



British Nuclear Weapons and the Test Ban 1954–1973

Britain, the United States, Weapons Policies and
Nuclear Testing: Tensions and Contradictions

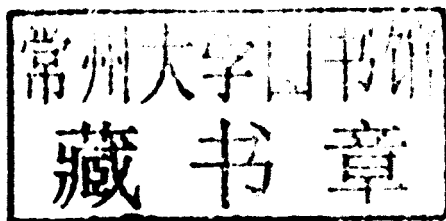
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Nuclear Testing: Tensions and Contradictions

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ASHGATE

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List of Abbreviations

ABM (T)	Anti-Ballistic Missile (Treaty)
ACDA	Arms Control and Disarmament Agency
ACSA (N)	Assistant Chief Scientific Adviser (Nuclear)
AWRE	Atomic Weapons Research Establishment
CCD	Conference of the Committee on Disarmament
CDS	Chief of the Defence Staff
CTBT	Comprehensive Nuclear Test Ban Treaty
DARPA	Defence Advanced Research Projects Agency
DGAW	Director General Atomic Weapons
DOD	Department of Defense
DOP (O) C	Defence and Overseas Policy (Official) Committee
DRPC (AES)	Defence Research Policy Committee (Atomic Energy Subcommittee)
ENDC	Eighteen Nation Disarmament Committee
FCO	Foreign and Commonwealth Office
FO	Foreign Office
HE	High Explosive
HEU	Highly Enriched Uranium
HMA	Her Majesty's Ambassador
HMG	Her Majesty's Government
IAEA	International Atomic Energy Agency
JCCAE	Joint Congressional Committee on Atomic Energy
JCS	Joint Chiefs of Staff
JOWOG	Joint Working Group
MIRV	Multiple Independently-targetable Re-entry Vehicles
MOD	Ministry of Defence
MOU	Memorandum of Understanding
MRC	Medical Research Council
NATO	North Atlantic Treaty Organisation

NPT	Non-Proliferation Treaty
NRDC	Nuclear Requirements for Defence Committee
NTAC	Nuclear Tests Advisory Committee
NTPC	Nuclear Tests Policy Committee
PNE	Peaceful Nuclear Explosions
PTBT	Partial Test Ban Treaty
RAE	Royal Aircraft Establishment
REB	Re-entry Body
ROF	Royal Ordnance Factory
SAGW	Surface to Air Guided Weapon
SALT	Strategic Arms Limitation Talks/Treaty
SLBM	Submarine Launched Ballistic Missile
SPS	Single Point Safety
SRPAG	Seismic Research Programme Advisory Group
UKAEA	United Kingdom Atomic Energy Authority
ULMS	Underwater Long-range Missile System
UNDC	United Nations Disarmament Commission
UNGA	United Nations General Assembly
USAEC	United States Atomic Energy Commission

Chronology of UK Nuclear Tests, Testing Moratoria and Test-Ban Treaty Negotiations 1952–1974

1952

3 October UK nuclear test (25 kilotons), Hurricane, Montebello, Australia.

1953

15 October UK nuclear test Totem 1 (10 kilotons), EmuField, Australia.
27 October UK nuclear test Totem 2 (8 kilotons), Emu field.

1956

16 May UK nuclear test Mosaic (15 kilotons), Montebello.
19 June UK nuclear test Mosaic (60 kilotons), Montebello.
27 September UK nuclear test Buffalo One Tree (17 kilotons), Maralinga, Australia.
4 October UK nuclear test Buffalo Marcoo (> 2 kilotons), Maralinga.
11 October UK nuclear test Buffalo Kite (3 kilotons), Maralinga.
22 October UK nuclear test Buffalo Breakaway (16 kilotons), Maralinga.

1957

15 May UK nuclear test Grapple Short Granite (300 kilotons), Malden Island.
31 May UK nuclear test Grapple Orange Herald (c800 kilotons), Malden Island.
19 June UK nuclear test Grapple Purple Granite (200 kilotons), Malden Island.
2 July UK proposes technical studies on control
14 September UK nuclear test Antler Tadge (1 kiloton), Maralinga.
25 September UK nuclear test Antler Biak (6 kilotons), Maralinga.
9 October UK nuclear test Antler Taranaki (25 kilotons), Maralinga.
8 November UK nuclear test Grapple X (1.8 megatons), Christmas Island.

