s, with a new but insecure Labour government, and how an emasculated Polaris missile system survived the enormous changes to the defence industries pursued by that government that culminated in Chevaline.

THE AMERICAN ORIGINS OF POLARIS

Polaris was required by the Americans to fit into the US Strategic Triad. From the early 1960s the nuclear heavy-lifting was done by the heavy bombers of the United States Air Force Strategic Air Command. Polaris had neither the range nor the accuracy to be used in a city-busting role against inland targets. Polaris was not accurate enough to destroy hardened targets, but would have been effective against dispersed surface targets such as airfields, radar and SAM sites, and military and industrial centres of strategic importance. Inertial navigation guided the missile to about a 900 m (3000-foot) CEP, insufficient for use against hardened targets.¹

Polaris was mostly useful for attacking dispersed military surface targets (airfields or radar sites), clearing a path through defences for heavy bombers, although in the general public perception (especially in Britain) Polaris was a second-strike retaliatory weapon.²

The Polaris programme began in 1956 and the first launch from Cape Canaveral in Sept 1968 was followed by a first successful launch from a submarine in July 1960. The A-1 version of Polaris had a range of only 1,000 nautical miles (nm) which put the launch submarine at a severe disadvantage should Polaris be targeted at an inland city, example Moscow, with the submarine's operating area limited to the Barents Sea, a limited area of the Norwegian and North Seas, and the approaches to the Baltic. The Baltic Sea being for practical reasons a no-go area for missile submarines, as was the Black Sea. See the map A-1 range.³



Polaris A1 sea room Target: Moscow

The A-2 missile used the same flawed W-47 warhead rejected by the UK,⁴ and its range was little better at 1,500 nm, limiting the submarine's sea-operating area to the Barents Sea, North Sea and Norwegian Sea east of Iceland. The northern Mediterranean could in theory be a deployment area, but in practice difficult because of the need to transit the Gibraltar Strait undetected, and the great distances from shore support in Scotland. See the map A-2 range.⁵

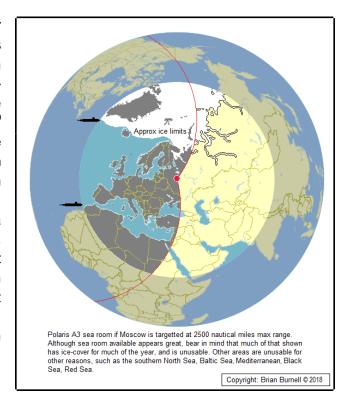
When the final A-3 version emerged, the less than reliable W-47 warhead was replaced with three smaller W-58 warheads, and range was better at 2,500 nm,⁶ with increased sea-operating areas shown at map of A-3 range.⁷ Note that the northern areas of the Indian Ocean are within range of Moscow (SVO). Britain considered basing Polaris in



Polaris A2 sea room Target: Moscow

Fremantle, Western Australia, with submarines transiting to the Arabian Gulf, bringing parts of China into range while retaining an option to target Moscow. Despite the great distance of 3,500 nm from shore support at Fremantle reducing considerably time on patrol. Leningrad was beyond reach from this location, although radar coverage of southern approaches to the USSR was less developed and penetration was likely to be better from this "soft-underbelly" approach.⁸ A more realistic view of Polaris A-3 range taking into account Arctic ice cover is shown below.

Polaris shortcomings in range and its poor accuracy limited use by the US Navy to targets defined as "targets of naval opportunity", such as submarine pens, port facilities, and fixedbased air and missile defences on the peripheral coastal areas of the Soviet Union.9 Areas that were never protected by anti-missile defences. This permitted the Polaris launch submarines the security of operating far from the Soviet Union. The US Navy had in addition to their Holy Loch base on the Clyde, a Forward Operating Base in southern Spain. Operating in the Atlantic from their base at Cadiz Polaris A-3 reach into the Soviet Union was even further limited, with Northern Fleet bases around Murmansk at extreme range, and unable to reach targets in the Caspian Sea. See map. 10



Polaris was no more than a door opener. Used to prise open the doors and neutralize air defences of the Soviet Union for the more vulnerable US heavy bombers, and not intended by the Americans for the purpose of delivering the heavy knockout blows that Strategic Air Command was intended for. For comparison, a similar but non-nuclear role in the Gulf Wars was performed by cruise missiles and stealth aircraft that struck first to neutralise Iraqi air defences before the main airstrikes began. The purpose of the US Navy Polaris force was to clear a safe pathway for the heavy bombers by neutralising peripheral defences, and in that role, A-3 Polaris, unimproved, was an adequate weapon up to the end of its natural lifespan in the late 1980s.

