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BRITISH NUCLEAR WEAPON STOCKPILES 1953—1978

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William Hague told the House of Commons on 26 May 2010 that he was, 'pleased to announce today that, for the first time, the Government will make public the maximum number of nuclear warheads that the United Kingdom will hold in its stockpile-in future, our overall stockpile will not exceed 225 nuclear warheads. This is a significant step forward on previous policy, which was to publish only the number of warheads classed as "operationally available", the maximum number of which will remain at 160. We believe that the time is now right to be more open about the nuclear weapons that we hold.'² So for the first time in almost sixty years as a nuclear weapons state, the UK has released a Ministerial statement on its total nuclear weapons stockpile; this represented a radical departure from previous practice where total stockpile numbers were a closely held secret. It is perhaps now timely to look also at historical holdings of UK nuclear weapons to see what sort of picture can be painted drawing on official papers at The National Archives at Kew.³

¹ Dr Walker works in the Arms Control and Disarmament Research Unit, Foreign and Commonwealth Office. His book *British Nuclear Weapons and Test Ban 1954—1973 Britain, the United States, Weapons Policies and Nuclear Testing: Tensions and Contradictions* was published by Ashgate in 2010. A follow-up book, *Britain and Disarmament: The UK Nuclear, Biological and Chemical Weapons Arms Control and Programmes 1956—1975* will also be published by Ashgate – forthcoming.

² Hansard, Oral Answers, column 181, 6 May 2010.

³ The bulk of the research for this paper was originally done as part of the AHRC funded project at the Mountbatten Centre, Southampton University on the history of the UK nuclear weapons programme 1954—1976: see <http://www.mcis.soton.ac.uk/programmes/bnhistory.php>. The views expressed here are the

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There are many files available at Kew containing information on the plans and requirements for, and historical holdings of, UK nuclear weapons stockpiles from the early days of the programme right up until the end of the 1970s. Information is scattered across a diverse range of records from the main government departments (Ministry of Supply, Ministry of Aviation, Air Ministry, Ministry of Defence and Cabinet Office) involved with nuclear weapons issues and the various branches within them. Piecing together the jigsaw is a demanding task as there is no one piece of paper that provides a single authoritative overview and there is of course the nagging doubt that possibly key pieces of the jigsaw are still missing. Definitional issues are also a problem: what is a nuclear weapon? There were weapons deployed to the RAF and Royal Navy, but there were also surveillance rounds and even spare components (nuclear and non-nuclear) such as fissile cores and aircraft bomb tail assemblies. Constantly changing plans and requirements are other significant complexities to disentangle. Establishing the facts is thus inordinately difficult from the available historical record.

The following table is the first attempt to compile as accurate a picture as possible of the different types of British nuclear weapons and their numbers from November 1953, when the first weapon was made available to the RAF at Wittering to 1978 when the total UK stockpile appears to have been at, or close to, its highest level in terms of total numbers produced. This table is also an initial contribution to the promotion of greater transparency on historical

author's own and not necessarily those of the Foreign and Commonwealth Office. The author is also grateful for advice and comments on this article from Richard Moore and Brian Burnell.

aspects of nuclear weapons stockpiles based on official records – a factor that may assume greater significance as further progress is made towards the goal of nuclear disarmament. It also highlights that there are inevitably gaps in the historical record and the scale of the task in compiling detailed, comprehensive and accurate accounts spanning an almost thirty year period.

It has proved slightly easier to provide accurate figures for deliverable nuclear weapons in the 1958 to 1964 period as Richard Moore has shown in his recent book *Nuclear Illusion Nuclear Reality* published by Palgrave in 2010. Appendix 1 of this book provides a breakdown of the numbers of each weapon type and the total stockpile numbers for each year. Britain's stockpile increases from 63 weapons in 1958 to 264 in 1964.⁴ As this present study shows, the UK stockpile was to expand to a maximum size of about 400 warheads by the late 1970s with the major overall expansion in total numbers coming in at the very end of the 1960s and early 1970s. The early weapons were expected to have a short shelf-life as the consequences of ageing were unknown at that time; it was only the WE177 weapons and Polaris warhead that had much longer life-spans.

