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THE EAST-WEST BALANCE IN LONG RANGE NUCLEAR WEAPONS 1960-1983

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ABSTRACT

During the 1970s, the SALT I and II negotiations focussed international interest on long range strategic nuclear weapons. Now, the Soviet buildup and planned NATO modernization program of long range theatre nuclear forces, together with impending discussion on arms limitations, are drawing increasing attention to these classes of weapons. SALT III may encompass both classes.

To compare the forces on both sides and predict future developments, it would be useful to portray their development over the past twenty years in graphical form. This has been done in six annotated diagrams, showing data for ICBMs, SLBMs, heavy bombers, long range land and sea-based theatre missiles, and long range theatre nuclear aircraft.

RESUME

Pendant les années soixante-dix, les négociations SALT I et II ont attiré l'intérêt international sur les armes nucléaires stratégiques de longue portée. A l'heure actuelle, l'accroissement de l'arsenal soviétique et le programme de modernisation des forces nucléaires de théâtre européen, de même que les délibérations imminentes sur la limitation des armements nucléaires, dirigent de plus en plus l'attention vers cette seconde catégorie d'armes. Les négociations SALT III pourraient porter sur les armes stratégiques, et sur les armes tactiques.

Dans le but de comparer les forces des deux camps opposés, et de pronostiquer les développements à venir, il serait utile de dépeindre leur histoire au cours des vingt dernières années sous forme de graphique. On l'a fait ici, dans six diagrammes annotés, fournissant des données sur les ICBMs, les SLBMs, les bombardiers lourds, les missiles de théâtre européens de longue portée, basés au sol et en mer, et les avions nucléaires tactiques de longue portée.

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I. INTRODUCTION

1. Much is being written about the military balance between East and West. Analysis is often subdivided into components such as the strategic nuclear balance, the theatre nuclear balance, the naval balance, or the balance in conventional forces. Some treatments list tables of numbers and weapon performance, others present very necessary cautions regarding the limited significance that should be accorded to numbers alone in attempting to assess the relative powers of the opponents. Something that is seldom done is to trace historical data, showing which systems have been abandoned as well as which ones are in place today or planned for the future. It is hoped that information of this type may be of use to those following developments in arms control discussions during the overall period 1981 to 1983.

2. The purpose of this paper is to present material concerning long range nuclear weapons systems of both the central strategic and theatre categories, in a manner highlighting the historical development since 1960 and indicating expected future developments to 1983. Diagrams display two parameters of the weapon system, year by year, believed to be the most indicative of the significance of the system in the military balance.

3. The numbers and characteristics of past and present systems have been derived from successive editions of The Military Balance[1], published by the International Institute for Strategic Studies annually, from the annual posture statements of the US Secretary of Defence [2], from SIPRI Yearbook [3], published annually by the Stockholm Peace Research Institute, from Jane's yearly publications [4,5,6], and those of John Collins [7,8]. As regards projections into the future, there is of course no definitive authority, but assumptions can

be made on the basis of announced programs (such as that for NATO modernization of Long Range Theatre Nuclear Forces, or the US programs for MX and Trident) and supposing that the terms of SALT II will be observed even if the treaty remains unratified.

4. Among the parameters not shown on the diagrams is the very important one of warhead accuracy. This is crucial for estimating the capability of a weapon for use in a counterforce first strike, although of less importance for coutervalue retaliation. Another very significant factor not shown is vulnerability. However, simplicity, a valuable asset in presenting a summary, comes at the price of neglecting important factors.

II. STRATEGIC NUCLEAR WEAPONS

5. The first group of systems to be illustrated, consisting of ICBMs, SLBMs, and intercontinental bombers, are frequently defined as "strategic" or "central" systems, because their intercontinental range allows them to be used in direct attacks on the USA or USSR. The systems covered in the SALT I and II negotiations came from this category. However, it should be noted that attacks on the major cities of Western Europe, which would certainly be regarded as "strategic" by the inhabitants, can be delivered by systems of less than intercontinental range. These are discussed under the heading of Long Range Theatre Nuclear Forces.

III. ICBMs

6. The two parameters selected to represent the strategic significance of Intercontinental Ballistic Missiles are Throw Weight and numbers of independently targetted warheads. Once the ranges achieve intercontinental span, the difference between say 7000 and 8000 km hardly matters. Numbers of launchers or numbers of missiles could have been used, but numbers of MIRVs seems more significant, especially now that they are becoming

so accurate. Throw weight is a good measure of what can be accomplished by the missile, whether in the form of large warheads, multiple warheads, or penetration aids.

7. Figure I illustrates the history of Intercontinental Ballistic Missiles since 1960. The horizontal scale shows calendar years, with the Soviet programs on the left and United States on the right. The history of a particular ICBM is shown by a shaded area on the diagram. The baseline forming the bottom boundary of each shaded area is placed at a height representing the throw weight of one missile, while the vertical thickness of the shaded area (above its baseline) represents the number of independently targetted warheads on all of the operational missiles. Multiple Reentry Vehicles (MRV) distributed without independent guidance are counted for this purpose as a single warhead. The scale of throw weight, in kilograms, is drawn up the left hand margin of the diagram. The scale of numbers of warheads is shown inset on both the Soviet and US halves of the diagram. For example, the shaded area for Minuteman III, in the lower right-hand quadrant of Figure I, shows that the first missile became operational in 1970, the throw weight of each is 1000 kg, and the total number of MIRVs deployed rose to 1650 by 1975. There are still 550 Minutemen III deployed in 1980, each with three MIRV, and no change is expected during the next few years.