ENTER THE BRITISH

Who were as always, skint. Even so, the UK Defence Budget in the 1950s was up to 10% of GDP. As almost always their lack of funds obliged them to avoid duplicating weapons systems. There was no possibility of a British Strategic Triad. Impoverished by two World Wars the British could afford only one strategic delivery system. Added into that mix was a popular attachment to the air forces and RAF heroes of WW2; national pride in the accomplishments of their post-war aircraft industries, pride in the modern jet-powered V-bombers, and the technologies that spawned them, and a desire to spin-out the lives of those expensive bombers to the max. The Skybolt ALBM (Air Launched Ballistic Missile) carried by Vulcan bombers was to be the vehicle needed for that life extension; and its cancellation by the United States was a heavy blow in terms of domestic politics; the Conservative Party was in open revolt and in the country the Conservative government were increasingly seen as accident-prone.



David Frost
Ned Sherrin
Bernard Levin
Willie Ruston
Lance Percival
Millicent Martin

John Profumo Christine Keeler Lord Home

These were the days of "THAT WAS THE WEEK THAT WAS", David Frost, Ned Sherrin, the satire boom on television, the Profumo affair, Christine Keeler, Mandy Rice-Davies, and an interim, unelected and aristocratic Prime Minister Sir Alec Douglas-Home, the Earl of Home, Baron Home of the Hirsel, who as an arch-appeaser in 1938 had been in Chamberlain's entourage at Munich to meet with Hitler, and was a supporter of Foreign Secretary Lord Halifax, who in 1940 after the fall of France, advocated a deal with the Nazis. In reality a surrender. As interim Prime Minister, Sir Alec's contribution to 1964 economics was the box of matches he did his arithmetic with.



Prime Minister in 1964 Sir Alec Douglas-Home and matches he used to do his arithmetic

There was a resurgent Labour Party led by Harold Wilson, and Wilson's effective and oft-repeated slogan of "Thirteen Years of Tory Misrule" that galvanized his supporters. And on the popular music scene, Bill Haley and The Comets, Elvis Presley and The Beatles. Late in 1964 came the earth-shattering assassination of JFK. Then in my mid-20s and politically active, I remember it well.



Prime Minister Harold MacMillan

Harold Macmillan, SuperMac of redtop tabloid description, scrambled around after the Cuban Missile Crisis in 1962 doing his elder statesman act with President John F Kennedy and emerged, like Chamberlain before him, clutching a promise that the US would supply Polaris in place of the cancelled Skybolt, but with no thought or discussion among the British about whether Polaris met British needs, or any vision of whether Polaris would measure up to the tasks that the British required of it.

Hobson's Choice, and a poor one.

However, that's not the whole truth, because Polaris had indeed been considered and rejected by the Macmillan government an alternative to the flawed Blue Streak MRBM (Medium Range Ballistic Missile) as early as 1959. 11 Conservative ministers asserted in newspaper interviews that despite Polaris being a hard-tolocate mobile system, and despite rudimentary development of Soviet submarine detection systems, Polaris SSBNs would be unlikely to remain undetectable.12



Silo-launched liquid-fuelled Blue Streak MRBM Note the size relative to surroundings

There was also prolonged and bitter opposition to Polaris from the Royal Navy, at a time when Polaris had not yet flown, not even unsuccessfully or from a shore-based pad, and the Navy's understanding of how Polaris might be useful was unlikely to be well-formed.¹³

CAVEAT EMPTOR

The term *CAVEAT EMPTOR* appears to have taken a back seat with the British, for in return for Polaris the US administration wanted a face-saving concession from the British to trade with Congress. So the British conceded that their Polaris force would be assigned to SACEUR¹⁴ (the Supreme Allied Commander Europe is always an American general) and targeting would be done by NATO with UK Polaris strike plans devised by NATO to meet their needs in a war on the continent of Europe, and fully integrated into the Western Alliance nuclear strike plans. In practice that meant that the British Polaris force would be used under American direction, in a similar fashion to US Navy Polaris weapons, targeted on peripheral defences of the Soviet Union with the sole purpose of clearing a pathway for USAF heavy bombers. A task that Polaris was well-suited for, and with an almost zero chance of interception.

THAT PROVISION OF ASSIGNMENT TO THE NATO SACEUR STILL PREVAILS INTO THE TRIDENT ERA. UNLESS THE BRITISH BELIEVE THEIR SUPREME NATIONAL INTERESTS SHOULD OVERRIDE IT.

THE BRITISH HOWEVER, HAD OTHER PLANS

The British had a political requirement for a

NATIONAL NUCLEAR DETERRENT OF LAST RESORT

The Nassau Agreement with President Kennedy included a provision that Polaris could be used independently by the British.

When the British government determined that

SUPREME NATIONAL INTERESTS

were an issue.