1958

- 31 March Soviet Union announces suspension of its test programme.
- 28 April UK nuclear test Grapple Y (3 megatons), Christmas Island.
- 1 July–
- 22 August Conference of Experts to Study the Possibility of Detecting Violations of a Possible Agreement on Suspension of Nuclear Tests.
- 22 August UK nuclear test Grapple Z Pennant 2 (24 kilotons) Christmas Island.
- 22 August UK and US announce test suspension of one year if Soviet Union follows suit and progress is made towards setting up an effective control system. Eisenhower proposes negotiation on a test ban treaty.
- 2 September UK nuclear test Grapple Z Flagpole (1.21 megatons), Christmas Island.
- 11 September UK nuclear test Grapple Z Halliard (800 kilotons), Christmas Island.
- 23 September UK nuclear test Grapple Z Burgee (25 kilotons), Christmas Island
- 31 October Conference on the Discontinuance of Nuclear Weapons Tests opens in Geneva.

1959

- 23 June–15 July Technical Working Group 1 meets in Geneva as part of the Conference on the Discontinuance of Nuclear Weapons Tests to discuss high altitude nuclear tests.
- 20 July UK announces that it will not resume testing for as long as negotiations on test ban treaty remain useful.
- 19 November–
- 19 December Technical Working Group 2 meets in Geneva as part of the Conference on the Discontinuance of Nuclear Weapons Tests to review underground nuclear explosion identification issues.
- 29 December Eisenhower announces that US would consider itself free to resume testing after 31 December, but would not do so without giving notice.

1960

- 29 March Eisenhower and Macmillan propose technical research programme by three nuclear powers to address problems of detecting underground tests and that once treaty banning

atmospheric test concluded. As soon as a test ban treaty was signed and research programme put in hand, they would be ready to begin a voluntary undertaking to refrain from holding any underground tests below seismic level 4.75 mb for an agreed period.

- 3 May Soviet Union proposes period for voluntary ban on small yield tests should be four to five years.
- 11–30 May Seismic Research Programme Advisory Group meets in Geneva as part of the Conference on the Discontinuance of Nuclear Weapons Tests.

1961

- 21 March Conference on the Discontinuance of Nuclear Weapon Tests resumes and UK and US table new proposals in Geneva on outstanding differences over the control system.
- 18 April UK and US table complete draft treaty prohibiting tests in the atmosphere, under water and in outer space together with all underground tests above 4.75mb. It provided for a quota of 20 on-site inspections per year in the Soviet Union.
- 29 May UK and US offered to substitute a variable quota of between 12 and 20 on-site inspections annually on the basis that within these limits each side would have the right to inspect 20 per cent of unidentified events above 4.75 mb.
- 30 August Soviet Union announces end to its test moratorium
- 1 September Soviet Union resumes testing.
- 3 September UK and US propose that the three nuclear powers agree not to conduct tests in the atmosphere.
- 9 September Conference on the Discontinuance of Nuclear Weapon Tests goes into recess.
- 15 September US conducts underground test in Nevada
- 27 November Soviet Union proposes treaty to ban all tests in atmosphere, outer space and under water. Verification would be based on national control only.
- 28 November Conference on the Discontinuance of Nuclear Weapon Tests resumes.