8. The feature that emerges from Figure I is the Soviet superiority in large missiles, beginning with the SS-9 in the late 1960s and confirmed with the SS-18. Even if the US deploys MX missiles with a throw weight of 3600 kg and 10 MIRVs each, with 200 missiles operational by 1989, they will be considerably outweighed by the Soviet combination of SS-18 and SS-19. The numbers of SS-18, SS-19, and SS-17 shown for future years assumes that the provisions of SALT II are observed, i.e. limits of 308 "heavy ICBMs" with 10 MIRVs per missile, and 820 MIRVed ICBMs.

9. Another fact depicted in Figure I is that instead of the "missile gap" forecast for the early 1960s, the US was well ahead in numbers and throw weight during that period, but lost its lead during the 1970s.

IV. SLBMs

10. For Submarine-Launched Ballistic Missiles, range is extremely important, since it determines the area of ocean in which the submarine can patrol with the ability to threaten its assigned targets. The location of the baselines of the shaded areas of Figure II indicates range, on a scale of kilometres shown up the left-hand margin, while the vertical width of the shaded areas represents numbers of independent warheads as shown on the small inset scales.

11. Figure II demonstrates the significance of the American Poseidon missile, now being supplemented by Trident. 31 SSBNs, each carrying 16 Poseidon SLBMs fitted with an average of 10 MIRVs each, gave the USA predominance in numbers of independently targetted warheads from 1972 onwards. It is possible that the large Soviet SS-N-18 or a later SLBM could be fitted with many warheads, up to 14 being permitted by SALT II, but if the USSR holds to the SALT II limits of 1200 MIRVed ballistic missiles, the number of MIRVed SLBMs cannot exceed 380 unless they reduce the number of MIRVed ICBMs below the permitted total of 820. With only 550 MIRVed Minutemen III ICBMs, the US can deploy 650 Poseidon and Trident MIRVed SLBMs.

V. INTERCONTINENTAL BOMBER AIRCRAFT

12. The parameters selected to describe long range bombers are numbers of aircraft and payload. Range, or combat radius, are important, but are partially exchangeable for weapons load, and can be very greatly extended by aerial refuelling. The number and type of weapons carried may be changed easily, but are limited by the payload. The shaded areas on Figure III have

their baseline placed opposite the appropriate payload (in kg) marked on the vertical scale up the left hand margin. Their (vertical) thickness represents numbers of aircraft, as indicated on the two small inset scales.

13. The outstanding feature of Figure III is the large number of US bombers in the 1960s and the sharp reduction thereafter. The reduction occurred as the ICBM and SLBM forces were building up. In contrast, the Soviets have maintained a steady inventory of Bear and Bison bombers, considerably inferior in both numbers and payload to the B-52.

VI. LONG RANGE THEATRE NUCLEAR FORCES

14. Decision as to which weapons systems should be categorized as "Long Range Theatre Forces" is a matter of judgement rather than agreed definition. Some systems, such as aircraft, can carry either nuclear or conventional weapons. Naval systems can be used against land or sea targets. If we wish to consider only the European Theatre, there are a number of weapons normally deployed in areas out of range of this region, but which could be transferred fairly quickly. The numbers of weapons shown in Figures IV to VI represent an estimate of those considered to be deployed for a nuclear role against land targets in the European Theatre, using assumptions made in The Military Balance 1980-81 (9).

VII. LONG RANGE LAND-BASED NUCLEAR MISSILES FOR THE EUROPEAN THEATRE

15. Long Range land-based nuclear weapons in the European Theatre include IRBMs, MRBMs, and cruise missiles. The shaded areas on Figure IV have their baseline at a height indicating missile range (shown in kilometres up the left hand margin). Unlike the case of ICBMs, for which nearly all targets are within range of nearly all missiles, the number of targets in the European Theatre that can be threatened by IRBMs

and MRBMs does depend on the missile range, as does the freedom to disperse the launching sites over a wide area. The (vertical) thickness of the shaded areas represent numbers of independent warheads (with the scale shown in the two small insets). The lower limit for a "long range" land-based missile is taken to be 1500 km. As assumed by the IISS [10] it is supposed that one quarter of Soviet ballistic missiles are allocated to the Eastern Front and do not threaten the European Theatre.

16. It is evident that the Soviet Union has dominated this balance, with the SS-5 and SS-4 from 1960 to 1980, and the SS-20 in 1980. In the early 1960s the USA had Thor and Jupiter IRBMs and the MACE cruise missile, but withdrew them. Deployment of the NATO GLCM and Pershing 2 MRBM, beginning in 1983, will not match the SS-20 in either range or number of warheads.

VIII. SLBMs IN THE EUROPEAN THEATRE

17. Figure V shows SLBMs in the European Theatre, with the vertical location of the shaded areas indicating missile range and the thickness indicating numbers of independent warheads. The lower range limit for a "long range" SLBM is taken to be 1000 km. Following the IISS [10] it is assumed that the Soviet SS-N-5 SLBMs, carried by diesel SSB and old Hotel SSBN submarines, are deployed in the Baltic and targetted against Western Europe. In addition, and much more important, 400 American Poseidon warheads are assumed to be allocated to SACEUR and targetted against Eastern Europe. Thus, there is an element of double counting between Figure II (for strategic SLBMs) and Figure V (for European Theatre SLBMs). 1000 km is taken as the lower limit for a theatre SLBM to be categorized as "long range".