In addition to the points mentioned above, there are several important caveats to bear in mind when reading the table:

- Information is taken and pieced together from declassified papers in

The National Archives or other official histories or statements: no

⁴ Richard Moore, *Nuclear Illusion, Nuclear Reality Britain, the United States and Nuclear Weapons, 1958-64* (Palgrave, 2010), p.256

closed records were used. There are still gaps and uncertainties, so this represents the best estimate from these sources.

- Some of the information is based on inference from the available sources.
- There is a distinction in the UK system between weapons deployed to the RAF and Royal Navy and those held as spares to cover for maintenance cycles.
- Using papers covering many years and from several government departments often reveal apparent contradictions; these can be partly explained by changing plans and requirements, often caused by budgetary retrenchment.
- The detailed footnotes reveal the sources of information – some of which are historical accounts written some years later at the time of its writing; in other words looking back to previous reports and understandings. Others were statements were on intentions and plans, which were apt to change as circumstances changed and it is not clear whether all plans were fully implemented.
- Further research might be able to reveal a more detailed breakdown for the whole period for the numbers and types of weapons held in particular years – we have this for only parts of the period under review and it is possible that still retained, or yet to be released papers may have the full answers. There is however a timetable of the planned figures for WE177A and C production from the later 1960s to the mid 1970s, which envisaged roughly two weapons per month being completed and made available to the RAF. At the initial part of this

period the second generation bomb, Red Beard, and first thermonuclear warhead - Red Snow - were being withdrawn from service and broken down. Recovered fissile material was reused in the WE177s, and probably in the Polaris warheads too, but there does not appear to be clear material from the archives that shows the actual withdrawal and dismantlement timetable for each year.

- The views and interpretations expressed are the author's own and not necessarily those of HMG.

Clearly more work is required to build a detailed review of UK nuclear weapons holdings for each year and to clarify some of the current uncertainties and possible inaccuracies; we also need to look into figures for Chevaline warheads as these are just beginning to become available at Kew.⁵ We know, for instance, that the first outload of Polaris missiles was limited to 12 missiles with two warheads, but as of yet there are no details on total number of warheads built and how many were planned in total.

⁵ See The National Archives DEFE 23/222 UK strategic nuclear deterrent: options, Chevaline Project and Production Progress in the DCDP (IV) Area up to 15 October 1980.

BRITISH NUCLEAR WEAPON STOCKPILES 1953—1978

WEAPON/WARHEAD	IN SERVICE	ORDERED	DEPLOYED	SPARES	SURVEILLANCE	YIELD	PROBABLE TOTAL PRODUCED	IN SERVICE 1978
1 BLUE DANUBE MK1, II AND III	1953-1962	100 ¹	57/58 ²	UNKNOWN	UNKNOWN	10/16 Kt ³	57/58	0
2 RED BEARD MK 1 AND II (RAF & RN)	1960-1973	127/142 ⁴	127/142 ⁵	(17 ⁶)	12 ⁷ /6	15 Kt ⁸	142	0
3 VIOLET CLUB (GREEN GRASS) ⁹	1958-1959 ¹⁰	13 ¹¹	5 ¹²	0	0	400 Kt ¹³	5	0
4 YELLOW SUN MK1 (GREEN GRASS)	1959-1962 ¹⁴	37 ¹⁵	22 ¹⁶ /37	UNKNOWN	12 ¹⁷	500 Kt	37 ¹⁸	0
5 RED SNOW WARHEAD ¹⁹	1961-1971	120/134 ²⁰	123/131 ²¹	UNKNOWN	UNKNOWN	1 Mt	134	0
6 (a) YELLOW SUN MK II	1961-1967 ²²	96 ²³	83 ¹⁶	UNKNOWN	UNKNOWN	1 Mt	96	0
7 (b) BLUE STEEL ²⁴	1962-69 ²⁵	57 ²⁶	40/48 ²⁷	1	1 ²⁸	1 Mt	40	0
8 WE177A (RN)	1969-1991 ²⁹	60/62/63 ³⁰	35 ³¹	8 ²⁹	3 ³²	0.5Kt/10 Kt ³³	43	43
9 WE177A (RAF)	1969-1998	44 ³⁴	44	10 ³⁵ /8 ²⁹	4 ³⁰	10 Kt	44/64 ³⁶	44/64 ³⁷
10 WE177B	1966-1995	53 ³⁸	48	5	6	450/500 Kt ³⁹	53	53
11 WE 177C	1972-1995	125 ⁴⁰	115 ³³	10 ³³	4 ³⁰	190/200 Kt ⁴¹	125 ⁴²	125 ⁴³
12 POLARIS ET 317	1968-1982 ⁴⁴	160(?)	144 ⁴⁵	16 ³⁷	UNKNOWN	500 Kt ⁴⁶	160	160
TOTAL								c400 ⁴⁷ /425