1962

- 16 January At the Geneva Conference the UK and US reject Soviet 27 November proposals and instead suggest resumption of negotiations on an internationally verifiable test ban treaty or that the Conference should adjourn and remit the test

	ban question to the new Eighteen Nation Disarmament Committee (ENDC).
29 January	Conference on the Discontinuance of Nuclear Weapons Tests holds final session in Geneva.
1 March	UK nuclear test Pampas, Nevada Test Site (about 10 kilotons).
2 March	US announces intention to resume testing.
14 March	ENDC holds first meeting in Geneva.
21 March	ENDC sets up nuclear test ban sub-committee consisting of UK, US and Soviet Union.
25 April	US begins atmospheric tests at Christmas Island.
27 August	UK and US table two alternative treaties in Geneva: a comprehensive test ban with minimum verification and a limited version covering tests other than those conducted underground. Soviet Union rejects both.
26 November	ENDC reconvenes. UK and US offer to reduce on-site inspections quota in proposed treaty from 12 to 20 to eight to ten.
7 December	UK nuclear test Tendrac, Nevada Test Site

1963

14–31 January	UK, US and Soviet Union hold private talks on test ban issues in Washington and New York.
12 February	ENDC reconvenes. Soviet Union makes no advance on its offer of two to three on-site inspections.
1 April	UK and US table Memorandum of Position summarising their proposals on on-site inspections.
10 June	UK and US announce that Lord Hailsham and Averill Harriman would visit Moscow for talks on test ban issues on 15 July.
18 June	UK announces that it would not conduct further atmospheric tests unless other countries did so first.
21 June	ENDC goes into recess.
25 July	UK, US and Soviet Union agree Partial Test Ban Treaty in Moscow.
5 August	Partial Test Ban Treaty formally signed in Moscow.
10 October	Partial Test Ban Treaty enters into force.

1964

17 July	UK nuclear test Cormorant, Nevada Test Site.
25 September	UK nuclear test Courser, Nevada Test Site.

1965

10 September UK nuclear test Charcoal, Nevada Test Site.

1974

23 May UK nuclear test Fallon, Nevada Test Site.

Acknowledgements

This book originated in my contribution to the Arts and Humanities Research Council funded project on the history of the UK nuclear weapons programme from 1953 to 1973. This project was based at the University of Southampton's Mountbatten Centre under the direction of Professor John Simpson. The original plan was that whilst on a part-time exchange from the Foreign and Commonwealth Office's Arms Control and Disarmament Research Unit between 2005 and 2007, I would contribute material for the then envisaged three volumes covering the periods 1953–58, 1959–64 and 1965–73 on the UK nuclear weapons programme and arms control. My original intention was to look at the Comprehensive Nuclear Test Ban Treaty (the test ban), the cut-off in the production of fissile material for weapons purposes, the Nuclear Non-Proliferation Treaty and the Anti-Ballistic Missile Treaty and the Strategic Arms Limitation Talks. Once I started looking into papers available at The National Archives it quickly became apparent that there was more than enough original documentary evidence to devote an entire book just to the interrelationships between the UK's nuclear weapons programme and the test ban – hence this volume.

Although this book is almost entirely based on primary sources several former defence scientists offered their comments and advice, both on the draft and in oral history seminars on more general points. I am extremely grateful to Frank Panton, Peter Marshall, Alan Douglas, Eric Carpenter, Frank Whiteway, Ken Johnston, Alwyn Davies, Roy Dommett, and Tom Lukeman. I benefited from discussion with, and advice from, scholars of British and Soviet nuclear history: John Simpson, Richard Moore, Robin Woolven, Kristan Stoddart, Brian Jamison, David Holloway, Lorna Arnold (a model and inspiration for any nuclear historian) and Kate Pyne. I would also like to thank all those who participated in the project advisory board and study groups and in particular to Angela Murphy and Marion Swinerd for their part in helping with this project. It goes without saying that any errors of fact or interpretation are my sole responsibility.

Although this book is based on research at The National Archives, I did have access to a few retained papers at AWE Aldermaston and Harwell in order to check a few points of detail on UK positions at the 1958 Geneva Experts' meeting and the reasons for the self-imposed testing moratorium between 1965 and 1974. I am grateful to the archivists at both establishments for facilitating my access. The information in these documents, however, was not used, paraphrased or cited in any of the pages that follow. This book thus in no way constitutes any sort of official history. I should also add that the views expressed in here are my own and not those of the Foreign and Commonwealth Office.