18. As was true in comparing Figure II (strategic SLBMs) with Figure I (ICBMs), a comparison of Figure V (theatre SLBMs) with Figure IV (theatre land-based missiles) shows the West building up sea-based missile systems while the USSR accumulated land-

based missile systems. However, the preponderance of the Western SLBM superiority is due in large part to the allocation of Poseidons from the central strategic role.

IX. LONG RANGE THEATRE NUCLEAR-ARMED AIRCRAFT

19. Although payload rather than range was chosen as one of the most significant parameters for intercontinental bombers, on the grounds that range can be extended by aerial refuelling, in the case of aircraft operating from and in the European Theatre we select unrefuelled combat radius. A large fraction of the sortie is likely to be over enemy territory, with poor chances of safe refuelling. Combat radius is dependent on the mission profile and the weapons load, and the figures used here are supposed to represent the conditions of a typical nuclear combat sortie. In order to give some recognition to payload, we will show number of nuclear weapons rather than number of aircraft, and use the IISS estimates on the number that can be carried by each type [9]. These could be in free-falling bombs or Air-to-Surface Missiles.

20. On Figure VI, the baselines of the shaded areas are plotted opposite the appropriate level on the radius of action scale (in km), while the (vertical) thickness of the areas represents the number of nuclear weapons carried by the aircraft of the type indicated, on a scale shown in the two insets. Tactical aircraft fitted for nuclear weapons can also carry conventional bombs, and some of the total inventory will be deployed in other theatres. It is necessary to assign less than the whole inventory to a nuclear role in the European Theatre, and the proportions are based on assumptions taken from The Military Balance [9,10].

21. The Soviet Backfire dominates Figure VI. The nearest competitor, the American FB-111, is not assigned to Europe, but is not counted in the strategic inventory, and could be deployed to Europe quite quickly.

FIGURE I: ICBMs

Location of shaded areas on vertical scale indicates throw weight in kg. Vertical thickness of shaded areas indicates number of independent warheads (i.e. MIRV but not MRV).

SS-18

Assume 10 MIRV per launch vehicle

Assume that USSR deploys 308, limit of number of heavy ICBM, allowed by SALT II

SS-19

Assume all SS-9, to be replaced by SS-18s

SS-19, SS-17

Assume 6 MIRV for SS-19, 4 for SS-17

SALT II limit of 820 MIRVed ICBMs, less 308 SS-18, permits total of 512 SS-19 plus SS-17

SS-11

Assume reduction to accommodate SALT II limit of 2250 strategic nuclear delivery vehicles

New Soviet ICBM

SALT II permits a new light ICBM, which could be mobile. If deployed, it would take the place of some SS-17s or SS-19s if MIRVed, or some SS-11s or SS-13s if not MIRVed.

MX

SALT II permits a new light mobile ICBM. This could be MX, with 10 MIRV. Initial operational capability planned for 1986. Some Minutemen III could be withdrawn to keep within the SALT II limit of 1200 MIRVed ICBM + SLBM.

