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SOVIET CAPABILITIES FOR STRATEGIC ATTACK THROUGH MID-1964

Submitted by the
DIRECTOR OF CENTRAL INTELLIGENCE

The following intelligence organizations participated in the preparation of this estimate: The Central Intelligence Agency and the intelligence organizations of the Departments of State, the Army, the Navy, the Air Force, The Joint Staff, NSA, and AEC.

Concurred in by the
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on 9 February 1960. Concurring were The Director of Intelligence and Research, Department of State; the Assistant Chief of Staff for Intelligence, Department of the Army; the Director of Naval Intelligence; the Assistant Chief of Staff, Intelligence, USAF; the Director for Intelligence, The Joint Staff; the Assistant to the Secretary of Defense, Special Operations; the Director of the National Security Agency, and the Atomic Energy Commission Representative to the USIB. The Assistant Director, Federal Bureau of Investigation, abstained, the subject being outside of his jurisdiction.

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TABLE OF CONTENTS

	Page
THE PROBLEM	1
FOREWORD	1
CONCLUSIONS	2
DISCUSSION	5
I. INTRODUCTION	5
II. THE DEVELOPMENT OF SOVIET STRATEGIC ATTACK CAPABILITIES TO DATE	6
Long Range Aviation	6
Naval and Tactical Aviation	7
Air-to-Surface Missiles	7
Ground-Launched Ballistic Missiles	7
Nuclear Weapons	9
Soviet Evaluation of Current Capabilities	9
III. BROAD CONSIDERATIONS AFFECTING THE FUTURE COMPOSITION OF SOVIET STRATEGIC ATTACK FORCES	9
IV. INTERCONTINENTAL BALLISTIC MISSILES	10
V. MEDIUM RANGE BALLISTIC MISSILES	14
VI. LONG RANGE AVIATION	15
Medium Bombers	15
Heavy Bombers	16
Air-to-Surface Missiles	17
VII. SUBMARINE-LAUNCHED MISSILES	17
ANNEX A: CALCULATIONS OF SOVIET ICBM REQUIREMENTS	19
METHODOLOGY	21
Basic Data	21
Requirements Against US Retaliatory Bases	21
Requirements Against US Metropolitan Areas	22
ANNEX B: SCALE OF ECONOMIC EFFORT FOR CERTAIN ICBM PROGRAMS	25
Missile Production	25
Launching Facilities	27
Personnel	28
Total Cost	28
ANNEX C: ECONOMIC ASPECTS OF PROBABLE STRATEGIC ATTACK PROGRAMS	29
Expenditures for Strategic Attack Programs	29
Shifts in Composition	29
The General Scope of the Major Categories	30
Ground-Launched Missiles	30
ANNEX D: PERFORMANCE CHARACTERISTICS OF SOVIET LONG RANGE BOMBERS	31
ANNEX E: DEPLOYMENT AND TARGET COVERAGE OF BOMBERS AND MISSILES (Graphics)	

SOVIET CAPABILITIES FOR STRATEGIC ATTACK THROUGH MID-1964

THE PROBLEM

To estimate probable trends in the strength and deployment of Soviet long-range air and missile weapons systems suitable for strategic attack, through mid-1964.[1]

FOREWORD

The critical feature of this estimate is our judgment with respect to the force goals of the existing Soviet ICBM program. This judgment is based in part on calculations regarding Soviet ICBM requirements for various defined strategic purposes. These calculations are especially sensitive to possible differences between our assumptions and those actually made by Soviet planners with respect to two important factors:

a. The probable future performance characteristics of the improving Soviet ICBM.

b. The probable future development of the US nuclear retaliatory force.

We have assumed for the Soviet ICBM the performance characteristics estimated for it at various dates in NIE 11-5-59, "Soviet Capabilities in Guided Missiles and Space Vehicles," dated 3 November 1959, and in the USIB "Memorandum to Holders of NIE 11-5-59" dated 19 January 1960. Soviet planners may expect a better performance, in which case their estimates of the numbers required would be lower than ours. However, we would expect them to use conservative assumptions in making so vital a calculation.

With respect to Soviet targeting, we have assumed that existing approved US military programs will be carried out. Explicit information on these programs is presumably not available to Soviet planners, but we believe that they have

[1] "Strategic attack" as used herein is defined as nuclear attack against retaliatory forces and key war-making strengths in North America, as well as US and Allied retaliatory forces at sea and in overseas areas. The weapons systems primarily considered are heavy and medium bombers assigned to Long Range Aviation, related air-to-surface missiles, ground-launched missiles with maximum ranges of 700 nautical miles or more, and submarine-launched missiles. It is recognized that other delivery systems are available for use against targets at sea and overseas.

enough general information from open sources to be able to estimate them with fair accuracy. These US programs are, of course, subject to change—as is the Soviet ICBM program also. The present Soviet ICBM program, however, must be based on the present Soviet estimate of the probable future development of the target system.

It is beyond the scope of this estimate to consider what political or military courses of action the USSR might adopt if the development of its strategic attack capabilities were to be as estimated herein. Such matters will be considered in the forthcoming NIE 11-4-59, "Main Trends in Soviet Capabilities and Policies, 1959–1964."

CONCLUSIONS

1. The Soviet rulers probably regard their present strategic attack forces as capable of devastating US and Allied concentrations of population and industry, but incapable of preventing, by military action, the nuclear devastation of the USSR. (Para. 36)

2. The ICBM presents the best prospects of being able to deliver a heavy weight of attack within the least time after a decision to attack, and thereby to prevent the launching or reduce the weight of a US strategic attack on the USSR. Hence, we believe that the future development of Soviet intercontinental attack capabilities will be primarily a function of the development, production, and deployment of ICBMs. Soviet ICBM capabilities will be supplemented by the development of a submarine-launched missile capability and by the maintenance of a substantial long range bomber capability. (Paras. 40–43)

3. Our analysis leads us to believe that, if the US military posture develops as presently planned, the USSR will in 1961 have its most favorable opportunity to gain a decided military, political, and psychological advantage over the US by the rapid deployment of operational ICBMs. Even at that time, however, the proportion of US retaliatory forces which the Soviets could expect to destroy in a missile attack would depend not only on the number of missiles employed and their performance characteristics, but also, and critically, upon the degree of surprise attainable and upon the precision with which the initial salvo could be timed. Even if surprise were complete and timing perfect the USSR would have to expect retaliation from such US bombers as might be on airborne alert at the time of attack, from at least some of the US aircraft carriers and missile-launching submarines then at sea, and from any other US retaliatory forces that survived the initial salvo. After 1961 the numbers of semihardened and hardened US ICBM sites programmed to become operational would require a steep increase in the number of Soviet ICBMs to achieve comparable objectives against US retaliatory forces. (Paras. 45–52)

4. From an economic point of view the main determinant of the Soviet ICBM program is not so much the availability of resources, as the physical difficulty of rapidly building up production of missiles and particularly of launching facilities during the first year or two after IOC, and of training in a comparatively short time the personnel required to maintain and operate a large number of missiles. These difficulties set practical limits to the Soviet ICBM program. (Paras. 56–58)

5. Every present indication suggests that the Soviet ICBM program, while not a crash program, is designed to provide a substantial ICBM capability at an early date. The goal of the program is probably an ICBM force as large as Soviet planners deem necessary to provide a substantial deterrent and preemptive attack capability. In our view, this

would be consistent with the present deliberate and orderly tempo of the Soviet ICBM test-firing program, with current Soviet military doctrine, and with the USSR's observed policy of maintaining a balance among military capabilities designed to accomplish various missions.[2] (Para. 55)

6. We conclude that the probable Soviet ICBM program would provide on the order of 140–200 ICBMs on launcher in mid-1961. Within this range, the Assistant Chief for Intelligence, Department of the Army, and the Assistant Chief of Naval Operations for Intelligence, Department of the Navy, estimate that the Soviet program is likely to be toward the low side. The Director of Intelligence and Research, Department of State, the Assistant Chief of Staff, Intelligence, USAF, and the Director for Intelligence, The Joint Staff, believing that Soviet planners would regard the advantages to be gained as justifying additional effort, estimate that the number of Soviet ICBMs on launcher is likely to be towards the high side of the 140–200 range. (Para. 61)

7. The military capabilities which the Soviets would acquire with this missile force would depend to a great degree upon the performance characteristics of the missile. By the end of 1960, however, the estimated Soviet ICBM force will constitute a grave threat to the principal US metropolitan areas, and will thus represent a powerful political and psychological weapon in international relationships. By 1961 it will present an extremely dangerous threat to SAC bomber bases, unhardened ICBM sites and command installations, although the degree of assurance the Soviets would have of being able to destroy US retaliatory forces would vary considerably depending on the performance characteristics of their ICBMs, and in any case would be subject to the qualifications in paragraph 3. (Para. 62)

8. The development of the Soviet ICBM force beyond 1961 would be likely to be affected by such considerations as the actual development of the target system to be attacked, the prospects for a greatly improved Soviet ICBM, and the prospects (on both sides) for an effective anti-ICBM, as well as by the general development of the world situation and of relations between the US and the USSR. Any figures for future years should be reviewed in the light of such considerations and of evidence on the actual progress of the Soviet ICBM program. Projecting our estimates of the present ICBM program (and assuming that if the USSR has approximately 200 ICBMs on launcher in mid-1961 production would substantially level off in the sub-

[2] The Assistant Chief of Staff, Intelligence, USAF, does not concur in the second sentence of paragraph 5. He does not believe that Soviet behavior, as we have observed it, warrants the judgment that their objectives would be satisfied by attainment of only substantial deterrence and pre-emptive attack capability. Rather, he believes that the Soviet rulers are endeavoring to attain at the earliest practicable date a military superiority over the United States which they would consider to be so decisive as to enable them either to force their will on the United States through threat of destruction, or to launch such devastating attacks against the United States that, at the cost of acceptable levels of damage to themselves, the United States as a world power would cease to exist. He further believes that such an objective could be attained by the development of their overall military capabilities which would include an operational ICBM force of about 250 (185 on launcher) by mid-1961, 500 (385 on launcher) by mid-1962, and 800 (640 on launcher) by mid-1963. It is generally agreed that the Soviets have both the technical and industrial capability to produce such a force; the physical difficulties thereby entailed will almost certainly not be the limiting factor.