A fantastical requirement to engage alone, without allies in strategic nuclear war with the Soviet superpower that seemed, and still seems to many, to defy rationality. There are numerous declassified official sources that state with great clarity that Moscow was the target, the only target, and British national targeting policy after the replacement of the RAF V-bomber force was given its own title of

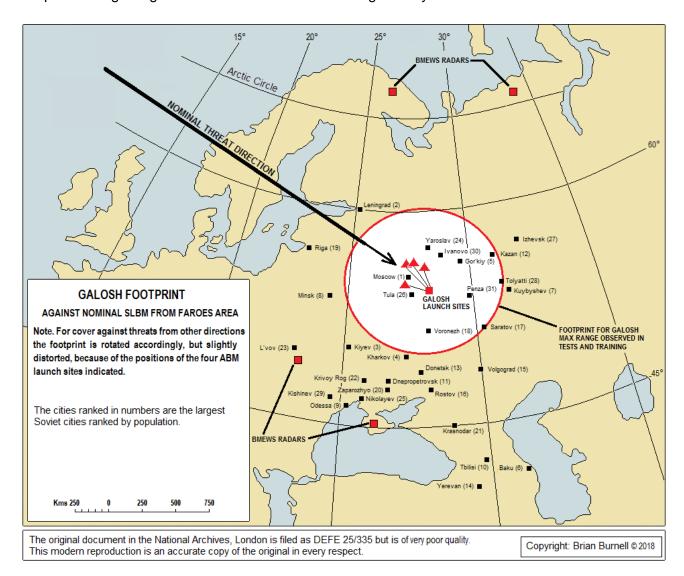
THE MOSCOW CRITERION

THE MOSCOW CRITERION

A strategy to decapitate the Soviet leadership concentrated in and around Moscow

The Moscow Criterion was in essence a strategy to decapitate the Soviet leadership concentrated in and around Moscow.¹⁵

This British national element of the Nassau Agreement rather than the NATO element, allowed British politicians to focus remorselessly on promoting Polaris to the British public as a strategic second-strike retaliatory weapon; despite its origins as a weapon very limited in capability, and despite it being assigned to NATO's SACEUR and targetted by him.



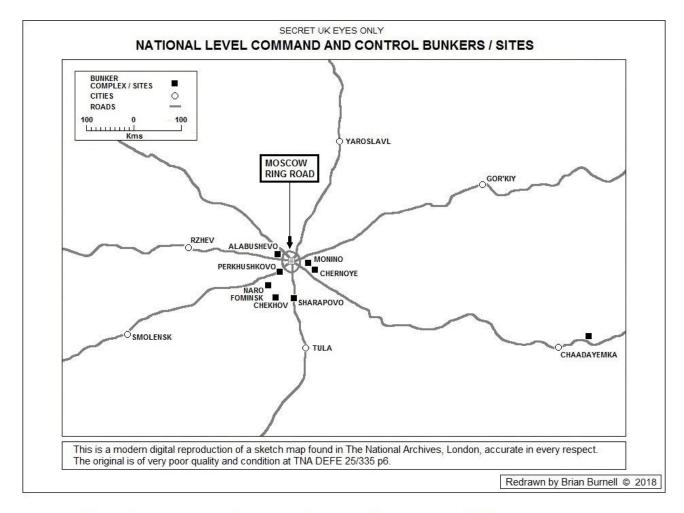
Galosh ABM footprint from DEFE 25/335 found in The National Archives

Polaris was never intended by the Americans to be a weapon that could ever be relied on for a decapitation strike on the Soviet leadership in Moscow.

The Americans didn't design it for that purpose.

Did the British know what they were buying?

Did the British consider the phrase CAVEAT EMPTOR?



Bunker complexes in and around Moscow from DEFE 25/335 found in The National Archives

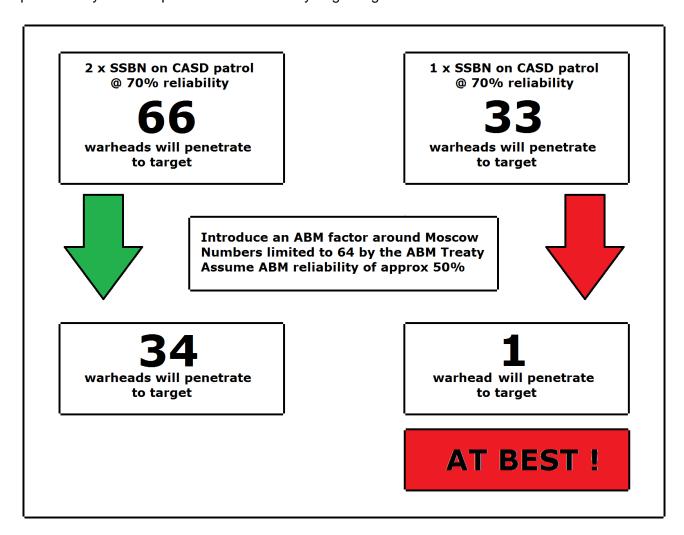
Let's for a moment digress, and consider a scenario from a completely different area of modern life. Medicine, the pharmaceutical industry, and licensing of drugs. The pharmaceutical companies develop, patent and test new drugs designed to treat specific diseases. Drugs that are then licensed to treat those diseases. However a practice has developed where clinicians prescribe drugs for diseases for which the drug was neither designed, tested or licensed. Doctors and patients understand that practice to be at their own risk. However it provides a useful analogy for what the British did with Polaris, for the British used Polaris for a purpose for which it was neither designed or tested, the purpose being to salvage some domestic political credibility after the misconceived Skybolt, and before it the similarly misconceived Blue Streak MRBM; and that sowed the seeds for the expensive Chevaline fiasco.