¹ The National Archives (TNA) AVIA 65/1792, History of atomic weapon production, 1963. 100 was the requirement as it stood in March 1955

² There were apparently cores for 58 weapons. Storage facilities for 48 weapons were built at both RAFs Barnham and Faldingworth and ten weapons at four RAF stations – See TNA AVIA 65/1160 and Wayne D.Cocroft and Roger J.C.Thomas Edited by P.S.Barnwell, *Cold War Building for Nuclear Confrontation 1946–1989*, English Heritage, Swindon, 2004, page 30.

³ TNA AVIA 65/1160, Bomb Aircraft H.E. 10,000 lb M.C., D.A.W.D.P, Ministry of Supply to *miscellaneous addressees*, 22 February 1957; TNA AIR 8/2469, William Cook, AWRE to E.S.Jackson, DGAW, Ministry of Supply, 27 June 1956. The initial order for 19 weapons called for yields of 10 kilotons - see TNA DEFE 19/45, Confidential Annex to COS (53) 9th Meeting, Atomic Weapons, 20 January 1953.

⁴ TNA AVIA 65/1792, History of Atomic Weapon Production, DAWP 1963. 122 were delivered to the RAF by December 1962, along with 35 for the Admiralty. However another source makes clear that there were 91 Mark Is and 36 Mark II versions ordered – in the later case that was at least a proposal. TNA AIR 2/13774, R.J.Penney, Air Ministry to C.W.Fogarty, Treasury, 10 February 1960.

⁵ TNA AVIA 65/1792, History of Atomic Weapon Production, DAWP 1963. Other references suggest that there were 110 RAF weapons, but by the end of the 1960s there appear to have been 94 still in service – see TNA AIR 2/18210, Nuclear Weapons policy, 1969–1970.

⁶ TNA AIR 6/117, Air Council memoranda, 1-104, 1959.

⁷ These were drill weapons for training RAF/RN ground crews; the round had the same shape, dimensions and centre of gravity. Surveillance weapons were identical to service weapons except that the fissile components were replaced with inert materials such as brass or depleted uranium. See TNA AVIA 65/1792.

⁸ TNA AVIA 65/1155, Nominal yield of service designs, C.W.Shaw, ADAW (D) 1 to DD OR2, 28 November 1956.

⁹ Green Grass was a large fission only weapon using large quantities of highly enriched uranium. It was based on an AWRE design known as Knobkerry. Richard Moore, *UK Nuclear History Working Paper Number 1, The Real Meaning of the Words: a Pedantic Glossary of British Nuclear Weapons*, Mountbatten centre for international studies, http://www.mcis.soton.ac.uk/Site/Files/pdf/nuclear_history/Working_Paper_No_1.pdf.

¹⁰ The Violet Clubs were converted into Yellow Sun Mk IIs between April and August 1959, TNA AIR 6/117, Air Council Memoranda 1959, Progress Report on Nuclear Weapons Appendix AC (59) 7, 13 January 1959.

¹¹ Number of interim weapons originally estimated at 16; reduced to 15 so Admiralty could have some highly enriched uranium and further reduction to 13 due to the additional megaton trials - see TNA AIR 2/13718, Interim Megaton Weapons, DGAW to DCAS, 19 September 1957.

¹² TNA AVIA 65/1218, C.H.B.Bullock (Group Captain) D.A.W.A.P. to S.S.W.P/A.W.R.E, Violet Club Production, 18 November 1958.