It is the view of the Assistant Chief of Staff, Intelligence, USAF, that, while Soviet planners will undoubtedly feel that they will have attained a capacity for substantial deterrence and pre-emptive attack by mid-1962 or earlier, the real objective of the Soviet ICBM program is "decisive military superiority." He believes that the Soviets would not be content with conceptual levels of deterrence; they would realize the possibility of error in their own calculations and acknowledge the possibility of Western preemption of their deterrent capabilities. This latter contingency would weigh the more heavily if the Soviet leaders intended, as he believes likely, to exploit their capabilities in political offensives. In this event, their estimate of the likelihood of Western "desperate" acts would induce them to attempt attainment of total deterrence, i.e., "decisive military superiority."

sequent two years) the most likely number of Soviet ICBMs on launcher in mid-1962 would be 250–350 and in mid-1963 would be 350–450.[3] (Para. 63)

9. The USSR will have no serious difficulty in meeting its estimated requirements for 700 n.m. and 1,100 n.m. ballistic missiles. (Paras. 64–67)

10. On the basis of the foregoing conclusions, our numerical estimates of Soviet medium and heavy bombers in Long Range Aviation units, long and medium-range ballistic missiles, and missile-launching submarines are as shown in the following table: [4] [5]

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
Bombers					
Heavy	135	150	140	130	120
Medium	1,100	1,050	1,000	900	800
Missiles					
700 n.m.					
In Inventory	250	350	450	450	450
On Launcher	110	150	150	150	150
1,100 n.m.					
In Inventory	80	160	240	300	300
On Launcher	50	100	100	100	100
ICBM					
In Inventory	50	175–270	325–450	450–560	[a]
On Launcher	35	140–200	250–350	350–450	[b]
Submarines					
"Z" class [c]	4	4	4	4	4
"G" class [d]	9	15	18	18	18
Nuclear [e]	..	2	6	10	14

[3] The Assistant Chief of Staff, Intelligence, USAF, does not concur in this sentence. See his footnote to paragraph 5, above.

[a] Not estimated beyond 1963.

[b] Not estimated beyond 1963.

[c] Each "Z" class submarine would probably carry two missiles.

[d] Each "G" class submarine would probably carry about five missiles.

[e] The associated missile may not become available until 1963, in which case the missile used in the "G" class might be used in this submarine. Each submarine would probably carry 6–12.

DISSENTING VIEWS

[4] The Assistant Chief of Staff, Intelligence, USAF, does not concur in the numbers of heavy bombers and ICBMs estimated, believing they should be:

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
Heavy bombers	135	150	175	200	200
ICBM					
In Inventory	50	250	500	800	
On Launcher	35	185	385	640	

[5] The Assistant Chief of Staff for Intelligence, Department of the Army, does not concur in the numbers of heavy bombers estimated. In his view, future Soviet heavy bomber strength will approximate the following:

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
Heavy bombers	125	115	100	75	75

DISCUSSION

I. INTRODUCTION

11. Soviet decisions regarding the development of strategic attack capabilities are taken in the context of Soviet (not US) political and strategic concepts. Although we lack direct intelligence of Soviet intentions and programs for the future development of strategic attack forces, the conceptual context in which such plans are formed is generally well known.

12. Ruling circles in the USSR regard the world situation as one of constant, unremitting struggle between Communist and anti-Communist forces. Their faith requires them to prosecute the struggle by every expedient means. They believe that the courses of action which may be appropriate at any given time can be determined with scientific accuracy by Marxist calculation of the everchanging "relation of forces." They recognize, of course, the possibility of error through un-Marxist analysis of the situation. "Left deviation," or "adventurism," is the underestimation of opposing forces (or overestimation of Communist forces) which leads to the incurrence of unwarranted risks. "Right deviation," or "opportunism," is the reverse, which results in failure to take maximum practicable advantage of enemy vulnerabilities. Either deviation is not only a mistake, but a sin.

13. Military force is only one factor in the complex "relation of forces" to be calculated. Marxist analysis does not admit of the sharp distinction between military and political affairs which has been characteristic of much Western civil and military thought. Its central concept is power, and power includes, in addition to the military factor, political, psychological and economic elements, which are understood to be mutually reinforcing. Thus military forces are valued for psychological and political as well as strictly military potentialities.

14. The calculation of their military requirements in the context of the total relation of forces has led the Soviet rulers to maintain, at considerable economic cost, large and diversified forces. Strategic attack forces are only one element in this total military requirement, and, up to the present at least, have been allocated a comparatively small proportion of total Soviet military expenditures.

15. In the present world relation of forces, the Soviet rulers almost certainly calculate that the only military contingency they have to fear would be a massive US nuclear attack on the USSR. They would regard the provocation of such an attack as wildly "adventuristic." Consequently, they are deterred from pursuing courses of action which, in their estimation, involve serious risk of producing that result. But they evidently consider that the US is in large measure deterred from delivering such an attack. They attribute this deterrence to psychological and political as well as military factors in the total relation of forces. Moreover, from the Soviet point of view, mutual deterrence from nuclear strategic attack is not a stalemate, but an opportunity to press more vigorously psychological, economic, and political forms of attack, and possibly even to engage in some limited forms of military action.

16. The Soviet rulers, however, are not content to maintain the present relation of Soviet to US military power. They are bound to endeavor to change this relationship to their advantage. In their estimation, the greater their relative military strength, the greater will be their political opportunities, without actual recourse to general war. They would consider themselves guilty of "right deviationism" if, with the advent of intercontinental ballistic missiles, they did not attempt to achieve a military advantage over the US. From their point of view, it would be desirable to attain a superiority so decisive as to enable them either to dictate terms to the US or, if necessary, to attack the US without receiving unacceptable damage in return. At the same time, however, they must exercise care to avoid provoking a US preventive attack.

17. Even if a "decisive military superiority" should prove unattainable, Soviet conceptions of security requirements call for provision against the contingency of nuclear war resulting from accident, or miscalculation, or US desperation. In the Soviet view, the more successful the USSR may be in pressing its political and psychological attack, the more acute the danger of a desperate US military reaction may become. Consequently, the security of the Soviet state and society requires a capability to destroy the US nuclear attack forces prior to launch—or at least the capability to reduce the weight of such an attack to the maximum feasible extent by a combination of offensive and defensive measures. In this connection, Soviet military literature has developed a concept of pre-emptive attack—that is, an attack with immediately available forces designed to seize the strategic initiative from an enemy who is himself preparing imminently to attack.[6]

II. THE DEVELOPMENT OF SOVIET STRATEGIC ATTACK CAPABILITIES TO DATE

18. During World War II the USSR did not develop an effective long range attack capability. Nevertheless, the USSR was quick to perceive the strategic significance of nuclear weapons, long range bombers (the B–29), and ballistic missiles (the V–2), toward the close of the war. It immediately launched urgent programs to achieve for itself capabilities in these fields. Of necessity, its initial efforts were directed toward the achievement of strategic dominance in Eurasia. As the only feasible military counter to US strategic attack capabilities at that time, it also devoted a major effort to the development of air defense. From the first, however, the USSR almost certainly had the objective of developing an effective strategic attack capability against the continental US.

[6] This concept is distinguished from preventive attack—that is, an attack deliberately planned, prepared, and initiated for the purpose of destroying an enemy's attack capabilities before they have been fully developed.

Long Range Aviation

19. In 1946 the USSR established Long Range Aviation as an independent operational command directly subordinate to the Ministry of Defense. The BULL piston medium bomber, a copy of the US B–29, was produced for the equipment of this force. The BULL, however, can have been regarded only as a convenient means of meeting an urgent interim requirement. Even while the buildup of BULL strength was in progress, the BADGER jet medium bomber was under urgent development. It went into large-scale production in 1954. The transition from BULLs to BADGERs in operational units proceeded steadily thereafter, in accordance with a smooth and orderly program. BULL strength was substantially maintained for several years, however, while the BADGER buildup was in progress. This overlap appears to reflect a desire to retain an established capability until an improved capability designed to supersede it had also become well established. As a result, Long Range Aviation reached a peak strength of nearly 1,400 BULL and BADGER medium bombers in 1957–1958. Since then BULLs have been phased out more rapidly: the mid-1959 medium bomber strength of Long Range Aviation is estimated to have been 225 BULLs and 1,050 BADGERs. The production of BADGERs has now ceased. Thus, when the last BULL has been phased out of Long Range Aviation in 1960, the net result will be the replacement of BULLs by BADGERs on virtually a one-for-one basis.

20. These medium bombers are best suited for operations in and near Eurasia. They are capable of reaching targets in the US if need be, but with few exceptions only on one-way missions.[7] For a more satisfactory capability against the US, the USSR required a heavy bomber. To meet this requirement, the BEAR turboprop and BISON jet heavy bombers were developed concurrently with each other and with the BADGER. There are indications that large-scale production of heavy bombers

[7] For a graphic presentation of possible target coverage by particular bomber types from forward staging bases, with and without refueling, see Annex E.

was intended. However, BEAR production ceased after the completion of about 60 aircraft. Cumulative BISON production reached about 115 in mid-1959. It has been marked by numerous modifications of the aircraft and by low and fluctuating production rates. During the fall of 1959, the rate of production appears to have been one or two a month.

21. Some of the delays in BISON production were manifestly due to deficiencies discovered in the aircraft, but we believe that there has also been a Soviet change of mind about the heavy bomber program. Disappointment in the performance of the BEAR and BISON, consideration of concurrent and prospective improvements in the air defense of North America, and growing confidence in the development of an effective Soviet ICBM appear to have resulted in a Soviet decision to forego the rapid buildup of a heavy bomber force. Soviet heavy bomber strength is now about 80 BISONs and 40 BEARs in operational units.

22. The deployment of Soviet Long Range Aviation and the locations of forward staging areas in the Soviet Arctic are shown in Annex E. The estimated optimum performance characteristics of the BULL, BADGER, BISON, and BEAR are shown in Annex D.

23. The USSR has not developed a specific tanker aircraft to meet its inflight refueling requirement, but has developed such a capability through the conversion of BISON and BADGER bombers for use as tankers. All of the BISON regiments and about half of the BADGER regiments probably have this capability. The use of bombers as tankers would, of course, reduce the number available for use as bombers in any single attack.