For by 1960 the British themselves were researching possible Anti-Ballistic-Missile (ABM) systems. So were others including the Americans and the Soviets from 1956. Before Harold Wilson took office in 1964, and four years before the first UK Polaris SSBN entered service, the Soviets had deployed an ABM, displayed it in Red Square, and intelligence, specifications and images were available to Prime Minister Wilson on the first day he took office in No.10. Some of this now declassified intelligence from TNA is illustrated here¹⁶, and here¹⁷, and here.¹⁸

This adequately indicates that issues regarding Polaris penetrability and vulnerability were known of in government circles from the early 1960s; and certainly well before the British took delivery of Polaris A3T missiles; the final production version, with missile, but not warhead components "hardened" against ABM exo-atmospheric radiation, - intense X-rays, - the warhead kill mechanism of ABMs. 19, 20

However, as stated earlier, these were issues of little importance were Polaris confined to the role envisaged by the US Navy and the designers, Lockheed. Because the targets assigned by the NATO SACEUR were related to war on the European continent undefended by ABMs, rather than strategic global war.

Problems arose only when the British chose to use Polaris as their "weapon of last resort"; a National Nuclear Deterrent that was to be used alone, without assistance from allies. In that role, penetrability was compromised from the very beginning.



The arithmetic is unarguable.

However the arithmetic can be overturned by one simple measure.

Never deploy a single Polaris SSBN.

Always deploy at least two British Polaris submarines.

For defence planners there were three principal solutions to the ABM issue.

- 1. Proceed with Polaris Front End Improvement PIP later named Chevaline.
- 2. Upgrade to Poseidon missiles with greater warhead numbers in existing submarines.
- 3. Build a fifth Polaris submarine to ensure two were always available and at sea on patrol.

Many professional naval officers preferred the Poseidon upgrade. That is well documented. Poseidon fitted into existing British Polaris submarines, and was a tried and tested, fully engineered weapon system, with a readily available stock of spare parts off-the-shelf, ensuring commonality with the US Navy. With its heavier throw-weight it could carry up to fourteen warheads with higher warhead post-re-entry terminal speeds and like Chevaline would exhaust Soviet ABM defences even in the small quantities fielded by the British. There were concerns about availability of the MIRV system however. In diplomatic circles there were concerns that Congress would not agree to supply





President Richard Nixon

Secretary of State Henry Kissenger

MIRV technology to the UK, and the Nixon administration, preoccupied with Watergate and the Vietnam War were not in a strong position.

Poseidon, in several formats and with several warhead combinations was eventually ruled out. A blessing perhaps because lacking the MIRV technology, whatever choice of warhead was made they would be unique to the British, who would be stuck with 100% of the front end development and sustainability costs. Costs that were broadly similar to PIP, with the principal difference being that Poseidon costs were (in finance terms) more front-end loaded.

Prior to Harold Wilson taking office, a fifth submarine was favoured by the outgoing Macmillan government. Five were ordered before leaving office, and the interim government of Lord Home endorsed that fifth submarine order before losing the General Election of 1964. Sufficient Polaris A3T warheads were ordered and built to provide outloads for five Polaris boats, plus the usual supply chain spares. Numbers only being reduced later to salvage fissile material as working stock for the Chevaline programme.²⁸

The 1964 incoming government of Harold Wilson had been very critical of the decision to buy Polaris before and during the election campaign and was faced with the choice of continuing the inherited nuclear weapons programme or cancelling, in what were very difficult economic times. Defence budgets had been trimmed by the outgoing government from heights of approximately 10% of GDP. and the incoming Labour government was determined to reduce it much further. By 1974 it was at 5.8% with Wilson pledging to reduce to 4.5% in the following ten years. Wilson's declared policy was to build no further generation of strategic nuclear weapons. 22



Prime Minister Harold Wilson

Wilson's choices were limited. He agreed to continue with two existing nuclear weapons development programmes; the WE.177 tactical weapon for the RAF and Navy; and Polaris; on the spurious grounds that cancellation and the subsequent redundancies would be more expensive than the alternative.²³

Wilson also had other pressing issues to balance. His majority in the House was wafer-thin at four seats. Elderly and unwell Labour MPs were being trollied into the Commons from their hospital beds to vote in Divisions, and Wilson's Cabinet included several nuclear weapon opponents including Richard Crossman, Anthony Crossland and Tony Benn; whose views attracted considerable support in the country.