I would like to thank in particular Jez Littlewood for agreeing to participate in the exchange arrangement between Southampton University and FCO that enabled my participation in the UK nuclear weapons history project. I am extremely grateful too to all those at Ashgate for their help and commitment: Beth Dixon, Tom Gray, Nicole Norman, Claire Percy and Albert Stewart. And finally thanks to Lorna Miller for some very timely editorial advice – I am such a hopeless proof reader.

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Chapter 1

Introduction

Historians have thus far ignored the impact of arms control on the UK nuclear weapons programme. Yet given the wealth of material now available in the National Archives, it is possible to undertake a detailed review of the one arms control issue that could have had the most impact on the nascent British weapons development programme, a test ban. There was also the possibility of a freeze on fissile material production, but it is arguable that a comprehensive test-ban treaty, had it come about, would have brought an end to UK weapon development in the 1950s. Parallel developments were occurring in the arcane world of warhead design and UK strategic and tactical nuclear plans and the rather more public arena of international negotiations for an end to all nuclear weapons testing. There were times when UK nuclear weapon objectives were contradictory and this story is as much about the Eden and Macmillan Conservative governments' attempts to square this circle as it is about warhead R&D. This story also involves an exploration of the nature of defence planning, Anglo-American relationships, the efficacy of British diplomacy and UK contributions to arms control and disarmament, both at the general and detailed technical levels. A key question for this study is to see just how the UK managed to balance the conflicting pressures created by its determination to become and remain a credible nuclear power whilst wanting to pursue disarmament objectives. The relative weight of these pressures changed over the period in question – 1954 to 1973 in response to both domestic and international imperatives. Charting these changes and their relationships is another key question to address in this study.

Whilst all this was going on at the diplomatic and political level, Britain struggled to build and sustain an effective nuclear weapons stockpile throughout the late 1950s, 1960s and early 1970s. This book will deal with the interrelationships and contradictions between the test ban and weapons development by providing a narrative of the key events that shaped this aspect of British nuclear weapons history. The Conservative governments of Harold Macmillan were stalwart supporters of the ban and played a key role the bringing about the Partial Test-Ban Treaty in 1963.¹ Between 1958 and 1962 the UK, along with the US and the USSR, participated in the Tripartite Conferences on the Discontinuance of Nuclear Weapon Tests, which sought to produce a comprehensive ban on all types of nuclear tests save for peaceful nuclear explosions in specific circumstances. The UK's involvement in these efforts at some of the key stages is highly significant,

¹ Kendrick Oliver, *Kennedy, Macmillan and the Nuclear Test-Ban Debate, 1961–63* (Basingstoke, 1998), p. 209.

in particular how UK Ministers and officials pursued or reacted to arms control and disarmament initiatives. What is being offered here is not a detailed blow-by-blow account of the long and painful negotiations that took place in the Geneva-based Conference on the Discontinuance of Nuclear Weapon Tests. Rather it will highlight some of the key events and issues that help illuminate UK thinking and attitudes to working with the US; to verification; to wider nuclear arms control negotiations; and to the relationship between its own weapons programme requirements and arms control imperatives. Inevitably there will be some detailed narrative describing the chronology of some of the events in this period, which is necessary to help us understand the nature of UK thinking and rationales at particular moments in our story. The extensive footnoting is quite deliberate. A key objective of the Arts and Humanities Research Council (AHRC) funded UK Nuclear Weapons History project at the Mountbatten Centre was to provide a reference for other scholars who wish to explore some of the issues affecting the nuclear weapons programme, as well as its relationship to arms control, in much greater detail. A good deal of the available archival material has only been summarised in some places here. More detailed accounts of many aspects of this story could be produced, such as the procurement and deployment histories of individual nuclear weapons, or British attitudes to the institutional aspects of future test-ban treaty implementation. This book is not the final word.