¹³ AWRE recalculated yield of Green Grass at about 400 KT with a possible variation of +/- 15% between rounds. (Megaton range defined as 500 KT and above), TNA AIR 2/13705, Green Grass Warhead, A. Smith DD OR2 to DD Ops B.

¹⁴ Last minute delays in Yellow Sun clearance resulted in service taking delivery of a total of five Violet Clubs; deliveries of Yellow Sun in January 1959 conversion of Violet Clubs to Yellow Sun should start in April to be completed by August. TNA AIR 6/117, Air Council Memoranda 1959 Progress Report on Nuclear Weapons Appendix AC (59) 7, 13 January 1959.

¹⁵ TNA AVIA 65/1792, History of atomic weapon production, 1963.

¹⁶ Production of Green Grass was due to cease at No 22 in March 1960 with all further Yellow Sun deliveries being Mk 2, the first of which was planned for mid 1960 - see TNA AIR 2/13705, Yellow Sun policy, 1957—1966..

¹⁷ TNA AIR 2/13705, Yellow Sun – Application Policy, G.M.Brisbane, ADDOR 2 to DD Ops (B) OR 1136, 2 August 1957.

¹⁸ TNA AVIA 65/1992, History of Atomic Weapon Production, DAWP, 1963.

¹⁹ Red Snow was the megaton warhead used in both Yellow Sun Mk II and Blue Steel.

²⁰ Production order for Red Snow was cut down from 144 to 134 leading to a surplus of ten carcasses – see TNA AIR 2/13705, P.R.M.Groom to Ops (B) 3 July 1962. There also appears to be a discrepancy in production orders between warheads and carcasses. The 120 figure comes from TNA AVIA 65/1792,

²¹ This is an estimate based on fact that the frontline V-force was under 100 aircraft and that the force was shared between Yellow Sun Mk II and Blue Steel.
²¹ Red Snow warheads were converted to use in Blue Steel, thus rendering 21 Yellow Sun carcasses surplus to requirements. See TNA AIR 2/13705, E.D.Crew A/D of ops (B & R) to Head of S.9, 27 July 1964.

²² TNA AIR 2/13705, W.J.Stacey DD Ops (B) RAF to DD OR 10 (RAF), 18 May 1966 – originally meant to be returned by end of July, but extended to end December 1967. WE177B served as replacement.

²³ TNA AVIA 65/1992, History of Atomic Weapon Production, DAWP 1963. Figures as of December 1962.

²⁴ TNA AIR 2/13705, E.D.Crew A/D of Ops (B & R) to Head of S.9, 27 July 1964 notes that, 'Bomber Command transferring Red Snow warheads from Yellow Sun 2 to Blue Steel to match the front line force of Blue Steel aircraft. By the end of 1964 the transfer should be completed and about 21 Yellow Sun carcasses will become surplus to op requirements.'

²⁵ Humphrey Wynn, *RAF Nuclear Deterrent Forces*, HMSO, London, page 631.

²⁶ The figure here represents missiles, **not** warheads. TNA AIR 19/1014, Draft Memorandum by the Minister of Aviation, Blue Steel. Defence Committee D. (62) 1st meeting, 12 January 1962.

²⁷ TNA AIR 2/17065, BS Post-Acceptance Launch Programme Annex to Memo AF/TF661/64/DDOR9 (RAF) dated 8 January 1965; Humphrey Wynn, *RAF Nuclear Deterrent Forces*, HMSO, London page 217 states that only 5 V-bomber squadrons were fitted with Blue Steel i.e.40 as the Unit Establishment for a squadron was eight aircraft. See also TNA AIR 6/152, Future Nuclear Warhead Programme for the V-Force, Annex C to AC (63) 9, 1963.

²⁸ TNA AIR 20/1080, Blue Steel: Nuclear Warheads 1959-1963, D.A.J.West to AUS (A), 19 December 1962.

²⁹ TNA PREM 13/3126, Deployment and Movement of Nuclear Weapons 1964-1970, Secretary of State for Defence to Prime Minister, 16 June 1969. The tactical nuclear weapons Red Beard was now becoming obsolescent and unstable for low level tactical work.