Antony Crossland

Tony Benn

Richard Crossman

Despite surrounding himself with people such as James Callaghan, Roy Jenkins, Shirley Williams and Denis Healey; acknowledged right-wingers in the Labour Party and key members of his government; Wilson characterised himself as a progressive left-winger and Bevanite,²⁴ a former chairman of the Bevanite group Keep Left.²⁵

Key Bevanites



Richard Crossman

- Intellectual
- 'Keep Left' pamphlet
- Democratic socialism
- 'Third force' foreign policy independent from USA or USSR



Michael Foot

- Later leader of Lab 1980-83
- Fell out after Bevan renounced unilateral disarmament
- Also helped write 'Keep Left' pamphlet - 1947



Harold Wilson

- Resigned from Cabinet with Bevan in 1951 over health service
- Became chairman of Keep Left
- Backed Gaitskell in 1955 against Bevan

With a General Election imminent in 1964, and with Labour opposed to Polaris, the three Service Chiefs and the CDS, Lord Mountbatten, fearing Polaris cancellation, prepared a briefing paper to present to Wilson on assuming office at No.10 in an effort to forestall cancellation.²⁶







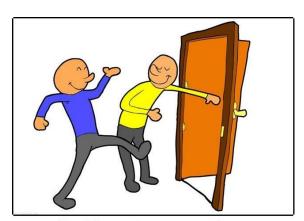


CDS Earl Mountbatten and 1964 Service Chiefs Admiral Sir David Luce Field Marshal Sir Richard Hull Air Chief Marshal Sir Charles Elworthy

Little did the Service Chiefs know that they were really pushing at an open door. For on nuclear weapons issues Wilson was secretly a pragmatist, as the following example illustrates.

Recent material has come to light that Wilson advised the Japanese Prime Minister Eisaku Satō after the first Chinese nuclear test, and immediately prior to the 1964 Tokyo Olympic Games:

"That if [the] other fellow had nuclears it was only common sense to have them oneself".²⁷



Pushing at an open door

Given the recent history of Hiroshima, Nagasaki and the Japanese domestic political context, that comment from Wilson appears bizarre. The syntax appears very Wilsonian too. Although it is doubtful that Wilson, being an astute political operative would ever make such an incautious remark intended for UK domestic consumption.



Japanese PM Eisaku Satō

WILSON HAD AN OPPORTUNITY TO CONTINUE BUILDING A FIFTH POLARIS SUBMARINE.

Cost is unlikely to have exceeded the cost of the preceding ones (£39M each) and a fraction of the eventual cost of Chevaline. However, once the dust had settled and Wilson improved his majority after the 1965 General Election the fifth boat was cancelled 1965.²⁸

A fifth submarine costing perhaps £39 million (plus missiles and staffing, say £80 million total) would have made Chevaline entirely unnecessary, saving the Exchequer £1 billion at 1979 prices.

HOWEVER THERE WERE DOWNSIDES TO A FIFTH SUBMARINE.

- 1. Its funding would be **HIGHLY VISIBLE** both to Wilson's Cabinet dissidents, and an increasingly sceptical and anti-nuclear general public.
- 2. It would damage Wilson's political credibility, and threaten the survival of the Wilson Labour government, with its wafer-thin majority.

Wilson chose to go the PIP route, hesitantly at first, conducting a secret study, HR.169, (most of this being still classified and withheld from the public) then funding the design programme secretly in instalments of six months duration, that could be kept secret even from his closest Cabinet colleagues.

As has now been well documented, PIP developed into the Chevaline programme and ran into significant technical difficulties exacerbated by poor management, itself hamstrung by the practice of funding the project in secret six-monthly instalments. The result was over-expenditure on an heroic scale for an overcomplicated solution to a problem that had a simpler and cheaper solution.

A secondary effect was to keep the Atomic Weapons Research Establishment busily occupied, at a time when there were significant pressures for it to be closed

NEITHER WILSON NOR CALLAGHAN EVER DISCLOSED THAT SECRET PROGRAMME.