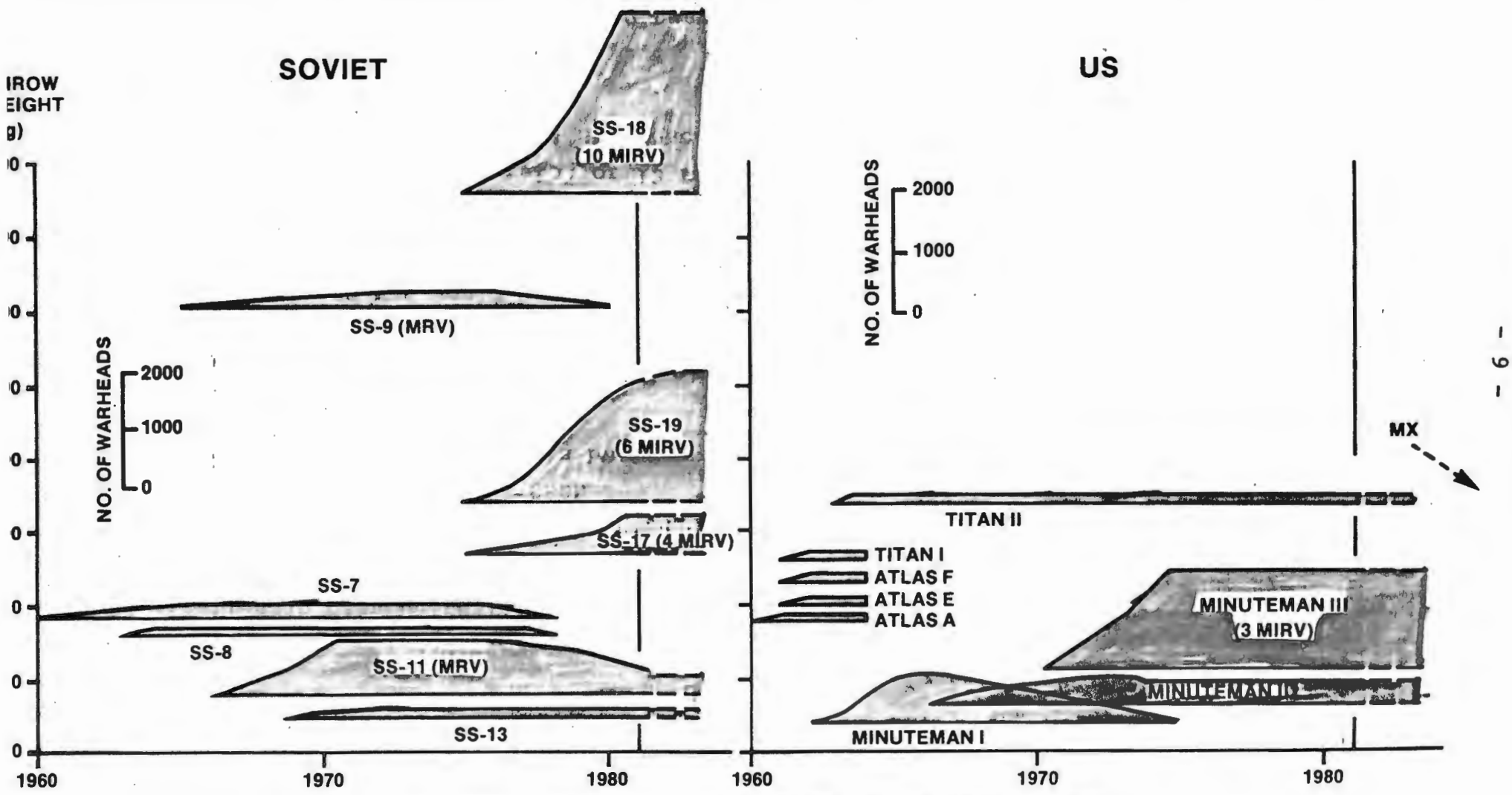

FIG. I: ICBMs: THROW WEIGHT AND NUMBER OF INDEPENDENT WARHEADS

FIGURE II: SLBMs

Location of baseline of shaded areas indicates missile range in km.
Vertical thickness of shaded areas indicate number of independently targetted warheads (i.e. MIRV but not MRV).

SS-N-8

Assume single warhead.
12 missiles carried by Delta I SSBN, 16 by Delta II.

SS-N-18

Assume 3 MIRV.
16 missiles in each Delta III SSBN. Could be more on new Typhoon SSBN.

SS-N-6

Assume single warhead (or MRV)
16 missiles in each Yankee I SSBN
Numbers reduced as SS-N-8 totals build up. Could be assigned to European Theatre.

New Soviet SLBMs

SALT II permits new SLBMs. If MIRVed, the number of independent warheads is limited to 14. A new Soviet SLBM could take the place of the indicated buildup of SS-N-18. If not MIRVed, inventory of SS-N-6 would probably be reduced as offset.

Trident I (C4)

Assume 7 MIRV
Numbers build up with conversion of 12 Poseidon SSBNs (16 SLBM each) and construction of 8 new Ohio-class SSBNs (24 SLBM each)

Poseidon C3

Assume 10 MIRV (average)
Numbers reduce with conversion of 12 SSBNs to Trident I

Polaris A3

Assume MRV - Numbers phased down to 0 as oldest SSBNs retired.