Chapter 2 will look at the early pressures between 1954 and 1958; the UN Disarmament Committee and the Grapple tests; pre-1954 UK-US relations; AWRE's first attempts at thermonuclear designs and tests; and the growing public and international concerns. As well as the key Antler tests in Australia, Chapter 3 will examine the decisive year of 1958, which witnessed the successful planning and conduct of the Grapple Y and Z tests and which coincided with pressures for a moratorium and the resumption of the UK-US nuclear relationship with signing of the 1958 and 1959 Mutual Defence Agreements. Chapter 4 will look at the testing moratorium and how it impacted on the development of the first UK megaton range weapons: Yellow Sun; the US-designed Mark 28 warhead and its UK counterpart Red Snow; and the critical role that the Assessment Trials in Australia played in warhead design and adoption. Future UK test requirements and options will also be reviewed. Chapter 5 covers the testing moratorium and British responses to US policies. The Tripartite Conference on the Discontinuance of Nuclear Tests opened in 1958 and the latter part of this chapter will chronicle UK objectives and role in the Conference between 1958 and 1961 as well as Anglo-American differences. British efforts to solve the test-ban verification problems are reviewed in Chapter 6, which also provides the first detailed examination of the emergence of forensic seismology in the UK. This looks at the extent to which seismic research in the UK underpinned British approaches to test-ban verification. Chapter 7 begins with the end of the testing moratorium in 1961 and UK responses – a test of the new implosion system Super Octopus and other nuclear tests. The US request to use Christmas Island and the resumption of atmospheric testing presented significant problems and opportunities for the UK. Also, the Discontinuance Conference came

to an end in 1962 and the shift of test-ban negotiations moving to the Eighteen Nation Disarmament Committee (ENDC). Chapter 8 deals with the lead up to, and participation by the UK in the Partial Test-Ban Treaty (PTBT) 1962 to 1963. Chapter 9 looks at the testing plans in the 1963–65 period including the Polaris warhead and WE177; UKAEA's proposed research test programme in 1964; the Polaris Economy tests; the arrival of Labour; and the impact on the testing and weapons programme of its 1965 defence review. British policy towards a CTBT from the mid 1960s until the early 1970s is reviewed in Chapter 10; this looks at the decline in superpower interest in the test ban and UK efforts to address the verification issues. Chapter 11 deals in detail with AWRE's future and the Kings Norton review; the Wilson government's nuclear policy review (no new strategic weapons); first steps in the Polaris Modernisation debate leading to Antelope, Super Antelope, STAG, Hybrid, Option M and Chevaline choices being addressed in 1966–73; and the decline and revival of Anglo-American nuclear relationship. As this modernisation work progressed the British return to testing with the UK effects tests and the decision to resume underground testing and the impact of this on CTBT policy is also examined. Finally, the concluding chapter will discuss how priorities were reconciled; when a test ban was a subordinate objective to the weapon programme requirements and when these priorities were reversed; the nature and impact of the UK-US relationship on UK test-ban policies; and the problems in acquiring and sustaining an effective and credible nuclear deterrent. Finally, the lessons of the British experience generally and for arms control and non-proliferation are reviewed in Chapter 12.

We should not forget that writing nuclear weapons history faces certain problems. These include very high levels of security and compartmented information systems that existed during the Cold War period – a strict need to know policy where only a handful of individuals were privy to the information; complex, diverse and changing bureaucratic structures responsible for or related to nuclear policy and implementation; changing understandings over time of the basic science and engineering of nuclear weapons; continued closure of archival material beyond the 30-year rule; sometimes contradictory and misleading evidence in open archives; and an ever diminishing band of original participants. None of these are new or novel. Given such obstacles historians might be forgiven if they decided to abandon any attempt at writing a comprehensive account of the UK nuclear weapons programme. However, the picture is not all bad; there is a surprisingly large amount of archival material available in The National Archives at Kew and in other places that enable a reconstruction of the detailed broad themes and directions of the UK programme. We can supplement archives with oral histories. The key is to be aware of the partial nature of the picture that might be painted and avoid extravagant claims based on limited evidence. Much can then be said about the UK programme, certainly in terms of main thrusts of policy, policies, rationales and a good deal too on the weapons systems themselves.

The threat (or opportunity) of a test-ban treaty hung over the UK nuclear weapons programme for much of the period covered by this book; the

interrelationships changed over time as programme and international pressures varied. Exactly how these interrelationships operated at particular moments in time will, hopefully, become clearer in the following chapters.