It was left to an incoming Conservative government in 1979 to disclose it, horrified at the cost, and determined to never again build a system unique to Britain, in which the UK bore all the design and development and sustainability costs; and never again to get out-of-step with the Americans.²⁸ The Cabinet Secretary and Head of the Civil Service, Sir Robert Armstrong in his briefing to a new incoming Prime Minister in 1979 wrote that:

"It is now generally recognised that the cancellation of our fifth Polaris boat in 1965 was an expensive mistake, without which we might have avoided the costly Polaris improvement programme now nearing completion (Chevaline)".²⁹



Concerned at the cost of the flawed decision to cancel the fifth submarine, the Chancellor of the Exchequer, Sir Geoffrey Howe (and like all Chancellors before him and since, always averse to spending money on defence) advocated upgrading from a technically adequate Trident 1 to a bigger, more expensive, more capable Trident 2, so as to make longer-term savings by keeping in step with American equipment.³⁰

Chancellor Sir Geoffrey Howe

The scientific and engineering history of Chevaline is intensely fascinating, and especially to those involved, who are justifiably proud of their design accomplishments. But that should not obscure the fact that the project was born of domestic politics, for neither the engineers nor the scientists, nor the naval officers and submarine crews tasked with producing Chevaline and deploying it were party to or responsible for the flawed decisions that led to Chevaline. Those flawed decisions were above their pay grades, taken for party political reasons.

Firstly, the fantastical notion that a geographically vulnerable middle-ranking power that is Britain could credibly engage alone in strategic nuclear war with the Soviet superpower. That Britain alone could decapitate the Soviet leadership.

Secondly, that PIP, the Polaris Improvement Programme was initiated for entirely the wrong reasons; domestic political expediency to hide the project and costs from political dissidents in the Cabinet.

A failure of leadership on an heroic scale.

Wilson's motives were clearly to keep his fragile majority together by appeasing his dissident Ministers. Professional naval, scientific and engineering advice was sidelined. PIP later renamed KH.793 and later still Chevaline, was an entirely ill-conceived political project.

Once started and large sums of money secretly committed and spent, it became impossible to stop. Especially since its existence was known to so few.

ADDENDUM.

Readers will note the absence of references to Edward Heath's government from 1970-74. Heath's government, sandwiched as it was between the two Wilson governments, had a role in the Chevaline story, albeit a small one. Much is made of the fact that the first formal order to proceed with design and development was taken by the Heath government, but that is misleading. Much of the analysis and pre-design research was already done by the preceding Wilson government creating an unstoppable momentum. Heath's role was limited to continuing with the secretive sixmonthly drip feeding of funds; fudging a decision to proceed faster; and maintaining secrecy of a project that by the time of Heath's period in office had consumed so much money with so little accountability, and so little to show for it, that it was almost impossible to stop. Heath's administration was also severely hamstrung by the US administration's difficulties with Watergate and President Nixon's eventual resignation. Nixon's Secretary of State Dr Kissinger repeatedly advised the British not to risk Congressional wrath with technology requests. Added to that mix was Edward Heath's obsessive determination to take the UK into the then Common Market.

For Heath, Chevaline technology also represented a possible sweetener to share with the French, who had their own developed missile technology but who were technologically weaker on the frontend technologies represented by Chevaline. Indeed, Heath's government had extensive well documented discussions with the French, including consideration of supplying American nuclear secrets to the French. All of which fortuitously came to nought.

So in this account, Heath's government does not feature. Heath wasn't a party to Chevaline at either the beginning or the end, and took no part in the decisions to initiate PIP, to press it to a conclusion from 1975, the earlier decision to purchase Polaris, or the calamitous decision to cancel the fifth submarine.³¹

Brian Burnell amended 10 April 2019 v2.3

Footnotes.