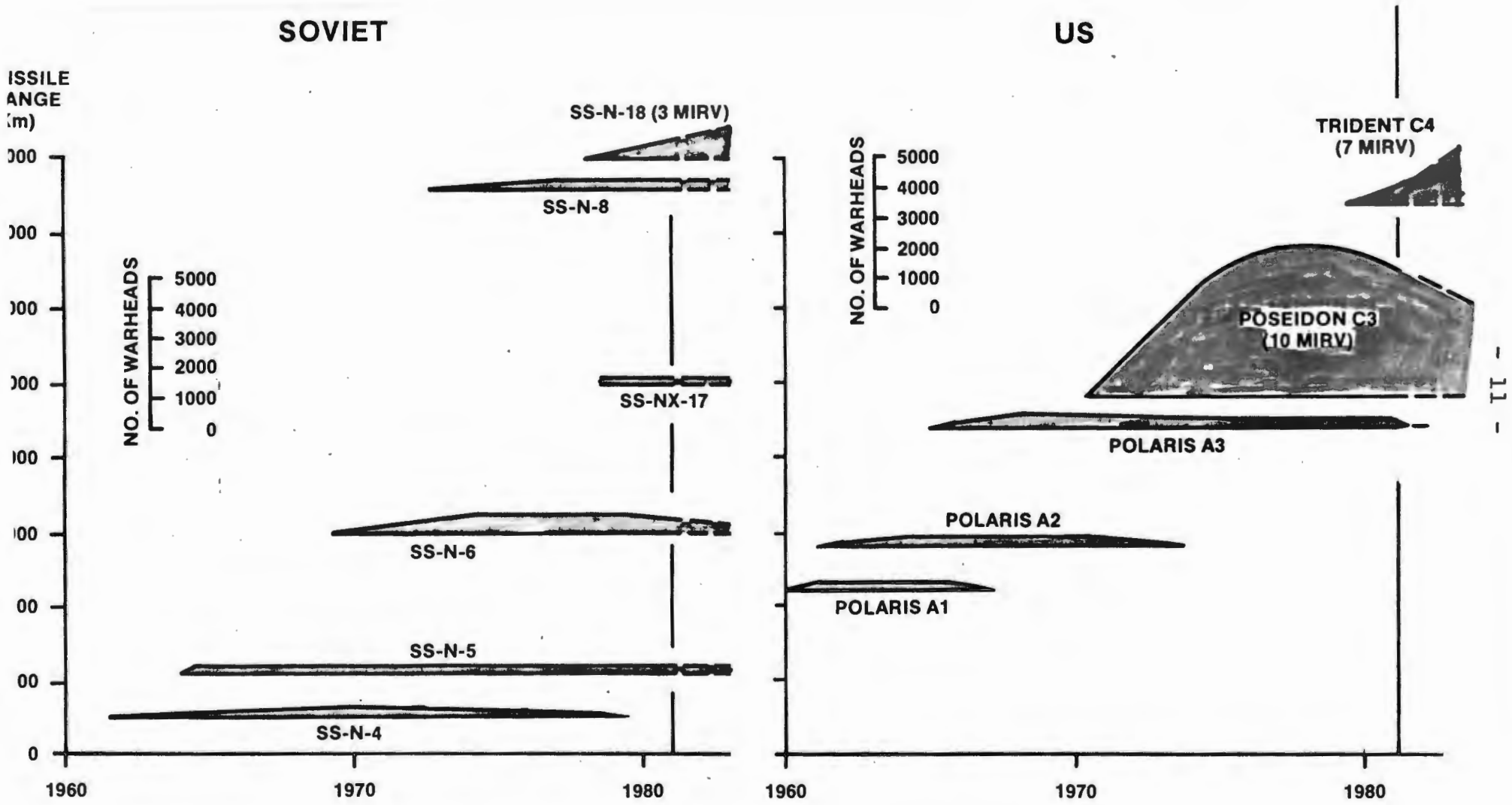

FIG. II: SLBMs: MISSILE RANGE AND NUMBER OF INDEPENDENT WARHEADS

FIGURE III: INTERCONTINENTAL BOMBERS

Location of baseline of shaded areas indicates bomber payload in kilograms. Vertical thickness of shaded areas indicates number of aircraft.

ALCM

Air-Launched Cruise Missiles, which are permitted (within limits) by SALT II, will probably be deployed on US B-52G bombers in the early 1980s.

120 bombers equipped with ALCM can be deployed within SALT II limits, or more if the numbers of MIRVed ICBM + SLBM are correspondingly reduced.

SALT II

The numbers of weapons on Figures I, II, and III comply with the SALT II limit of 2400 strategic nuclear delivery vehicles in 1980, 2250 thereafter.

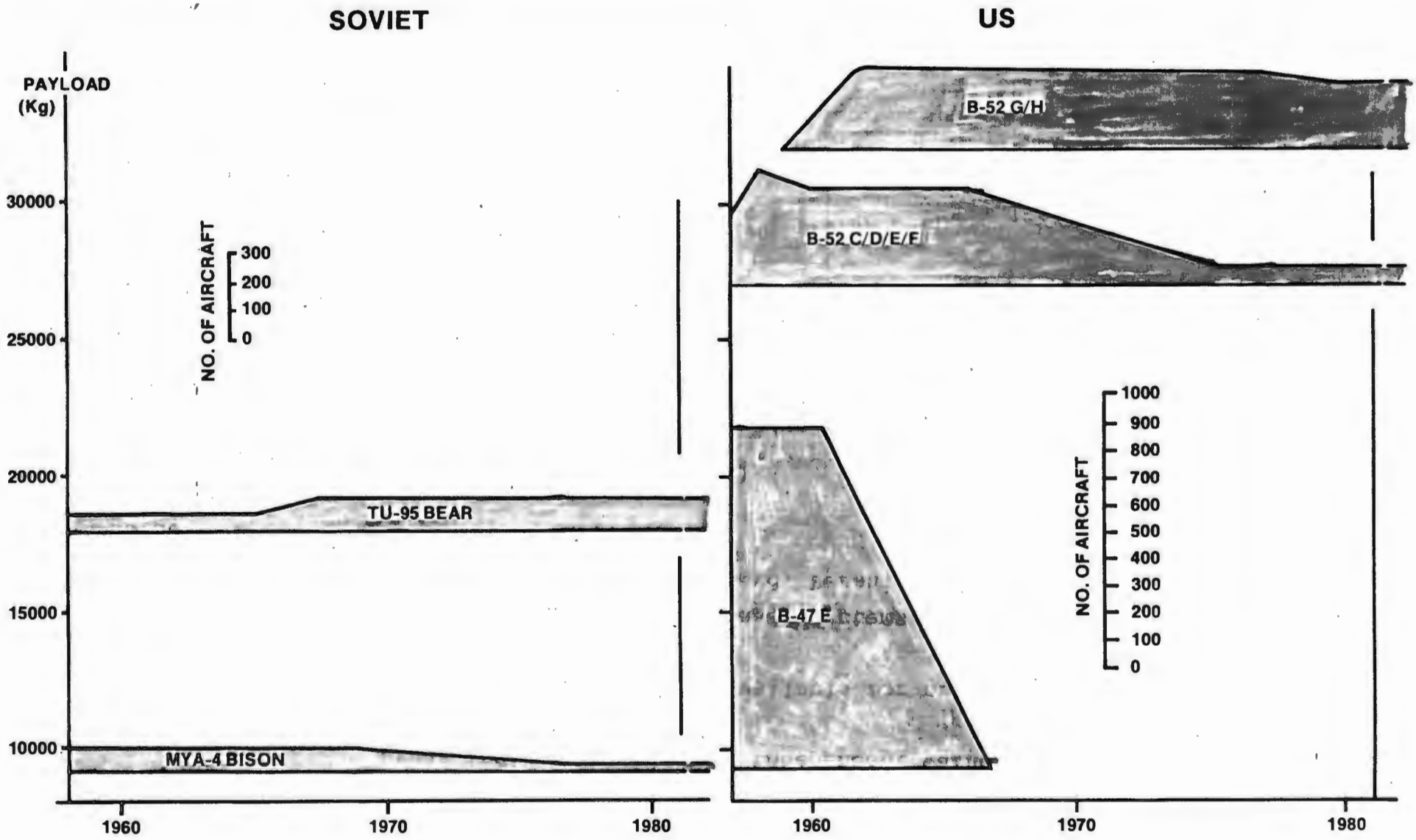

FIG. III: INTERCONTINENTAL BOMBERS — PAYLOAD AND NUMBER OF AIRCRAFT

FIGURE IV: LONG-RANGE LAND-BASED THEATRE NUCLEAR FORCES

Location of shaded areas on vertical scale indicates missile range in km. Vertical thickness of shaded areas indicates number of independent warheads (MIRV but not MRV).