24. Within the limitations of its bomber aircraft, Soviet Long Range Aviation is now a proficient force, although its training, basing and maintenance standards fall below those of the US Strategic Air Command. Its deployment and home base structure are adequate to support large-scale operations launched directly from these bases against Eurasian and peripheral targets. Its capabilities against the US are limited by the difficulty of staging through Arctic bases. In recent years, somewhat more realistic and larger scale training exercises have been conducted, and the scope and magnitude of Arctic operational training has increased. Electronic equipment for navigation, bombing, and ECM has been improved. Storage and loading facilities for nuclear weapons are probably now available at all home bases and some Arctic staging bases; we believe that crews have been trained in the handling, loading, and delivery of these weapons.

Naval and Tactical Aviation

25. In addition to those in Long Range Aviation, some 290 BADGERs have been assigned to Soviet Naval Aviation. These naval BADGER units are specially trained and equipped to attack naval targets: e.g., carrier task forces at sea. There are also some 120 BADGERs assigned to Soviet Tactical Aviation. In addition to medium bombers, Tactical and Naval Aviation are equipped with numerous light bombers whose range permits them to attack many targets in Eurasia and its periphery.

Air-to-Surface Missiles

26. The only Soviet air-to-surface missile now operational (AS–1) is a subsonic type with a range of 55 n.m. This missile was designed to deliver a 3,000 pound warhead against ships at sea. We estimate that about six BADGER regiments, two of them in Long Range Aviation and the remainder in Naval Aviation, are now equipped with these missiles and trained in their use. Assuming that unit holdings now average two AS–1 missiles per assigned aircraft, the present allocation to operational units would be some 350 missiles.

Ground-Launched Ballistic Missiles [8]

27. Through a well conceived program conducted with high priority since shortly after World War II, the USSR has developed

[8] For a more extensive discussion of missile characteristics and of our bases for estimation, see NIE 11–5–59, "Soviet Capabilities in Guided Missiles and Space Vehicles," dated 3 November 1959.

a family of short, medium, and long range surface-to-surface ballistic missiles. We estimate that a Soviet ballistic missile (SS–4) capable of delivering a 3,000 pound warhead to a maximum range of 700 n.m. with a CEP of 1–2 n.m. has been available for operational use since 1956. On the basis of available intelligence, we cannot judge the present scale of production. We have not identified any units equipped with such missiles, although there are indications that the USSR is deploying this type of weapons to East Germany. Considering the length of time available for their production and deployment in conjunction with Soviet requirements (see Section V, below), we believe that in mid-1959 the USSR probably had an operational inventory of some 150 SS–4 missiles and about 75 launchers.

28. We estimate that another ballistic missile (SS–5) capable of delivering a 3,000 pound warhead to a maximum range of 1,100 n.m. with a CEP of two n.m. became available for operational use in late 1958 or early 1959. A small number of such missiles were probably deployed by mid-1959.

29. The SS–4 is road mobile; the SS–5 may be road or rail mobile. Annex B shows the ranges of these missiles from positions near the borders of the USSR itself and of the Soviet Bloc.

30. The USSR is currently test firing an ICBM which we believe is capable of delivering a 6,000 pound warhead to a maximum range of 5,500 n.m. if employed with a heatsink nosecone.[9] Available evidence is believed adequate to gauge the general progress but not the precise timing of the Soviet program to develop an operational ICBM system. We believe, however, that for planning purposes it should be considered that Soviet achievement of an initial operational capability (IOC) with a few—say, 10—series produced ICBMs will have occurred by 1 January 1960.

[9] A reduction in warhead weight would permit an increase in range; use of an ablative nosecone would permit a heavier warhead or extended range.

31. We have no direct evidence of Soviet ICBM deployment concepts or of the intended nature of operational launching sites. In other Soviet ballistic missile systems, mobility has been stressed as a basic design consideration. The Soviet ICBM could be rail mobile, with multiple prepared launching positions consisting of little more than a concrete slab on a special spur track. Such a system would reduce vulnerability by making launching sites difficult to find and identify, and by rendering uncertain the location of the launching unit at any given time. In any case, whether the Soviet ICBM force employs fixed sites, or rail-mobility, or a combination of the two, it will be essentially dependent on the Soviet rail net.

32. In recent years there have been increasing indications of Soviet interest in developing a capability to launch guided missiles from submarines. We estimate that in a first effort, about two "W" class submarines were modified to launch, while surfaced, two subsonic cruise-type missiles (SS–7) capable of delivering a 2,000 pound warhead to a range of 150–200 n.m. with a 2–4 n.m. CEP. In a later effort, about four "Z" class submarines have been modified (by enlarging the sail) probably to launch two ballistic missiles each. These probably could not be launched while the submarine is submerged but it has not yet been determined whether the submarine would have to be fully surfaced, or only partially surfaced. We have no specific information to permit identification of missiles for this purpose, but we believe that compatible missiles may be capable of delivering a 2,000 pound warhead to a range of 200 n.m. (or less likely of 350 n.m.) with an operational CEP of 1 to 3 n.m. The most recent development is the appearance of a new class of conventionally-powered submarine—designated "G" class by US Intelligence—six of which are probably now in operation with the Fleet. Although the evidence in this case is not so convincing as in the case of the modified "Z" class, we evaluate the "G" class as probably having ballistic missile launching capabilities. Their very large sail, considerably higher and longer than that of the modified "Z" class, suggests

that they could each carry about five 350 n.m. missiles, although shorter or even longer range ballistic missiles are less likely possibilities. The warhead weight could be 2,000 pounds and the CEP under operational conditions 1 to 3 n.m.

Nuclear Weapons [10]

33. By an extensive series of tests begun in August 1949, the USSR has demonstrated its ability to provide high-yield nuclear weapons suited to the various delivery systems discussed in this estimate. On the basis of accuracy and payload, the ballistic and submarine-launched missiles considered will require nuclear warheads for effective employment under all but limited and special circumstances. We believe that in general the USSR will equip its ICBMs and submarine-launched missiles with warheads of the maximum yield attainable within the limits of its nuclear and missile technology. Warheads for 700 and 1,100 n.m. ballistic missiles, however, will probably be produced in a range of yields in order to provide operational flexibility, i.e., to permit selection of yield in accordance with the weapon effects desired at the time of attack.

34. We believe that nuclear bombs of high and medium yields are now the primary armament of Soviet Long Range Aviation, and that they have been provided to BADGERs of Naval and Tactical Aviation as well. Air-to-surface missiles employed against ships at sea could employ either HE or nuclear warheads of medium or low yields.

35. Considering the estimated availability of fissionable materials and the level of Soviet nuclear weapons technology, we believe that at present the USSR has sufficient nuclear weapons for a major attack by long range air and missile weapons systems, including sufficient nuclear warheads for its operational submarine launched missiles and ground-launched ballistic missiles of 700 n.m. range and greater.

[10] For a complete discussion of this subject including the yields to be expected from the bombs and warheads associated with particular delivery systems, as well as the estimated availability of fissionable materials in the USSR, see NIE 11-2-59, "The Soviet Atomic Energy Program," dated 16 June 1959 (Limited Distribution).

Soviet Evaluation of Current Capabilities

36. The Soviet rulers probably regard their current strategic attack forces as:

a. Adequate to deliver a devastating attack on US and Allied concentrations of population and industry;

b. Incapable of preventing, by military action, the nuclear devastation of the USSR.

37. From the political point of view, however, the Soviet rulers evidently consider that they have recently achieved a substantially increased deterrent against nuclear attack, and that this achievement marks a very important shift in the global "relation of forces." In their own minds (and in general world opinion) this shift is attributed primarily to their emerging capability with long range missiles, the effectiveness of which is assumed to have been demonstrated by the Sputnik and Lunik shots. Whatever their military values, the Soviets evidently regard ICBMs and medium range missiles as psychological and political weapons of first importance.

III. BROAD CONSIDERATIONS AFFECTING THE FUTURE COMPOSITION OF SOVIET STRATEGIC ATTACK FORCES

38. It is evident that the Soviet authorities do not regard increased numbers of their present bombers as the means of meeting their strategic attack requirements. The production of BEARs and BADGERs has stopped; the production of BISONs is minimal. The problem, then, is to estimate the relative extent to which the Soviets are seeking to meet these requirements through the development and production of improved bombers, of missile launching submarines, and of long range ballistic missiles.

39. As Western air defense continues to improve, time and vulnerability factors are rendering manned bombers progressively less adequate for most Soviet strategic attack missions. The improvements in Soviet bomber

weapons systems estimated for the next several years are not likely to alter this basic trend. An attacking bomber force could inflict appalling damage upon US concentrations of population and industry, paying to air defense the price of admission. However, because of US early warning capabilities and alert procedures, Soviet planners could not expect attacking bombers to reach US strategic attack force bases in time to prevent the launching of a large-scale nuclear retaliatory attack upon the USSR.

40. The missile-launching submarine could provide an effective means of attack on selected targets in the US. We believe that the USSR is developing such a capability and would use it in any strategic attack. The number of Soviet submarines that could be deployed in launching position off US coasts without undue risk of forfeiting strategic surprise would depend on the established pattern of their operations. At present, the number that could be so deployed is very small. It could be increased over the coming years. Soviet planning, however, does not appear to contemplate delivery of the main weight of an attack by this means.

41. Because the ICBM presents the best prospect of being able to deliver a heavy weight of attack within the least time after a decision to attack, we believe that the future development of Soviet intercontinental attack capabilities will be primarily a function of the development, production, and operational deployment of ICBMs. The initial limitations of the Soviet ICBM, in terms of reliability, accuracy, and numbers, will diminish as the weapon system is improved and as production and deployment proceed. Soviet programming of forces for strategic attack will be calculated in terms of an improving ICBM system.

42. Nevertheless, we expect the bomber strength of Long Range Aviation to remain fairly constant during the next year or two, although it will probably decline toward the end of the period. The USSR has a substantial investment in the aircraft, skilled personnel, and base structure of its present bomber force. These assets are not likely to be discarded. Observed Soviet military practice suggests that Long Range Aviation will be maintained as an effective force in being at least until an ICBM capability has become well established.