	1471	HOMOTRILIA
1	Wikipedia: Wikipedia:	UGM-27 Polaris A-1 UGM-27 Polaris Strategic role
2 3	Great Circle Mapper	Centred on Moscow Int Airport for Polaris A-1 searoom (disregarding ice cover).
4	TNA AB 16/4675	Atomic warheads production committee, 1959-65.
•	TNA AVIA 65/912 E45	Use of US Missiles (especially Skybolt) for the British deterrent: CGWLs actions.
	110,1710,1710,070,12,12,10	Flawed on several counts according to DAWRE.
		Excessive amounts of fissile material and lithium-6
		A mechanical safety system that AWRE correctly assessed as dodgy, and later
		proved to be prone to failure, large numbers of warheads requiring re-manufacture.
		See http://www.nuclear-weapons.info/vw.htm#cite_note-vw1530, 31 & 32
5	Great Circle Mapper	Centred on Moscow Int Airport for Polaris A-2 searoom (disregarding ice cover).
6	TNA CAB 196/123	Arrangements for briefing a new Prime Minister 1964.
	TNA DEFE 69/719	Britain's strategic nuclear force: choice of system to replace Polaris.
7	Great Circle Mapper	Centred on Moscow Int Airport for Polaris A-3 searoom (disregarding ice cover).
8	TNA CAB 134/4431 p12	Ministerial Cttee on Nuclear Policy: papers 1966-71. Special circulation documents.
9	Chuck Hansen.	Swords of Armageddon. Vol VII p385. Footnote 1122.
		Polaris targets were initially defined as "targets of naval opportunity," such as
	0 1 0 1 1	submarine pens, port facilities, and fixed-base air and anti-aircraft missile defenses.
	Graham Spinardi.	Why the US Navy Went for Hard-Target Counterforce in Trident II
	Craham Crinardi	(And Why It Didn't Get There Sooner),
	Graham Spinardi.	INTERNATIONAL SECURITY, Vol. 15 #2, Fall 1990, pp. 151, 152. APL TECHNICAL DIGEST. Vol. 13 #1 Jan-Mar 1959.
		50 Years at APL John Hopkins University Applied Physics Lab, Maryland, p126/127
10	Great Circle Mapper	Centred from Cadiz, Spain for Polaris A-3 range.
11	Harold Wilson:	Purpose in Politics. Weidenfeld & Nicolson. 1964. p164-65, 169-70. No ISBN.
12	ibid	p167-79. House of Commons Defence Debate, 27 Apr 1960.
13	Dr AGR Groom	British Thinking About Nuclear Weapons, p539. Pub: Frances Pinter Ltd 1974.
		ISBN 0-903-804-018. Lecturer in International Relations, University College, London.
14	Harold Wilson:	Purpose in Politics. Selected speeches. Weidenfeld & Nicolson. 1964. p165.
	TNA CAB 129/181 c(75)2	1 Statement on the Defence Estimates 1975
15	Dr Tanya Ogilvie-White:	International Institute of Strategic Studies.
		On Nuclear Deterrence: Correspondence of Sir Michael Quinlan.
		ISBN 978-0-415-52165-9
		THE MOSCOW CRITERION - a leadership decapitating strategy.
		Targeting strategy underpinning UK nuclear doctrine for much of the Cold
		War, based on assessments that the UK should have the capability to
		independently strike the Soviet decision-making apparatus concentrated in the Moscow area (in order to destroy the Soviet leadership's capacity to remain in
		control of the Soviet Union in the event of a Soviet nuclear strike on Western
		Europe).
16	TNA DEFE 44/115	Red Square 1965 part 5, Galosh ABM (anti-ballistic missile) fig 8 p3
17	TNA DEFE 44/115	Red Square 1964 part 5, Galosh ABM (anti-ballistic missile) figs 1, 2 & 3
18	TNA DEFE 44/115	Red Square 1964 part 5, Galosh ABM (anti-ballistic missile) figs 4, 5 & 6
19	Dr Kristan Stoddart	Facing Down the Soviet Union. ISBN 978-1-137-44031-0 p253 footnote 113.
20	TNA CAB 134/4431 p3	Ministerial Cttee on Nuclear Policy: papers 1966-71. Special circulation documents.
	TNA CAB 168/27	Improvement to Polaris weaponry. 1970.
		Report by Chief Scientific Advisor on ABM kill mechanisms.
		incoming warheads, following a ballistic trajectory, will be
		affected by the X-rays generated by and spreading from the
		nuclear explosion of an anti-ballistic missile detonated outside the atmosphere What is intended in the ABM system is that the
		spreading X-radiation will penetrate the incoming warhead and
		damage the warhead container, its explosive contents and the
24	TNIA CAD 400/404 1:0/5	components of the firing system.
21	TNA CAB 129/181 I:3/5	Statement on the Defence Estimates.
22	Harold Wilson: TNA CAB 129/181 I:13	Purpose in Politics. Selected speeches. Weidenfeld & Nicolson. 1964. Statement on the Defence Estimates.
	11VA CAD 123/1011.13	" We do not intend to move to a new generation of strategic
		nuclear weapons."
		nation noupono.

23	TNA PREM 19/14	Future of UK strategic nuclear deterrent; Polaris successor; part 1. Spurious because the claimed savings did not include the 30-year life cycle maintenance, repair, mid-life upgrade costs of the submarine, the reactor, the crewing and other staffing costs. Nor did it account for the likely disposal costs of the reactor and other radioactive parts.
24	Wikipedia:	<u>Bevanism</u>
25	Wikipedia:	Keep Left (pamphlet) beginnings and leadership.
26	TNA DEFE 19/103	Weapons Development Committee: Nuclear Sub-Committee: 1964-69
27	US National Archives	National Archives & Records Admin RG59, Central Files 1964-66. POL JAPAN.
		Telegram from the [US] Embassy in Tokyo to the State Department. 29 Dec 1964.
		Subject: conversation with Japanese PM Eisaku Satō. Verbatim extract: Satō launched into problem of nuclear defense, stating his views coincided with those expressed to him by British PM Wilson that if other fellow had nuclears it was only common sense to have them oneself. [The] Japanese public he realised was not ready for this but would have to be educated on this point, and he felt [the] younger generation showed hopeful signs of going this way. Nuclears he had discovered were much less costly than was generally assumed and Japanese scientific and industrial level was fully up to producing them. I'm indebted to Prof Yoko Iwami, Professor of International Relations at GRIPS (National Graduate Institute for Policy Studies), Tokyo, for this material.
28	TNA DEFE 25/325	Deterrent Successor Systems.
29	TNA PREM 19/14	Future of UK strategic nuclear deterrent; Polaris successor; part 1.
30	TNA DEFE 24/2126	Nuclear policy: UK strategic nuclear deterrent (Trident D-5 decision).
	TNA PREM 19/159	Future of UK strategic nuclear deterrent; Polaris successor; part 2.