Soviet totals are those available for use against Western Europe.

Many shorter-range land-based systems are not shown (e.g. SCUD, FROG, Scaleboard, Pershing I, Lance, Pluton).

SS-20

Assume 3 MIRV

Assume 2/3 within range of Western Europe (9).

GLCM

Permitted in 1982 by Protocol to SALT II.

NATO Program for 464 with IOC in 1983.

Pershing II

NATO Program for 108 with IOC in 1983.

SS-5

Assume 90% within range of Western Europe (9).

SS-4

Assume all within range of Western Europe (9).

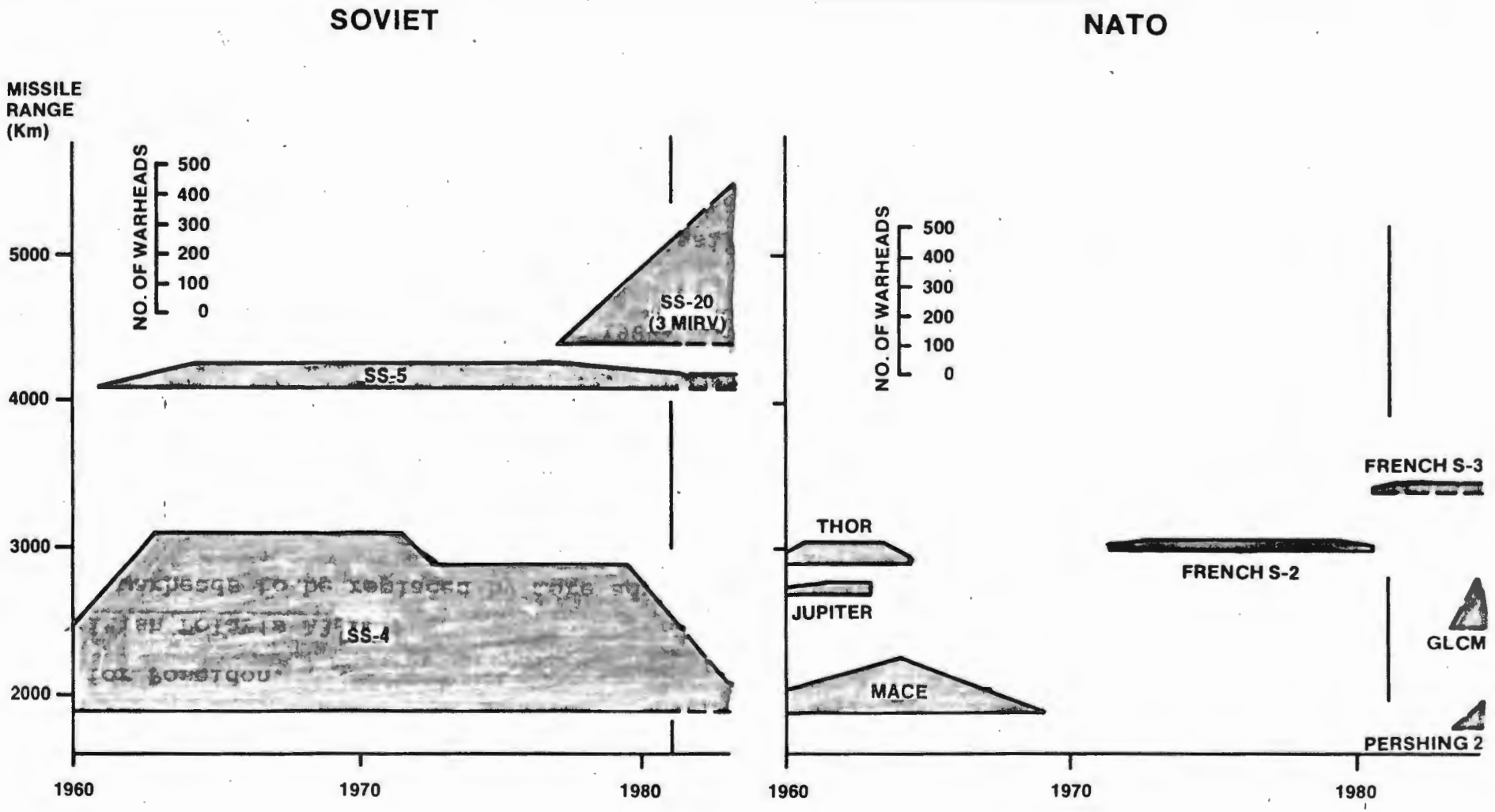

FIG. IV: LONG-RANGE TNF: RANGE OF LAND-BASED MISSILES AND NUMBER OF INDEPENDENT WARHEADS

FIGURE V: LONG-RANGE SEA-BASED THEATRE NUCLEAR FORCES

Location of baseline of shaded areas indicates missile range in km. Vertical thickness of shaded areas indicates number of independently targetted warheads (MIRV but not MRV)

US SLBM

For some years SACEUR has been assigned 3 US SSBNs, at first with Polaris, now Poseidon. These are double-counted with Fig II. Assume 1 warhead for Polaris A3, average of 10 for Poseidon.