43. Even after a formidable ICBM capability has been established, the USSR will have a continuing requirement for manned bombers, though in lesser numbers. For some time to come, the bomber will be capable of delivering heavier payloads with greater accuracy than can the ICBM. It will continue to be indispensable in certain types of missions: e.g., against targets of uncertain location.

IV. INTERCONTINENTAL BALLISTIC MISSILES

44. Soviet planners would consider that any substantial Soviet ICBM capability would have important psychological and political effects, including a major deterrent effect on the US, and that these effects would increase with the size of the Soviet ICBM force. The crux of our problem is to estimate how much effort and sacrifice the USSR will make, and how rapidly, to build up its ICBM force in order to: (a) achieve a calculated military capability to destroy US nuclear retaliatory forces prior to launch, and (b) exploit its ICBM capability through political and other nonmilitary methods.

45. As an approach to this problem, we have calculated the approximate numbers of Soviet ICBMs that would be required on launcher in the USSR to give Soviet planners high assurance of being able to inflict severe damage on the bases and fixed installations associated with US nuclear retaliatory forces: SAC operational air bases, ICBM sites, naval bases, and command installations beyond the range of Soviet 1,100 n.m. missiles.[11] We have confined our analysis to the period 1960–1963, beyond which projections of Soviet ICBM characteristics and US target systems become much more uncertain.

[11] For a detailed analysis see Annex A. The estimated characteristics of the Soviet ICBM are given in Table B of that Annex.

46. Our analysis leads us to believe that in 1961 the USSR would have its most favorable opportunity, through a rapid deployment of operational ICBMs, to gain a decided military, political, and psychological advantage over the US. On the basis of an initial Soviet operational capability on 1 January 1960, it is highly unlikely that the USSR could deploy during 1960 a sufficient number of ICBMs to provide high assurance of being able to destroy a strategically significant proportion of the US nuclear retaliatory forces prior to launch. On the other hand, after 1961 the number of semihardened and hardened US ICBM sites programmed to become operational would result in a steep increase in Soviet requirements, despite the estimated improvement in the performance characteristics of the Soviet ICBM. Moreover, as the period advanced the US nuclear retaliatory force structure would presumably include airborne alert, increasing numbers of missile-launching submarines and possibly also some mobile intercontinental missiles, systems generally untargetable for ICBM attack. In these circumstances, a crucial question for this estimate is whether the Soviet rulers would consider it feasible to establish in 1961 an operational ICBM force which, in conjunction with other Soviet forces, would give the USSR such a military advantage as would enable it to impose its will on the US.

47. In this connection, Soviet planners would recognize that the ICBM weapon system is inherently limited to employment against targets whose precise locations are known in advance. In evaluating the strategic effect of an ICBM attack on such fixed installations, they would have to take into account the mobility of the forces based thereon and their reaction times. They would recognize that Soviet achievement of a capability to destroy air and naval bases could be considerably offset by US maintenance of sizable air and naval forces, airborne and at sea.

48. The planned fast reaction times of US nuclear retaliatory forces would require a high initial salvo capability in any ICBM force designed to be able to attack them prior to launch. For this reason, we assume that the USSR would provide launchers to accommodate approximately 75 percent of the ICBMs in its operational inventory, that is, the percentage of missiles expected to be serviceable at any given time. We also assume that Soviet ICBMs rated as reliable on launcher will actually leave the launcher within minutes of the scheduled time. The improbability of so precise a performance in so complex an operation is a factor which would tend to increase the number of ICBMs required on launcher, or conversely, to reduce Soviet assurance of being able to accomplish the desired effect with a given number of ICBMs.

49. Since the accuracy, reliability, and warhead yield of the Soviet ICBM are not precisely known, we have used as a basis for calculation two sets of performance characteristics, one the "best" and one the "worst" that can be derived from our estimate on this subject.[12] Calculations made on this basis are set forth in some detail in Annex A. It is emphasized that our estimate of the characteristics for the Soviet ICBM does not correspond directly with either the "best" or the "worst" characteristics used for these calculations. (For a summary of our actual estimate, see footnote (a) to Table B in Annex A.) Accordingly, the illustrative calculations that follow cannot be directly correlated with the

[12] "Best" Missile

	1 January 1960	*Mid-1963*
CEP (n.m.)	3	1.5
In Flight Reliability (percent)	75	85

"Worst" Missile

	1 January 1960	*Mid-1963*
CEP (n.m.)	5	2.5
In Flight Reliability (percent)	55	70

(See USIB Memorandum to Holders of NIE 11-5-59, dated 19 January 1960. For the CEP of the best missile for 1963 we are using 1.5 n.m. In the Memorandum for Holders, it is stated that "probably not later than during 1963, the operational CEP for an all-inertial system could be reduced to about 2 n.m., and the operational CEP of the radio-inertial system would be somewhat better.")

capabilities of the probable Soviet ICBM program which appears in paragraph 61.

50. On the basis of the "best" missile characteristics of the 1961 Soviet ICBM a program to provide 225 ICBMs on launcher in mid-1961 would give the USSR a very high assurance of being able to inflict severe damage on SAC operational air bases, unhardened command and control installations, and unhardened ICBM sites beyond the range of 1,100 n.m. missiles. On the basis of the "worst" missile characteristics of the 1961 Soviet ICBM, a program to provide 470 ICBMs on launcher would give the same levels of assurance of these results.

51. If the USSR were to exercise this attack capability, however, it would still have to expect retaliation from bombers then on airborne alert, from all or some of the few semihardened and hardened ICBM sites then operational, and from aircraft carriers and missile-launching submarines then at sea. Moreover, even at high levels of statistical assurance, a small proportion of the targeted US retaliatory capabilities would remain after the original salvo.

52. If the Soviets were to raise their sights higher and seek to provide a very high degree of assurance of severe damage on hardened and semihardened as well as on unhardened ICBM sites and air and naval bases, the requirements in mid-1961, still assuming complete surprise, would be 480 "best" ICBMs on launcher or 1,340 "worst" ICBMs on launcher. It can be seen that the needs rise steeply with the number of hardened and semihardened sites considered for attack, and that the amount of assurance gained per additional missile falls off sharply.

53. Any force goal of the magnitude of 480 ICBMs on launcher by mid-1951 could be realized only through a crash program requiring diversion of resources from other programs to which the Soviet rulers have attached great importance, and a high level of activity that would tend to stimulate US countermeasures. There is no indication that such a Soviet effort is now underway. The Soviet leaders would probably take into account that the US might, by adopting such measures as a continuous airborne alert, or a marked acceleration of the construction of hardened ICBM sites, nullify a large part of the advantage they had expected from their numbers of missiles.

54. Finally, the assumption of complete strategic and tactical surprise underlying the above calculations must be subject to some degree of discount by the Soviet rulers. They would have to expect that any tentative warning, even any suspicion, that they intended to attack the US, would lead to an augmentation of US capabilities for deriving further warning, as well as to a heightened alert of SAC and other US retaliatory forces. For as long as the alert posture could be maintained, a substantial proportion of these forces could be placed in a position which would enable them to avoid missile attack. Thus the Soviet rulers would have to consider that in any period of unusual tension between the US and USSR the vulnerability of US forces to attack would almost certainly be diminished. With all these factors in mind, we conclude that the Soviet leaders would be unlikely to take the measures necessary to achieve a force goal of the magnitude of 480 ICBMs on launcher by mid-1961.

55. Every present indication suggests that the Soviet ICBM program, while not a crash program, is designed to provide a substantial ICBM capability at an early date. The goal of the program is probably an ICBM force as large as Soviet planners deem necessary to provide a substantial deterrent and pre-emptive attack capability. In our view, this would be consistent with the present deliberate and orderly tempo of the Soviet ICBM test-firing program, with current Soviet military doctrine, and with the USSR's observed policy of maintaining a balance among military capabilities designed to accomplish various missions.[13]

56. Regarding the scope of a program of even this more limited sort, the many uncertainties in available knowledge require that we allow for a wide range of possibilities. For

[13] The Assistant Chief of Staff, Intelligence, USAF, does not concur in this paragraph. See his footnote to paragraph 5 of the Conclusions.

example, calculations could allow for the existence and operation of one or more plants. On the assumption that one large final assembly plant is already in operation and building up to a peak production rate of 15 ICBMs per month, with a program for the construction of launchers and associated equipment and facilities already begun, and building up to a peak completion rate of nine launchers per month, the following would result:

ICBMs	*Mid-1960*	*Mid-1961*	*Mid-1962*	*Mid-1963*
Produced	60	230	410	560
In Inventory	50	175	325	450
On Launcher	35	140	250	350

57. This would be a vigorous program, but one which, in conjunction with other major military programs, could be carried out without appreciable hindrance to presently planned Soviet industrial and construction programs.[14] Its accomplishment would require highly effective planning, operations, and coordination in order to produce ICBMs and ground equipment, to construct launching facilities, and to train operating personnel in relatively short periods of time. We have made no allowance for serious breakdowns, bottlenecks, or other interruptions, although we recognize that such delays are usual in programs of this nature. If such difficulties occurred, the number of missiles and launchers would lag behind the schedule set forth.

58. To expand this ICBM program appreciably in the early years would introduce considerably greater, though not insurmountable, difficulties. A larger number of missiles could be provided by bringing a second large final assembly plant into production. Deliveries from this plant to operational units would probably begin 6 to 9 months after initial operational deliveries from the first plant. This interval would be the minimum lag consistent with obtaining satisfactory production from the second plant. Assuming a reasonably rapid production buildup, use of the two plants could increase the number of ICBMs about as follows:

ICBMs	*Mid-1960*	*Mid-1961*	*Mid-1962*	*Mid-1963*
Produced	60	350	550	700
In Inventory	50	270	450	560
On Launcher	35	200	350	450

The production of these missiles, however, would have little significance without a corresponding launcher construction program, including production of related ground support, launching, and guidance equipment. Even if the sites were unhardened, to provide the required launching facilities by mid-1961 up to 100 should be under construction simultaneously by the last half of 1960, presumably at widely dispersed sites. Furthermore, the task of training operating and maintenance personnel would be difficult to accomplish on this scale so soon after attaining an initial operational capability.