Questions from the conference audience afterwards.

Of questions from the floor, there was one on the nature of deterrence that deserves a fuller answer. This response is broadly similar but less eloquent than the answer Sir Michael Quinlan gave in a paper found in the National Archives.

- 1. In my view the Soviet leadership was always rational. They were tragically familiar with global war and huge loss of life and economic resources. They had no desire to repeat that or to commit suicide. That in a game of geopolitical chicken they would blink first as Khrushchev did in the Cuban Missile Crisis, Whatever the tactical circumstances were, Khrushchev didn't want a nuclear war.
- 2. Throughout the Cold War, British assumptions were that the Soviets would always be rational rather than otherwise, whatever we or others did. The USSR had lost over 20 million people in the war against the Nazis even with help from us and the United States. They didn't want to repeat that. Neither would they tolerate German rearmament on a nuclear scale and would surely move to pre-empt it. That isn't lost on the Germans and in part explains German support for the next best thing to a German bomb, a British bomb.

Among the letters found in the National Archives is one from the German Chancellor Helmut Schmitt to Margaret Thatcher in support of the UK decision to purchase Trident.²⁶

A key British objective was to convince the Soviets that Britain wouldn't always take the rational and sensible course. The Soviets knew that in Britain's long history of conflict the British have often done what they did in 1940 (to list one example). In 1940 the rational and sensible course would have been to do a deal, as Lord Halifax advocated. That deal was really a surrender and represented an existential threat to Britain. The Cabinet rejected that deal and instead chose to resist the Nazis, even though at that time it appeared to many to be irrational and would probably end in a German invasion and military defeat.

There had been other similar existential threats since the time of the Armada, Drake and Queen Elizabeth, and England had always resisted. Another example being Thatcher's response (against all the military odds) with the Falklands, and later the first Gulf War when Thatcher cautioned Bush Senior from going wobbly.

The Soviets knew that history of resistance and would take British resolve into account in their own response.

- 4. On the other hand, the Soviets would likely take a different view of French and American resolve. The French were not unfamiliar with military defeat, with collapses in civilian morale, and even mutiny in their army in wartime. That would be part of Soviet thinking and the likely responses from the French to an existential threat. The Americans had never experienced significant threats to their home territory other than Pearl Harbor, nor any bombing of American cities. They had never been exposed to an existential threat. Likely American resolve was less certain than the British.
- 5. Given all of that, the UK had to convince the Soviets that in extremis, as in 1940, the British would stand their ground, would not flinch, that we would be irrational enough to push the button, because to push the button would be an act of such insanity that no rational opponent would

contemplate it, and would blink first. And that in my view, - unproveable though it is, - is why the Cold War never became a Hot War. With some help from submariners.

6. The Soviets knew, as we knew, that Britain alone could not defeat the Soviet superpower. However they also knew, as everyone else and the dogs in the street knew, that a successful nuclear strike on the Soviet leadership would so weaken it as to leave the USSR helpless to resist other predatory opponents in both the Americas and the Far East. They would likely lose large parts of their Siberian empire and others in the west would break free of the Soviet yoke. Classical military history has shown repeatedly that an apparent victor is so weakened by conflict with a weaker opponent that it itself gets devoured by other dogs slavering on the touchline.

However, as I wrote at the beginning, not as eloquently put as the version written by Sir Michael Quinlan.

Brian Burnell amended 10 April 2019 v2.3

Q: So what was the purpose of Chevaline?

A: To exhaust and confuse the Russian defences

Verbatim quote from TNA DEFE 69/1265 E2 Annex A page 9 declassified 21 July 2017.

The essence of Chevaline is to confuse and exhaust the powerful but limited defences in the Moscow area by presenting, from one SSBN, a pattern of objects all of which appear to threaten Moscow. The objects are two re-entry bodies (ReBs) and a large number of decoys from each missile; the ReBs are hardened and separated in space to preclude the possibility, or indeed the feasibility, of any single ABM destroying both, and the decoys are designed so as to make discrimination between them and the ReBs by radar very difficult. To be certain of destroying the ReBs, the Russians would have to fire such a large number of ABMs at the threat posed by each Polaris missile that exhaustion of the defences would occur well before the arrival of the later missiles.

An illustration appears overleaf.

Q: Was there another simpler, cheaper alternative?

A: Yes.

Build a fifth submarine and keep two subs with 32 missiles and 96 warheads always at sea. That solution would also exhaust the Russian defences before later missiles arrived.

