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e06-0_02	Chevaline reduced weight warhead test, reduced weight warhead test, 1978 test, small diameter lightweight warhead test aimed at successor systems, Sep 1978
e38-07	Sep'78 UGT, advanced wh design suitable for future tactical and cruise systems
e65_01	Fondutta lightweight warhead 64nm
e107 annex-a	Polaris missile & sub life, build date.
annex-c	Soviet cruise msl defences, SA-X-10 SAM, CM attrition. CM not viable UK option
annex-d	Strategic launch platforms. Port exits
annex-e	US v French msls. Trident v M4 & US cruise
annex-g	CM procurement options, sub options
attachment-a	CM penetrability, 300 CMs. DeMIRVed C4 Cheap non-nuclear 2-msl subs CM option 80 msl per boat x 8 subs-640 CM M4 option 16 msl per boat x 8 subs-128 M4 Combined BM & CM force
e109 5pps	Drawbacks of French M4 4 subs with 16 M4 or 8 MIRVed C4 studied best choice 5 subs with 16 MIRVed C4 combined BM & CM force unaffordable

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e01 p1	Polaris A4 questions to US by incoming Thatcher govt June '79
e04	Borrowed Pu, 200 kg, Chevaline first outload, 32 + 12 warheads & REBs
e06	PM Thatcher nuclear release procedures exercise, e10, e13, e15, e40
e10	PM Thatcher nuclear release procedures exercise
e12	Skylark, Falstaff trials concluded Borrowed Pu
e19	Polaris A4 with some C4 technology, 300 CMs required and require more than 4 boats endo-atmo ABM development
e21	Lockheed study on A4, also e31, e54 attachment
e22	WE.177 replacement selectable yields TASM Short-range CM Torpedo Long-range CM Only 18 warheads per year possible in 1979
e31	Polaris A4 with some C4 technology, 300 CMs required and require more than 4 boats endo-atmo ABM development
e39	40 Chevaline warheads required by Dec 1980 78 Chevaline warheads required by end Oct 1981 New programme is : 40 Chevaline warheads by Dec 1981 78 Chevaline warheads by end Oct 1982
e54	Duff-Mason Commentary

e54 attachment p11	4 CM subs at sea to meet minimum damage criteria with 320 CMs SSN deployment quite inadequate
page 12 page 14	Polaris A4 with 5 MIRVs, also e55 attachment 2 page 11 576 C4 MIRV warheads reqd
e55 attachment 2	
page 11 page 13	Trident D5 first mention 576 warheads prod beginning in 1988
e56-0 attachment 1 p3	emphasis for UK warhead development had been towards small conical REBs with high-beta warheads. Latest to be tested at NTS at end Aug-Sep 1979 plus three more UGTs in 1980. UK was following the same dev path as the US. Hopes were for a successful UK weapon system by end 1980 or mid-81 latest, in time to produce warheads for a Polaris successor in the very early 1990s.
page 6	A fith Polaris boat might possibly have made Chevaline unnecessary.
e56-0 attachment 3 p3	BM options Polaris A3 Polaris A4 Poseidon C3 Trident 1 C4 Trident 1 C4 'flat-top' with UK front end (A3T or A3Tkvwarheads) Mk.500 Evader MARV Explosive safety arcs for C4
p4	Poseidon A4 disadvantages
p6	Mk.500 Evader less accurate than MIRV
e56-1 attachment 1 p2	C4 explosive content of C4 - 33,000 kg A4 explosive content of C4 - 17,360 kg
e66 p2	ACLM a poor choice because of our vulnerable geograpghy
e70 attachment p1	Polaris A4
e76 attachment 1	
p1	Polaris A4
p4	Polaris A4 – superior technically to the French M4
e78 attachment 2	
p12	Polaris A4 enhanced range and reliability of propulsion and control systems Major front end redesign.
p18	Polaris A4
e79 annex h	Costs. A4, Trident C4, D5, French M4, Poseidon.

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e2 PM Thatcher nuclear release procedures exercise

e3 Extra funding for successor system

e5 Successor options narrowed to SLBM & SLCM
TNF UK-owned GLCMs to replace Vulcans

e8 PM Thatcher nuclear release procedures exercise

e9 Revised msl & warhead numbers required to meet min damage criteria

e9 paper 21 pps
annex c p6 para 11 – CM attrition @ 80% min reqs min 350 CM

e9 paper p8-11
e17-1 part 3 p7 7 main options for sub-launched missiles and front ends. Also updated at

1. A3TK MRV Chevaline run on.
2. Polaris A4 MRV range 2800 nm more reliable propulsion & control, some commonality with Trident. Adapted Chevaline front end.
2. Poseidon C3 with US MIRVs. UK warhead. UK unique system thoughout its lifespan because of earlu US phrase-out.
3. Trident C4 with US MIRVs. UK warhead. Not UK unique.
4. Trident C4 'Flat-Top' without US MIRVs. UK unique. Would require UK development of front end. Possibly adapted Chevaline MRV or a UK-designed MIRV.
5. Trident D5 MIRVed. UK warhead. Otherwise not UK unique.
6. French M4 missile. MRV possibly a MIRV later.

e9 paper p12 Choice should be Trident C4 with US MIRVs
2 main fall-back options if that unavailable.