59. The military capabilities represented by these two ICBM programs depend greatly upon the operational characteristics of the ICBM which is produced. By way of illustration, the following table shows the statistical level of assurance of inflicting severe damage on SAC operational air bases which would be given by the programs in mid-1961:

	"Best" Missile	*"Worst" Missile*
200 missiles on launcher in mid-1961	95 percent	70 percent
140 missiles on launcher in mid-1961	85 percent	55 percent

It should be emphasized that this is merely an example; we do not attempt to estimate what the Soviet strategic concept for the employment of ICBMs would be, or what degree of assurance Soviet planners would consider necessary. Moreover, as noted earlier, the proportion of US retaliatory forces destroyed (as distinguished from the number of SAC bases hit) would depend on the degree of surprise achieved, and the precision with which the attack was timed.

60. In deciding on the magnitude and pace of its ICBM program, Soviet planners would take into account their other weapons systems

[14] For a detailed treatment of the economic aspects of this ICBM program, together with the other Soviet programs for strategic attack forces estimated in this paper, see Annex C.

for strategic attack—notably, long range bombers and missile-launching submarines. They would recognize that, in addition to the damage which could be inflicted in specific target areas, there would be millions of casualties and widespread denials from fallout. We believe that they would regard the capabilities represented by either ICBM program as constituting a substantial deterrent and preemptive attack capability.

61. We conclude that the probable Soviet ICBM program would provide on the order of 140–200 ICBMs on launcher in mid-1961. Within this range, the Assistant Chief of Staff for Intelligence, Department of the Army, and the Assistant Chief of Naval Operations for Intelligence, Department of the Navy, estimate that the Soviet program is likely to be toward the low side. The Director of Intelligence and Research, Department of State, the Assistant Chief of Staff, Intelligence, USAF, and the Director for Intelligence, The Joint Staff, believing that Soviet planners would regard the advantages to be gained as justifying additional effort, estimate that the number of Soviet ICBMs on launcher is likely to be towards the high side of the 140–200 range.

62. As stated above, the military capabilities which the Soviets would acquire with this ICBM program would depend greatly upon the performance characteristics of the missile. However, by the end of 1960, the Soviets could with no more than 50 ICBMs on launcher—whether with the best or worst performance characteristics—have a high assurance of detonating an ICBM over each of the 25 principal US metropolitan areas. Thus they will possess a political and psychological weapon of great consequence in every international relationship. By 1961, the estimated Soviet program will present an extremely dangerous threat to SAC air bases.

63. The development of the Soviet ICBM force beyond 1961 would be likely to be affected by such considerations as the actual development of the target system to be attacked, the prospects for a greatly improved Soviet ICBM, and the prospects (on both sides) for an effective anti-ICBM, as well as by the general development of the world situation and of relations between the US and the USSR. Any figures for future years should be reviewed in the light of such considerations and of evidence on the actual progress of the Soviet ICBM program. Projecting our estimates of the present ICBM program (and assuming that if the USSR has approximately 200 ICBMs on launcher in mid-1961 production would substantially level off in the subsequent two years) the most likely number of Soviet ICBMs on launcher in mid-1962 would be 250–350 and in mid-1963 would be 350–450.[15]

V. MEDIUM RANGE BALLISTIC MISSILES

64. Within the range of the Soviet 700 n.m. (SS–4) and 1,100 n.m. (SS–5) ballistic missiles, the distinction between strategic and tactical targets is slight. During the next five years, existing Western strategic and tactical air and missile bases in areas peripheral to the Bloc will be augmented by additional deployment of ground launched surface-to-surface missiles, a few of which may be in hardened sites by the end of the period. Factors of timing and security, as well as the programmed improvement in Western air defenses, will make it increasingly desirable that an initial Soviet attack against these peripheral retaliatory capabilities be delivered primarily with medium range ballistic missiles. Numerous bombers, as well as shorter range missiles, will be available throughout the period for use in initial or follow-on attacks as needed and for other related missions.

65. We believe the Soviets will seek to deploy SS–4 and SS–5 missiles and launchers in sufficient quantities so that, in an initial salvo, they would have 70–90 percent assurance of inflicting severe damage on Western retaliatory air bases and unhardened missile sites within range. Considering the potential target coverage of these missiles when launched from Soviet territory (see Annex E), we calculate that for this purpose the USSR would need to have on launcher in 1960 about 110 SS–4 missiles plus an equal number of SS–5

[15] The Assistant Chief of Staff, Intelligence, USAF, does not concur in the last sentence of this paragraph. See his footnote to paragraph 5 of the Conclusions.

missiles, all equipped with high-yield warheads. As both missile characteristics and the target system changed, the required number of SS–4 missiles on launcher would increase to about 150 in 1962 and after, while the SS–5 requirement would decrease to 100 or less from 1961 on.[16]

66. As in the case of the ICBM system, the major problems in building operational capabilities with medium range ballistic missiles lie in the preparation of launching facilities, establishment of logistic support, and activation and training of units, rather than in the production of the missiles themselves. We estimate that with relatively modest SS–4 and SS–5 programs, the Soviets could meet the calculated requirement for an initial attack against land-based retaliatory targets within 700 n.m. of the USSR from about 1960 on, and against such targets within 1,100 n.m. from about 1961 on. The following numbers of missiles on launcher are therefore estimated as comprising a Soviet initial salvo capability over the next five years:

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
SS–4 (700 n.m.)	110	150	150	150	150
SS–5 (1,100 n.m.) ...	50	100	100	100	100

67. The initial salvo capability estimated above represents only part of a larger Soviet need for medium range ballistic missiles. It is probable that the USSR is also producing such missiles for subsequent use in the initial phase of a general war and for employment in later phases of a sustained conflict. (They would probably allocate warheads of less than maximum yield to these purposes.) Assuming that to meet these needs as well as those of an initial salvo the USSR produces and deploys three SS–4 and SS–5 missiles per launcher, we estimate that a reasonable buildup in medium range ballistic missiles from present strengths would result in total operational inventories as shown in the table below. Should changing circumstances require somewhat greater numbers of missiles or even launchers, their production and deployment by 1964 would not present serious difficulties to the USSR.

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
SS–4 Inventory" ...	250	350	450	450	450
SS–5 Inventory" ...	80	160	240	300	300

VI. LONG RANGE AVIATION

Medium Bombers

68. The history of the BULL and BADGER suggests that hitherto the Soviets have estimated their standing requirement for medium bombers in Long Range Aviation at about 1,100 aircraft. As medium and long range ballistic missile units become an increasingly effective operational force, this requirement will tend to diminish. We estimate that the medium bomber strength of Long Range Aviation will gradually decline to about 800 in mid-1964.

69. Following a rapid buildup in 1958, the number of BADGERs in Naval and Tactical Aviation has recently tended to level off. We estimate that in mid-1960 the BADGER strength of these components will be about 350 and 120, respectively. It will probably not decline during the period, and there is a possibility that it will be increased through reassignment of BADGERs from Long Range Aviation. The medium bombers of Tactical and Naval Aviation, together with their light bombers, will contribute to Soviet capabilities for attack on naval task forces and Eurasian targets, rather than on targets in the US.

70. We consider it possible that the USSR will develop a medium bomber capable of supersonic dash. On the basis of present indications, such a bomber would be unlikely to be-

[16] Calculations were made in a manner comparable to that employed to derive ICBM requirements, using characteristics estimated for the Soviet missile systems in NIE 11–5–59, and planned and programmed Western retaliatory forces. The considerations set forth in paragraph 48 would apply here also.

" Operational inventories include missiles on launcher given in paragraph 66, plus additional missiles per launcher for purposes other than initial salvo. Total production of these missiles would be larger to provide for training, replacement, test firing, etc.

come available for operational use until 1962 or later. Its performance characteristics might be as shown in Annex D. If it is introduced into operational units, a total of 100 or so might be provided for highly specialized uses.[18]

Heavy Bombers

71. We estimate that Soviet heavy bomber strength will increase to about 150 in 1961, but that it will gradually decline thereafter, to about 120 in mid-1964. This estimate is based on the belief that no more than two BISONs per month will be produced over the next year or so, and that their production will then cease.[19] [20]

[18] The Assistant Chief of Staff, Intelligence, USAF, believes that the Soviets have a positive requirement for a bomber with supersonic dash capability for employment by Long Range Aviation, primarily in the advance wave(s) of strategic bomber strikes. Considering recent reports and sighting of new bomber types, and historical and continuing Soviet interest in the bomber as a strategic weapon delivery system, and the accepted technical capability of the USSR to develop and produce a supersonic dash bomber, the Assistant Chief of Staff, Intelligence, USAF, believes that the introduction of a supersonic dash bomber into operational units is likely by 1962.

[19] The Assistant Chief of Staff, Intelligence, USAF, believes that the Soviets will have a requirement for a larger heavy bomber force during the period of this estimate than that estimated above. He believes that the level and type of activity of the present Soviet heavy bomber force as well as the continued production of BISON bombers indicate a further buildup. He further believes that BISON-type bombers will be produced at the rate of two or more per month over the next few years.

[20] The Assistant Chief of Staff for Intelligence, Department of the Army, cannot concur in this estimate of an increase in operational heavy bomber strength, which would reflect an increase of 25 percent within the next year and a half over the current estimated strength of about 120 (paragraph 21.) This nonconcurrence is based on the following factors:

a. The trend in annual BISON production has been downward since the peak production year of 1957; the increase to 150 implies a general reversal of this trend.

b. The total of 150 presumably would include the same 40 BEARs now estimated to be in operational units, an aircraft which will then have been out of production for over four years. Thus, the increase estimated has either to assume a still greater BISON production rate or to assume that no BEARs are withdrawn or otherwise go out of service in the next year and a half. The former assumption would suggest an even sharper reversal of observed trends, while the latter assumption is hardly reasonable.

c. The apparent conflict with production trends referred to above could presumably be overcome and the force increased by adding bombers which have been produced but are not now in operational status. However, such action would also reverse a longstanding practice for no apparent reason, unless, contrary to our estimates, the Soviets associate special significance with the date, mid-1961.

d. The apparent emphasis on a buildup of Long Range Aviation heavy bomber strength, implied by a 25 percent increase, conflicts with judgments elsewhere in this NIE (paragraph 38) that the Soviets do not regard increased numbers of their present bombers as the means of meeting their strategic attack requirements and that they will commence a substantial buildup with ICBM's during the same period.