³⁰ TNA AIR 2/17372, R.Haynes (AUS (AS) to ACAS (Pol), draft submission from Chief of the Air Staff to Secretary of State, 26 November 1968. The order for the WE177A for the Royal Navy was placed in 1966 and completed in December 1968. The order for the RAF weapons was delayed pending decisions on the strike force size. TNA AIR 2/18209, (Requirements for WE177 A background Note Annex B to ACAS (Pol)/A890 dated 7 January 1969). Some of the naval orders were converted to RAF use.

³¹ TNA DEFE 69/464, Defence Review – Nuclear Matters, Annex A to DN plans SF, Dated 17 April 1974 in Assistant Director of Naval Plans (Polaris) to CFS Co-ord et al, The Annex showed DN Plans understanding of present and planned future policy relating to the 600 lb bomb.

³² A table in TNA DEFE 72/152, WE177 nuclear bomb; life storage programme, including surveillance 1973-74 implies that there were seven (3 RN and 4 RAF) in the programme for 1972-1984. T.P.O'Callaghan, Hunting Engineering Limited, Post Development Services to MOD, WE177 Surveillance and Life Evaluation Programme 25 October 1973 – see also C.J.Richards, WD2/SSDW AWRE to Mr T.P.O'Callaghan, PDS Hunting Engineering Ltd, WE177 Annual Report – Period 1 July 1974 to 30 June 1975, 18 August 1975 which clearly refers to seven rounds (three Royal Navy and four RAF) and their then status.

³³ TNA DEFE 69/464, Annex A to DN plans SF Dated 17 April 1974 in Assistant Director of Naval Plans (Polaris) to CFS Co-ord et al, Defence Review – Nuclear Matters, notes that the Navy principally used its WE177As as anti-submarine bomb and embarked 14 Buccaneers on HMS Ark Royal (presumably in a strike role). This would imply that of the 35 WE177As deployed at sea 21 were in the ASW role. 18 weapons were embarked on HMS Ark Royal, seven each on HMS Tiger and Blake and nine on HMS Hermes.

³⁴ TNA AIR 2/18209, Chief of the Air Staff to Secretary of State Nuclear Weapons for the RAF Chief of the Air Staff, 24 January 1969; TNA AIR 20/12080, Nuclear Weapons policy 1967-1969, J.G.Mathews, DD Ops (S) RAF to DD Mech Eng 3 (RAF), Future deployment of nuclear weapons – Availability of Existing SSAs for conversion to other purposes; British Nuclear Weapons in Germany D.C.Humphreys, Head of DS 9, 27 September 1968; J.D.Thirlwell, *AVD of Ops (B&R) (RAF) to D Air Plans, WE177A – Weapon Requirement*, 21 November 1967; TNA DEFE 19/125, Production of weapons and fissile material 1964 Jun 01 – 1969 March 31, see also papers in TNA AIR 2/18209 and TNA AIR 2/18210 and TNA AIR 20/12080, AIR 20/12198 and AIR 20/12199 that

state that the RAF ordered 56 plus 8 spares. There is also the question of conversion of WE177As to WE177Cs. See TNA DEFE 19/191, Minutes of Warhead Safety Co-ordinating Committee, 20 January 1975, which noted that, '... a certain number of ET.317 (i.e. Polaris) warheads broken down for re-use of the secondaries in KH 793 (i.e. Chevaline) would be subjected to detailed examination; the same would apply to any WE177A rounds converted to WE177C.'

³⁵ TNA AIR 2/18209, D.C.Humphreys, Head DS 9, to ACAS (Pol), 16 January, WE177B Supplementary Qs on WE177 submission. Ten spares were needed based on experience and UKAEA advice to ensure required number of operational weapons always available in fully serviceable condition; provided stockpile of spares to allow for safety and reliability testing over period of weapon service life. This rule of thumb is used here to estimate the likely numbers for the WE177C.

³⁶ It is not clear whether the RAF's full order was fulfilled or whether it was made up from the 20 transferred from the RN order. If the Macklen figure is the baseline, then we should assume that the order was made of up of 20 transferred from the Navy. This leads to a figure closes to 400.