1. Trident C4 'Flat-Top' with UK-designed MRV or MIRV front end.
2. Polaris A4 with UK MRV front end.

e9 paper p14 Chevaline warhead compatible with US SLCM.
A dedicated UK-unique SSCM sub of UK Polaris size may carry 80 CMs.

e9 paper p15 A next-gen dedicated SSN could carry 24-30 CMs if all other weapons removed.
30-40 mins reload time between salvoes. Leaving sub vulnerable to counter-battery
A next-gen additive SSN could carry 6-8 CMs
Requiring 15 of more than 24 subs at sea with 120 CMs at readiness to fire
Well short of meeting min damage criteria.
Severe command and control issues.

e9 paper p19 A4 requires 8-boats to meet min damage criteria.
400 min CMs required at sea needed to meet least demanding damage criteria.
Equates to 11 subs with 5 boats continuously at sea, each carrying 80 CMs
Equates to (9-boat outloads) 720 warheads plus spares of 10% plus 10% in the servicing and supply chain (based on known Trident practice) = 864 warheads.
With 400 CMs at sea, only 80 CMs could be expected to reach their target, (80% min attrition) with min 320 shot down.
More expensive option than the most expensive Trident option.
Where would fismat be found for 864 warheads based on the Chevaline warhead?

e9 annex C p6 para 11 – CM attrition @ 80% min reqs min 350 CM launches.

e9 annex G p1	Warhead costs assuming A4 MRV 4 x REB C4 MRV 6 x REB (Flat-Top) C4 MIRV 8 REB SLCM 1 REB Unit production cost per tactical REB assumed to be £0.5M Plus dev cost, additional production facilities, DASO cost and training REBs. Additional fismat and prod facilities not included. Missile costs
e9 annex G p3	Overall costs table summary.
e15-1 annex a	dev for strategic successor warhead begins 1980, ends 1986 dev for long-range TNF warhead begins 1982, ends 1988 GLCM for long-range TNF in-service 1989 WE.177B will be refurbished and in use until replaced by TNF GLCM WE.177A & C will be replaced by a new weapon in service early to mid 1990s. Dev to follow-on from completion of the strategic force warhead. WE.177A & C to be replaced on a one-for-one basis by the new weapon.
e15-1 annex b	Table
e16	PM Thatcher nuclear release procedures exercise
e17-1-part 3 p7-15	BM & CM & sub platform options repeated from e9 paper p8
e17-1 annex G	Repeat of costs etc. More legible than earlier copy. CM costs adjusted higher.
e18 annex A p2	Alternative proposed to Vulcan & WE.177B replacement with GLCM – A 'spare' strategic submarine "might be available that could be used in this role" Could this be the origins of a 'sub-strategic' warhead carried by Trident?
e18 annex E p17	Preference for description Trident C4 MRV rather than Trident C4 Flat Top.
e18 annex E p18	A4 Polaris – few Arms Control objections to A4 as similar to A3. 400-600 CMs could pose difficult Arms Control problems. Trident C4 MRV probably few Arms Control problems because increases marginal. Trident C4 MIRV only amounts to 3-4% of Soviet capacity, as A3T did in 1970.
e18 annex E p22	Table. Soviet forces 1990.
e20	PM Thatcher nuclear release procedures exercise.
e27 p3-6	Partial outloads because of production problems. Borrowed Pu.
e32 p1-2	Partial outloads because of production problems. Borrowed Pu.
e34	Updated more reliable costs for all options. Repeated at e36-0.
e35-0 p1	We target Moscow as a city, - not Moscow as a Soviet government capability. "[Chevaline] doesn't hit the bunkers which exist now".
e35-0 p3	CM min viable option 11 boats costing over £12 billion
e35-0 p4	C4 MIRV appears cheapest but the most capability.
e36-0 p1	WE.177 replacement again. NAST 1231.
e36-1 p1-7	NAST 1231 to replace WE.177A & C. Tables.

e40 att1 p6-7 Sub-strategic.

e47 p1
a) "Our present criterion is to attack Moscow as a city"
b) "For the future something better (Option 1) would offer surest deterrence, but Option 2 (better than we ..... they do) .... Option 3a (10 cities) would we believe deter."
c) "We cannot now choose the targetting option for 16 years hence. Our aim should be to buy flexibility.
d) On this argument – and cost and risk – C4 MIRV is best.

e47 p5 SoS recommendation for C4 MIRV 5-boats.

e50 p2 Research shows that figures on CM vulnerability more pessimistic than before.

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e4 report p8 HE more sensitive than A3T but superior nuclear safety.
e4 report p12 Weight issues

e10 p5 Lightweight warhead for Chevaline FONDUTTA UGT – FINDHORN device
e10 p6 Vulnerability to small arms fire during loading and transit from ROFB
e12 p1-2 Measures to protect from small-arms and RPG fire.
e12 p5-6 Lightweight warhead from FONDUTTA UGT.
e14a p6-7 Lightweight warhead for Chevaline

e15c p1-3 Polaris motor replacement applicable to the A4 also.
Model 100 Identical A3T replacement.
Model 200 Some changes to A3T build standard to benefit from current materials and technology. Range advantage over A3T standard motor.
Model 300 Significant design change incorporating C4 motor technology with other changes kept to a minimum.
Model 400 Model 300 plus new design equipment section structure and missile electronics using C4 technology to reduce inert weight and increase range. RAE claim front-end redesign probably required for 300 & 400.

e16 p3 A3TK benefits from the large amount of space junk cluttering the atmosphere and help to confuse any endo-atmo ABM system. See also p6.
P3 flight test. C-body landed where required.
P-body landed 18 miles short of target.
e16 p8 Lockheed motor studies (also for A4). Model 200 gives extra 150nm range.

e18 p1 Chevaline REB weight 3-5 lbs over limit
e18 p2 3DQP frusta for REB issues.
Hard decoys
Soft decoys
Dummy decoys
e19 p2 Dummy decoys