British Polaris A3

MRV warheads to be replaced by more advanced Chevaline

SLCM

Sea-launched cruise missiles are permitted in 1982 by the SALT II Protocol.

USSR deploys SS-N-3, SS-N-7, SS-N-9, and SS-N-12, but it is assumed that these are for use against targets at sea.

M4

French M4 with 7 MIRV planned IOC, 1985.

SS-N-6

As more Delta class SSBN with 8000 km missiles come into service, some Yankee class equipped with 3000 km SS-N-6 missiles could be targetted on Western Europe

SS-N-5

SS-N-5 on Golf SSB assumed to be deployed in Baltic for use against NATO land targets.

SS-N-4

With a range of less than 500 km, SS-N-4 on Golf SSB is not shown. It could be launched from the Baltic against NATO land targets.

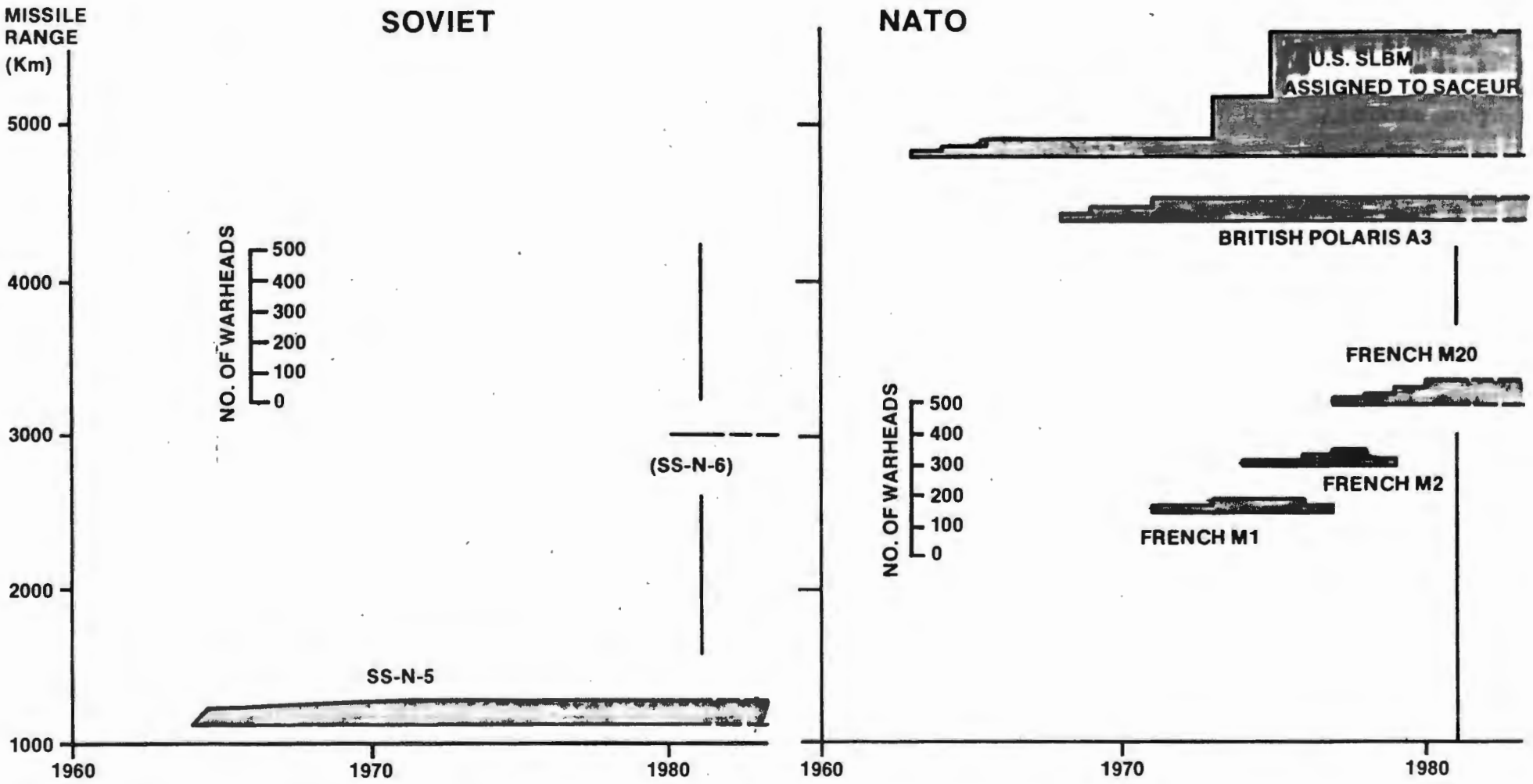

FIG. V: LONG-RANGE TNF: RANGE OF SUBMARINE LAUNCHED MISSILES AND NUMBER OF INDEPENDENT WARHEADS

FIGURE VI: LONG-RANGE AIR-DELIVERED THEATRE NUCLEAR FORCES

Location of shaded areas on vertical scale indicates unrefuelled combat radius in km. Vertical thickness of shaded areas indicates total number of nuclear warheads that can be carried by all aircraft assigned to nuclear role in European Theatre. Many shorter-range nuclear-capable aircraft are now shown (e.g. Fencer, Flogger, Fitter, Mirage IVA, Buccaneer, F-104, F-4, A6, A7).