³⁷ TNA AIR 2/18209, The Royal Navy had 63 WE177As on order for strike and anti-submarine operations in 1966. There was also agreement for RAF to place initial order for 44 WE177As. Following agreement the Royal Navy ceased to operate maritime strike aircraft in 1972, and the RAF took over the order for last 20 weapons.

³⁸ Production of the WE177B began in November 1965 in order to meet an in-service date of June 1966, which slipped to September. Humphrey Wynn, *RAF Nuclear Deterrent Forces*, HMSO, London, page 462 and page 87.

³⁹ TNA AIR 2/18209, Chief of the Air Staff to Secretary of State Nuclear Weapons for the RAF, 24 January 1969. Other sources in TNA DEFE files state 450 kilotons.

⁴⁰ TNA CAB 134/4431, Tactical Nuclear Weapons for the RAF, NP (72)1, 11 February 1972.

⁴¹ TNA AIR 2/18210 J.G.Mathews, DD Ops (S) (RAF) to DD Air Plans, RAF Germany Buccaneer Strike Capability, 15 October 1970. See also TNA CAB 134/4431, Tactical Nuclear Weapons for the RAF NP (72)1, 11 February 1972. This proposed that the plan was to have two weapons per aircraft for the Buccaneers in Germany and the UK and one per Jaguar in Germany only. The total requirement on this basis was for 175 weapons, including 15 for servicing purposes of which 110 would be for the Buccaneers and 65 for the Jaguars. Completion of the order was planned to be in 1976/77.

⁴² TNA DEFE 69/464, Chiefs of Staff Committee Defence Policy Staff, DP 13/74 (Final), 7 June 1974. The 1974 Defence Review (Nuclear Aspects) Report by the Directors of Defence Policy notes that one of the options in the defence nuclear review was to abandon all the UK's tactical nuclear weapons - this was Option 4. However, the Chiefs of Staff considered, 'that the RN/RAF tactical weapon programme should continue to complete the present programme and we reject saving Option Four.' This report also noted that the programme to produce an increase in the number of weapons was to be completed in 1976—77.

However, with a production rate at two weapons per month (see footnote 44), there would only be 101 by the end of 1977 unless the production rate were slightly increased to give 125.

⁴³ Some WE177As orders were converted into WE177Cs. In correspondence with the author, Richard Moore believes that the figure could have been 14.; TNA AIR 6/194, Annex D to AF/s200/10 dated 15 October 1976, Air Force Board Standing Committee RAF Policy and Programmes (Note by DUS (Air) states that by October 1976 the RAF committed 48 Vulcans, 12 UK based Buccaneers, 24 RAF Germany based Buccaneers and 60 Jaguars; all equipped with British nuclear weapons. Papers in TNA AIR 8/2785 say that each aircraft was allotted one sortie with a few weapons spare.

⁴⁴ The scheduled in-service date was planned for June. TNA CAB 134/2241, Nuclear Requirements for Defence Committee, Draft British Programme of Underground Nuclear Tests 1965/66. Note by the UK Atomic Energy Authority, AWRE, 9 December 1964.

⁴⁵ TNA DEFE 19/191, Tactical Outload Requirements for the UK Polaris Force, D.C.Fakley, Head D Sc 6 to DAWD, DAWP & F, AWRE, 21 February 1975, states that it would be sufficient to maintain three complete tactical outloads plus one spare partial tactical outload for both A3T and A3TK Polaris missiles. "Partial" *might* mean one-third as assumed here. Another source refers to a force of 4 submarines and a total of about 200 warheads ...' TNA FO 371/184413, Atlantic nuclear force 1965 WJUN 1192/295/G, The Provision of British Warheads for the Atlantic Nuclear Force, draft paper by the Ministry of Defence for the DOPC Sub-committee on the ANF, July 1965; R.J.Andrew, MOD to E.J.W.Barnes, Foreign Office, 13 July 1965.

⁴⁶ TNA AVIA 65/1771, Defence Committee on Nuclear Requirements 1959-1963, Brief for meeting or NRDC on 30 October 1963, 28 October 1963.

⁴⁷ Victor Macklen, DCA (PN), MOD, '... about 400 warheads ...' TNA DEFE 19/240, Record of a Meeting with Dr Frank Press, Presidential Adviser on Science and Technology, 16 February 1978.