Based on analysis of the foregoing factors, the Assistant Chief of Staff for Intelligence, Department of the Army, concludes that Soviet heavy bomber strength probably will remain relatively unchanged over the next year and a half, and then, with the probable cessation of BISON production and increasing age of the BEAR, will decline rather rapidly. In his view, future heavy bomber strength will approximate the following:

Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
125	115	100	75	75

72. A better than marginal improvement over present Soviet heavy bombers could be achieved by the development of a nuclear powered aircraft. Such a bomber could derive tactical advantages from its virtually unlimited range and its concomitant ability to make very low altitude penetrations. Although there are indications of Soviet interest in nuclear-powered aircraft, no specific Soviet program directed toward the development of such an aircraft has yet been identified. We believe that the Soviets have such a program underway, but believe it unlikely

that they will have any nuclear-powered bombers in operational status within the period of this estimate.[21]

73. In sum, we estimate the operational strength of Soviet Long Range Aviation, including BISON and BADGER tanker-bombers, will be about as shown over the next five years:

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
Heavy Bombers[22]					
BISON and BEAR	135	150	140	130	120
Medium Bombers[a]					
BADGER ..	1,100	1,050	1,000	900	800
Total	1,235	1,200	1,140	1,030	920

[a] There might be a few supersonic "dash" medium bombers in 1962, perhaps increasing to 100 or so in 1964, in which case we would expect a corresponding decrease in the number of BADGERs.

Air-to-Surface Missiles

74. There may be some further increase in the number of BADGER regiments equipped with the currently available subsonic air-to-surface missile (AS–1), but its limited range and utility argues against its production and deployment in large numbers. On this basis, we estimate that an operational inventory of some 500 will be maintained during the early 1960's. A portion of these missiles will probably be equipped with nuclear warheads of low and medium yields, the remainder employing HE.

75. The USSR has need of an improved air-to-surface missile, for use against well-defended targets on land as well as against ships at sea. We believe that such a missile (AS–2) is now under active development, and that it will probably become operationally available in 1961. It will probably be capable of delivering a 3,000 lb. warhead to a range of at least 350 n.m. at supersonic speed (Mach 1.5–2). This missile would presumably be designed to be carried by any medium or heavy bomber operational during the period 1961–1964. Assuming the replacement of AS–1 and an allocation to heavy bombers, we estimate that by mid-1964 some 600 or more AS–2 missiles will have been supplied to operational units. High yield nuclear warheads will probably be provided for those missiles intended for use against land targets. Medium and low yield nuclear warheads, and possibly HE warheads, are likely to be allocated for antiship use.

76. In the absence of evidence, but on the basis of operational desirability and technical feasibility, we estimate that the USSR may now have available air-launched decoys to simulate medium or heavy bombers. Such decoys could be carried along with a bomb load.

VII. SUBMARINE-LAUNCHED MISSILES

77. We believe that the USSR is proceeding with the development of submarines expressly designed to launch missiles and of improved missiles for them to employ. In view of operational considerations, the most desirable new system would be a nuclear-powered submarine capable of launching, while submerged, ballistic missiles of at least 500 n.m. range. On the basis of Soviet technical capabilities, we estimate that in 1961–1963 the USSR could have available for operational use a submarine-launched ballistic missile (SS–9) capable of delivering a 1,000 lb. warhead to a range of 500–1,000 n.m. with a CEP of 2–4 n.m. Present indications are that the Soviet nuclear-powered submarine program is sufficiently far

[21] The Assistant Chief of Staff, Intelligence, USAF, believes that in view of the tactical and psychological advantages of a nuclear-powered bomber, the state of Soviet aviation and nuclear technology and the evident Soviet interest in the development of such an aircraft that a small number of nuclear bombers may appear in operational status by the end of the period of this estimate.

[22] The Assistant Chief of Staff, Intelligence, USAF, believes that this table should read:

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
Heavy Bombers ..	135	150	175	200	200

[23] For the view of the Assistant Chief of Staff for Intelligence, Department of the Army, see his footnote to paragraph 71.

advanced so that the SS–9 missile could be incorporated as soon as the missile becomes available. A nuclear-powered submarine could probably carry 6–12 such missiles.

78. In the absence of direct evidence, but considering the potential value of the weapon system, we have assumed an active current development program which would make a nuclear submarine/ballistic missile system ready for operational use in 1961. Thereafter, in a reasonable construction program, the Soviets could probably introduce a few such submarines into operational units annually, while continuing the construction of nuclear submarines equipped with torpedoes.[24] On this basis, we estimate that about 14 nuclear-powered submarines equipped with 500–1,000 n.m. missiles will be operational in 1964. With proper operating procedures and alternate crews, a considerable portion of this number—perhaps half—could be deployed off US coasts at all times, should the Soviets so desire.

79. The foregoing weapon system is complicated and expensive, and will probably increase in number relatively slowly. In the next few years, the USSR will therefore probably build a limited number of new, conventionally powered submarines designed to launch ballistic missiles. The capability acquired through such an interim program would probably be retained to supplement Soviet strength in nuclear-powered missile submarines. The USSR would probably also retain converted missile submarines during a buildup in new submarines. We believe a reasonable allocation of missiles (excluding those for training and other noncombat purposes) would provide a number sufficient for about two combat patrols per submarine.

80. On the basis of the preceding discussion (see also paragraph 32) we project as follows the numbers of ballistic missile-launching submarines and their missiles, in Soviet operational units, through mid-1964:

Missile subs Missiles allocated	*Mid-1960*	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1964*
Nuclear-powered	..	2	6	10	14
500–1,000 n.m.[25]	..	24–48	72–144	120–240	168–336
Conventional ("G")	9	15	18	18	18
350 n.m.	90	150	180	180	180
Converted ("Z")	4	4	4	4	4
200 n.m.	16	16	16	16	16

[24] For a fuller discussion of estimated Soviet capabilities and programs for nuclear-powered submarines, see the forthcoming NIE 11-4-59, "Main Trends in Soviet Capabilities and Policies, 1959–1964."

[25] This missile system (SS–9) may not be available until as late as 1963, in which case the missile used in the "G" class might be used in this submarine.

ANNEXES

ANNEX A

CALCULATIONS OF SOVIET ICBM REQUIREMENTS

ANNEX A

CALCULATIONS OF SOVIET ICBM REQUIREMENTS

1. As an aid toward the estimation of the force goal of the present Soviet ICBM program, we have made calculations of the numbers of Soviet ICBMs that would be required, in each of the years covered by this estimate, to provide high assurance of being able to accomplish certain specific strategic purposes. We have considered three illustrative cases, as follows:

Case A: The number of ICBMs required to provide at least 90 percent assurance of being able to inflict severe damage on SAC operational air bases, unhardened US ICBM sites, and unhardened command installations beyond the range of 1,100 n.m. missiles. This concept would leave other targets (e.g., naval bases and semihardened and hardened targets) to attack by missile-launching submarines and bombers.

Case B: To provide at least 90 percent assurance of being able to inflict severe damage on semihardened and hardened as well as unhardened US nuclear retaliatory force targets, including naval bases.

Case C: To provide at least 50 percent assurance of being able to inflict severe damage on hardened US retaliatory force targets and a 70 percent assurance with respect to others, leaving naval bases to attack by other means.

2. Since the accuracy, reliability, and warhead yield of the Soviet ICBM are not precisely known, we have used as a basis for calculation two sets of performance characteristics, one the "best" and one the "worst" that can be derived from the USIB "Memorandum to Holders of NIE 11-5-59," dated 22 January 1960. It is emphasized that our estimate of the characteristics for the Soviet ICBM does not correspond directly with either the "best" or the "worst" characteristics used for these calculations. (For a summary of our actual estimate, see footnote (a) to Table B in this Annex.) Accordingly, the illustrative calculations that follow cannot be directly correlated with the capabilities of the probable Soviet ICBM program which appears in paragraph 61.

3. In introducing the numbers derived from these calculations, we must draw particular attention to the essential distinction between the effect of the detonation of a single Soviet ICBM on a target and the number of ICBMs required to give Soviet planners a desired level of *assurance* of being able to achieve that effect. It is with the latter order of numbers that Soviet planners would be concerned in establishing Soviet ICBM force goals.

4. As noted in the Foreword, our calculations are especially sensitive to possible differences between our assumptions and those actually made by Soviet planners with respect to the future performance characteristics of the Soviet ICBM and to the future development of US retaliatory forces. In any case, we must emphasize that the numbers resulting from our calculations are to be regarded only as approximations. Soviet planners, if they have made similar calculations, have undoubtedly arrived at somewhat different numbers. On the whole, however, we believe that their orders of magnitude would be the same as ours.

5. The target systems against which we have calculated Soviet ICBM requirements consist exclusively of fixed installations: SAC operational air bases, ICBM sites, naval bases, command installations. An inherent limitation of the ICBM is that it can be employed only against targets the precise locations of which are known in advance. In evaluating the

strategic effect of an ICBM attack on such fixed installations, Soviet planners would have to take into account the mobility of the forces based thereon and their reaction times. For example, the primary object of an ICBM attack on a SAC base would be the destruction of bombers prior to take off, but only such bombers as were present on the ground at the time of the attack could be destroyed. Similarly, an attack on naval bases could have no immediate effect on aircraft carriers and missile-launching submarines at sea. Soviet planners would have to consider that Soviet achievement of an ICBM capability to destroy air and naval bases could be considerably offset by US maintenance of sizable air and naval forces airborne and at sea.

6. In any case, the planned fast reaction times of US nuclear retaliatory forces would require that a Soviet ICBM attack be delivered in an initial salvo. For this reason, we have assumed that the USSR would provide sufficient launchers to accommodate all the ICBMs expected to be in commission at any given time. Our calculations have also assumed that Soviet ICBMs rated as reliable on launcher will actually leave the launcher within minutes of the scheduled time.[20] We are unable to quantify any allowance which should be made for the improbability—for technical or other reasons—of so precise a performance in so complex an operation. It is a factor which would tend to increase the number of ICBMs on launcher required, or conversely, to reduce the Soviet assurance of being able to accomplish the desired effect with the numbers of ICBMs indicated.