Backfire

Assume 4 warheads per aircraft assigned to nuclear role (9)
Assume 40% of LRA inventory assigned to nuclear role in European Theatre (9)
Assume construction of 30 aircraft per annum, 15 going to Long Range Air Forces

Badger

Assume 2 warheads per aircraft assigned to nuclear role (9)
Assume 40% of inventory assigned to nuclear role in European Theatre (9) after 1970

Blinder

Assume 2 warheads per aircraft assigned to nuclear role (9)
Assume 40% of inventory assigned to nuclear role in European Theatre (9)

FB-111

Assume 6 nuclear warheads per aircraft (11)
Assume all inventory in nuclear role, 50% assignable to European Theatre (Have not been so assigned up to 1981)

B-58

Assume 2 nuclear warheads per aircraft
Assume all inventory in nuclear role, 50% assignable to European Theatre

Vulcan, Victor, Valiant

Assume 2 nuclear warheads per Vulcan (9), one per Victor and Valiant (9)
Assume all Vulcans in nuclear role and assigned to European Theatre (9), half Victors and Valiants

Canberra

Assume 1 nuclear warhead per aircraft assigned to nuclear role

F-111E/F

Assume 2 nuclear warheads per aircraft assigned to nuclear role (9)
Assume 50% of European inventory assigned to nuclear role (9)

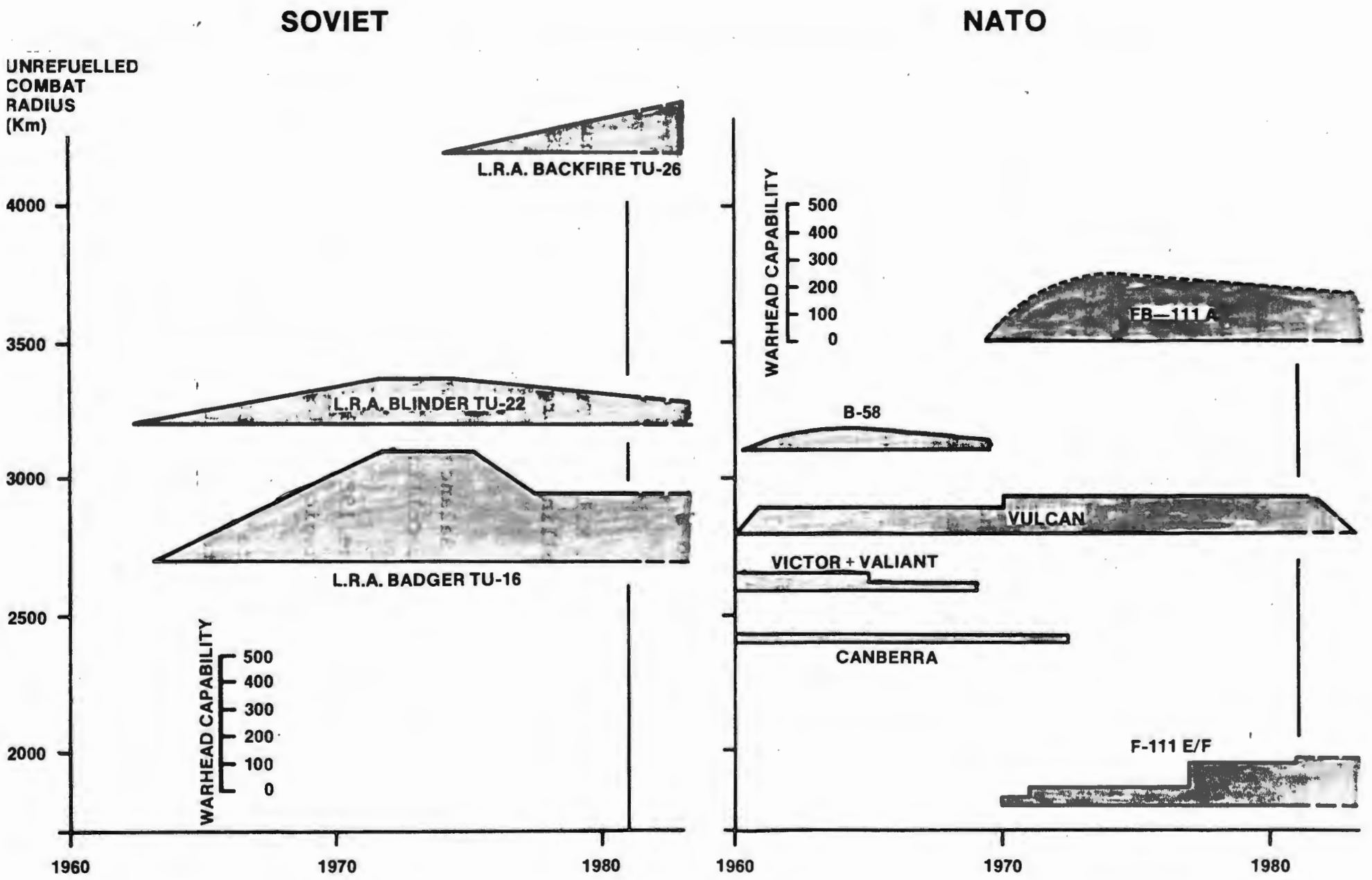

FIG. VI: LONG-RANGE TNF: UNREFUELLED COMBAT RADIUS OF AIRCRAFT AND CAPABILITIES FOR AIR-CARRIED NUCLEAR WARHEADS

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