[20] This assumption presupposes advance preparations to maximize readiness.

7. With respect to US ICBMs, our calculations take into account only the Atlas and Titan programs. Soviet requirements are likely to be increased, beginning in about 1963, by the growing but as yet uncertain number of hardened Minuteman sites becoming operational. To this extent, the Soviet ICBM requirements which we show for mid-1963 are low.

8. With these cautionary observations, we present in Table A the numbers of Soviet ICBMs which we calculate would be required in each of the cases specified in paragraph 1, through mid-1963.

9. As indicated above, Case A leaves naval bases, hardened and semihardened installations to attack by means other than ICBMs. The greatest portion of the Case A requirement therefore comprises the ICBMs needed on launcher to achieve at least 90 percent assurance of inflicting severe damage on SAC operational air bases alone. The on launcher requirement against these bases would be as follows:

	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*
"Best" Missile	[			
"Worst" Missile				]

10. It is clear that as the Soviet ICBM is improved, the number required to achieve a stipulated effect against a relatively static target system will decline, as in Case A. At the same time, however, the overall US nuclear retaliatory force base structure will be growing, dispersing, and hardening, with a resultant steep increase in overall Soviet ICBM requirements, as in Case B.

METHODOLOGY

11. There follows a detailed explanation of the method whereby the numbers given in paragraph 9 and Table A were calculated.

Basic Data

12. Three types of data were used to calculate Soviet requirements for ICBMs in operational inventory through the period of this estimate. These are:

a. the characteristics and performance of the Soviet ICBM weapon system under operational conditions;

b. the target systems which we believe the Soviets would consider appropriate to particular strategic purposes, as set forth in paragraph 1;

c. the appropriate degree of assurance of attaining a given level of damage on these target systems, as set forth in paragraph 1.

13. The characteristics of the weapon system which bear most heavily on the number of Soviet ICBMs needed to accomplish certain military objectives are accuracy, warhead size, reliability, and in-commission rate. Values for these characteristics used in the calculations are shown in Table B.

14. The improving weapon characteristics thus described have in both cases the effect of decreasing the number of ICBMs required to inflict a given level of damage on a given target. During the time period under consideration, the increase in accuracy reduces the number of weapons required to fall in the area of certain targets. The growth of the on launcher and in-flight reliabilities decreases the number of missiles on launcher required per missile arriving in the target area. Improvement in the in-commission rate reduces the number of spare missiles in operational inventory per launcher.

Requirements Against US Retaliatory Bases

15. One basic military target system was used in calculating ICBM requirements, although some types of targets were omitted for certain variations of strategic attack, as indicated in para. 1. The basic military target system includes all installations, beyond the range of Soviet 1,100 n.m. missiles, which possess an immediate retaliatory capability against the USSR. According to present US plans and programs, these targets will increase rapidly in number and change markedly in character throughout the period of this estimate. By 1962, US ICBM launching sites will begin to constitute a major element of the target system. Moreover, since most such sites becoming operational in 1961 and after will be hardened and dispersed, they will be increasingly difficult to destroy. The following summary of the basic military target system for ICBM attack illustrates its changing character:

	Number of Aiming Points			
Type of Target	*1960*	*1961*	*1962*	*1963*
Unhardened ICBM Sites ..	3	9	9	9
Semihardened ICBM Sites .	0	9	36	36
Hardened ICBM Sites	0	3	33	90
SAC Operational Bases	55	63	63	63
Naval Bases	10	10	10	10
Command and Control Installations	4	4	4	4

The foregoing list does not include improved ICBMs now in relatively early stages of research and development, which may begin to be deployed in hardened sites and possibly mobile units as well in the 1962–1963 period. Soviet planners would have to take into account the possibility that these would cause a further sharp increase in requirements.

16. The number of weapons required is also a function of the desired degree of advance assurance that a given level of damage will be inflicted on a specific target. The degree of assurance, say 90 percent, of inflicting a given level of damage on a single target expresses the likelihood that in a large number of such attacks, at least 90 percent of the time the target will receive such damage. In any given attack the target might be subjected to a lesser level of damage or might receive far more damage than intended. The effect of reducing the degree of assurance is to reduce the number of missiles necessary to accomplish the objective. For example, if the degree of assurance against the targets con-

sidered in Case B were reduced from 90 to 70 percent, the number of missiles required on launcher would be cut in half; if assurance were reduced from 90 to 50 percent, the number of missiles required on launcher would be cut to a third.

17. The criterion of severe damage was used in the calculations of requirements for the target systems discussed. This criterion, as used by US military planners, calls for the following damage on various types of targets:

Type of Target	
Unhardened ICBM Site	Overturning erected missiles, causing severe damage to nearby above ground facilities.
Semihardened ICBM Site	[
Hardened ICBM Site	[ ]
Airbases	Damage to parked aircraft so as to require depot repair and moderate to severe damage to above ground facilities.

18. The following procedure was used to calculate the numbers of ICBMs and launchers required in each year from 1960 to 1963:

a. using the estimated accuracy, yield, and reliability of the Soviet ICBM, calculate the numbers of ICBMs required on launcher to attain the stipulated degree of assurance that severe damage will be inflicted on a single target of each type;

b. multiply each of these numbers by the number of targets of each type in a given target system;

c. total these products to obtain the numbers of ICBMs required on launcher for the entire target system;

d. using the estimated in-commission rate, calculate the size of the operational inventory needed to meet the on launcher requirement at any given time;

e. allowing a minimal additional quantity of missiles (15–20 percent) for testing, training and quality control, and to account for major maintenance and normal attrition, calculate the required total production of ICBMs.

19. It should be emphasized that the numbers of missiles required for a given year, as calculated below, are for an operational weapon system with the characteristics estimated for the particular year. In any given year, some of the missiles in operational inventory will have been produced in earlier years. If all operational missiles were not modernized to attain the characteristics estimated for the year under consideration, a greater number would be required to accomplish the objective under consideration. Moreover, to the extent that the training and proficiency of the operating crews had not reached the standards implied in the estimated characteristics of the weapon system, a greater number of missiles would be required.

Requirements Against US Metropolitan Areas

20. We have also considered the number of ICBMs which would be required to give Soviet planners high assurance of being able to deliver a devastating ICBM attack on US concentrations of population, industry, communications, and government facilities. We find that about 35 percent of the total US population and about 60 percent of US defense manufacturing facilities are concentrated in 25 urban-industrial areas. Beyond this number of metropolitan areas, the concentration of population and industry falls off rather sharply. These 25 principal urban-industrial areas are:

New York	Baltimore
Chicago	Washington
Los Angeles	Buffalo
San Francisco	Milwaukee
Philadelphia	Cincinnati
Detroit	Hartford
Cleveland	Akron
Pittsburgh	Flint
Boston	Dayton
St. Louis	Youngstown
Minneapolis	Toledo
Indianapolis	Houston
Providence	

If the Soviets desired at least 70 percent assurance of detonating one ICBM over each of these metropolitan areas, the on launcher requirement for a single salvo would be no more than 50 from 1960 on.

TABLE A

	"BEST" MISSILE [a]				"WORST" MISSILE [a]			
	Mid-1960	*Mid-1961*	*Mid-1962*	*Mid-1963*	*Mid-1960*	*Mid-1961*	*Mid-1962*	*Mid-1963*
CASE A [b]								
On Launcher	[							]
In Inventory [c]								
Produced								
CASE B [b]								
On Launcher	[							]
In Inventory								
Produced								
CASE C [b]								
On Launcher	[							]
In Inventory								
Produced								

[a] See paragraphs 1 and 12 of this Annex.

[b] For definitions, see paragraph 1 of this Annex.

[c] In this table, the numbers of ICBMs "in inventory" are those which would need to be assigned to operational units in order to have the required numbers on launcher at any given time. The relationship between missiles in inventory and on launcher reflects the in-commission rate, estimated in NIE 11-5-59 to increase from 70 percent at IOC to about 80 percent in 1963. The total number of ICBMs produced would include the additional missiles required for testing, training, and quality control, and to allow for major maintenance and normal attrition. We have assumed a minimal additional quantity for these purposes (15–20 percent).

TABLE B[a]

Characteristic	"BEST" MISSILE IOC	Mid-1960	Mid-1961	Mid-1962	Mid-1963	"WORST" MISSILE IOC	Mid-1960	Mid-1961	Mid-1962	Mid-1963
CEP (n.m.)	3	2.7	2.2	1.8	1.5	5	4.5	3.7	3	2.5
Warhead (lb)[b]	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
In Commission (percent)	70	72	75	78	80	70	72	75	78	80
Reliability On Launcher (percent)	80	82	85	88	90	80	82	85	88	90
In Flight (percent)	75	77	80	83	85	55	58	62	66	70

[a] Values for the "best" and "worst" characteristics are derived from NIE 11-5-59 and the USIB "Memorandum to Holders of NIE 11-5-59," dated 19 January 1960; the figures for mid-1960, mid-1961, and mid-1962 have been interpolated. The actual estimate of accuracy and inflight reliability, as contained in the above mentioned Memorandum, may be summarized as follows:

Accuracy

a. Radio-inertial guidance—3 n.m. CEP at IOC; somewhat better than 2 n.m. in 1963.

b. All-inertial guidance—5 n.m. CEP at IOC; about 2 n.m. in 1963. All-inertial guidance will probably be incorporated in 1960–1962, after which the probable Soviet ICBM force is likely to include both radio-inertial and all-inertial guidance systems, with an increasing proportion of the latter system.

(footnote) The Assistant Chief of Staff for Intelligence, Department of the Army, continues to perceive no justification in presently available intelligence for the changes reflected in the above characteristics and believes the accuracy for the radio-inertial system at IOC should be 3–5 n.m. CEP; for the all-inertial system in 1963, 2.5 n.m. CEP.

Inflight Reliability

Estimated to be 55–75 percent at IOC; 70–85 percent in 1963. The Assistant Chief of Staff for Intelligence, Department of the Army, and the Assistant Chief of Naval Operations, Department of the Navy, believe the reliabilities lie at the lower end of the ranges in both years. The Assistant Chief of Staff, Intelligence, USAF, believes the reliabilities lie at the upper ends.

[b] Warhead yields as estimated for this weight in NIE 11-2-59, assuming no further nuclear testing, were used in calculating ICBM requirements.

ANNEX B

SCALE OF ECONOMIC EFFORT FOR CERTAIN ICBM PROGRAMS

ANNEX B

SCALE OF ECONOMIC EFFORT FOR CERTAIN ICBM PROGRAMS

1. This Annex analyzes ICBM programs which would meet the requirements identified in the main text as Case B (at least 90 percent assurance against all retaliatory force targets) and Case C (at least 50 percent assurance against hardened targets and at least 70 percent assurance against others). It considers the economic impact of production and deployment programs which would meet these requirements in mid-1961 and in mid-1963, and compares them with the ICBM program estimated as probable in Section IV of the main text.

2. An assessment of the economic impact of the several ICBM programs considered in this estimate requires the consideration of more than one dimension of the problem. Table A of this Annex summarizes four economic aspects of each program:

a. production of missiles;
b. provision of launching facilities;
c. provision of military personnel on site;
d. monetary costs.

Missile Production

3. As indicated in NIE 11–5–59, we estimate that series production of ICBMs and other system equipment is already underway in the USSR. For purposes of these calculations, we have in all cases assumed that the first series produced missile was delivered early in the final quarter of 1959. Missile production for these programs is based upon an ICBM final assembly facility which had been engaged in prior production of ICBM vehicles for development and test purposes. Thus, in the probable program this facility is assumed to have begun its missile buildup from a going rate of three per month and to reach a peak delivery rate of 15 per month 12 months later, providing about 100 missiles in the first year and 180 per year thereafter.

4. In other programs, where larger outputs were required, a peak rate of 25 missiles per month was assumed under the same conditions and reached in the second year.[27] Most of the larger programs required more than one of these plants, and it is assumed for the purposes of Table A below that all of these plants started production at the same time.

5. In actual practice, however, the Soviets would almost certainly not begin series production of ICBMs (or any other weapons) at more than one plant simultaneously. A second plant might lag the first by 6–12 months. Since only one facility could gain from being the producer of development and test hardware, the follow-on facilities would not start production until the problems of series output had been solved by the lead plant. The postulated multiplant programs would merely lead to a duplication of the initial production engineering problems. Therefore even more plants would probably be required to meet these larger programs. Soviet practice in multifacility programs can be

[27] The 25 missile per month peak rate was considered as maximum for a single facility. This assumption was based upon industrial requirements in the production of a multistaged vehicle with a mass ratio at least as great as the US Titan.

Table A SCALE OF ECONOMIC EFFORT FOR CERTAIN ICBM PROGRAMS

	M-1961						M-1963					
	Case B		Case C		Probable		Case B		Case C		Probable	
	Best	*Worst*	*Best*	*Worst*	*Upper*	*Lower*	*Best*	*Worst*	*Best*	*Worst*	*Upper*	*Lower*
Cumulative Number of ICBMs in Operational Inventory	640	1800	300	670	270	175	2040	5360	680	1820	560	450
Number of Missile Plants												
Peak rate of 10–15 per month	...	...	...	...	2	1	...	...	...	...	2	1
Peak rate of 20–25 per month	3	8	1–2	3	...	...	3	8	1	3	...	...
Peak Missile Production	58	160	28	60	25	15	70	180	23	62	25	15
Cumulative Number of Launchers	480	1340	230	500	200	140	1630	4300	550	1450	450	350
Peak Monthly Launcher Completion	38	110	18	39	13	9	50	130	17	45	13	9
Military Personnel (thousands)	27	75	13	28	11	8	91	240	31	82	25	20
Cumulative ICBM System Cost[a] (billion dollars)	6.7	19	3.2	7	3.3	2.4	25	66	8.3	22	9	7
Cumulative ICBM System Cost[a] (billion rubles)	30	84	14	31	16.	11	110	280	36	97	39	31
Annual Strategic Attack Expenditures[b] (billion rubles)	40	81	28	41	29	25	51	120	23	46	19	19

[a] Excludes cost of nuclear warheads and cost of modernization of previously produced ICBMs.

[b] Expenditures for fiscal year, assuring other elements of Soviet strategic attack capabilities are as estimated in main text.

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illustrated by the following source-time relationships in the BADGER program:

Production Source BADGER PROGRAM	Production Date Initiated	Peak Rate (per month)	Months to Reach Peak
Plant #22, Kazan	Aug 1953	20	8
Plant #1, Kuybyshev	Jun 1954	15	14
Plant #64, Voronezh	Jan 1955	10	12

6. In estimating a production program, a change in estimated IOC date could result in substantial changes. For example, in the probable program about 25–50 additional missiles could be available on launcher by mid-1961 if the IOC date were estimated to occur three months earlier. However, when applied to the probable program such a change could be offset by logistic pipeline lag as well as the assumption that no major problems occur at any point in the production program resulting in schedule slippage.

7. For each of the final assembly plants in the program there would have to be a large number of subsidiary plants to supply specialized components and subassemblies. Furthermore, a large number of other plants would be required to supply the ground support and ground guidance equipment necessary for the operation of the weapon system. In many respects the supply of this ground equipment is more of an economic burden than the missiles themselves; missiles represent only about 10–15 percent of the initial cost of establishing an operational capability with ICBMs.

Launching Facilities

8. The number of launching facilities is a good measure of the amount of activity involved in a given ICBM program. This is not so much because the launcher as such is so expensive, but more because this is a simple way of representing all the facilities, other than the missiles themselves, which are necessary to an operational weapon system. The other facilities which are subsumed under this measure are the ground guidance facilities, test, checkout and maintenance equipment, fueling and storage facilities, housing and general purpose equipment.

9. These facilities, including launchers, comprise the major initial costs of establishing an operational ICBM system and are the pacesetting factor in a deployment program. In the case of fixed installations, hard or soft, the orderly activation of launching facilities would require the efficient scheduling and completion of large-scale construction projects in widespread locations. In the case of a rail mobile system the primary problems would lie in the scheduled construction of special cars, installation of the necessary equipment, and orderly activation of complete missile trains; the construction of fixed facilities would be a lesser part of the effort but would still have to be scheduled into the entire program.

10. Since we do not know the Soviet deployment concept, the present analysis includes two extremes which we believe are likely to encompass the actual cost and effort involved in activating Soviet launching facilities. Launching facilities for the probable program are assumed to be fixed and hardened, costing $11 to $12 million per launcher and requiring a total construction time of 15 to 18 months each. Facilities for the other programs are assumed to be fixed and unhardened, costing $8 to $9 million per launcher and requiring a total construction time of 6 to 9 months each. Guidance facilities are assumed to be radio-inertial, and the net cost of a missile system using radio-inertial guidance is somewhat more than if all-inertial were employed. Costs are based on US plans and limited US experience, adjusting where possible for differences between Soviet and US prices, procurement methods, pay scales, etc.

11. The preliminary US studies available on rail mobile systems are inadequate to form a basis for economic analysis. We believe the cost and effort involved in activating such systems would fall somewhere between that required for soft and hard fixed systems, probably closer to the hard than the soft. However, the major impact would be on the railroad equipment industry rather than the construction sector of the economy. Semi-

hardened fixed systems would likewise fall between the two systems we have analyzed. Thus we believe that the total cost and implied effort shown in the table may be somewhat overstated in the case of the probable program, and may be somewhat understated in the case of the other programs.

Personnel

12. The number of military personnel required to operate, service, and guard ICBM sites is not large when compared with the total strength of the Soviet armed forces. However, a large portion of the operating and support personnel would have to be specially trained. This would require individual and unit training on a schedule consistent with the completion of launching facilities. Soviet experience with shorter range ballistic missiles should facilitate this training.

Total Cost

13. The total cost for establishing and operating the probable ICBM program through mid-1963 would amount to between 30 and 40 billion rubles, exclusive of the cost of nuclear warheads and research and development. This implies an average annual expenditure of 8–10 billion rubles: less than one percent of Soviet GNP. While this percentage appears negligible, economic aggregates of this type are too broad to reflect the physical effort and difficulties involved in implementing large programs for a single weapon system.

14. To appreciate the impact of the probable program on the Soviet economy, a comparison with some nonmilitary programs is useful. In the past seven years the USSR invested some 40 billion rubles in its ferrous metallurgical industry (iron mining and steel making); it plans to increase its crude steel output by 65 percent by investing about 100 billion rubles in this industry in the Seven-Year Plan Period, 1959 through 1965. Thus the average annual investment in this major industry was about 6 billion rubles in the past and is planned to be about 14 billion rubles in the future. Investment in the machine building, chemical and railroad industries are planned for the future at annual rates of 14 to 17 billion rubles per year each. The probable ICBM program in this estimate would imply average annual expenditures of about 8–10 billion rubles on the ICBM system alone, more than half the planned rate for investment in the entire ferrous metallurgical industry of the USSR.

15. The last line in the table illustrates the effect of the three ICBM programs on expenditures for strategic attack in FY–1961 and FY–1963, assuming that other elements of the Soviet strategic attack capability are as estimated in the main text. As a point of reference, these expenditures are estimated to be about 14 billion rubles in 1959. The probable program implies that these expenditures would be about 25–30 billion rubles in FY–1961 and about 19 billion in FY–1963.

16. In summary, the probable program is sizable in terms of the economic effort implied in activating and equipping the launching units especially during the first two years after IOC. The economic strain implicit in larger programs is not so much a matter of their financial cost as of the magnitude and pace of the physical activities required to produce missiles and ground equipment, to construct launching facilities, and to train operating personnel in a relatively short period of time. Even the accomplishment of the probable ICBM program through 1961 will require highly effective planning, operations, and coordination among selected subsectors of the Soviet economy. Although it is likely that a multitude of unforeseen, minor bottlenecks will appear, the probable program assumes that no major delays will be encountered.

ANNEX C

ECONOMIC ASPECTS OF PROBABLE STRATEGIC ATTACK PROGRAMS

ANNEX C

ECONOMIC ASPECTS OF PROBABLE STRATEGIC ATTACK PROGRAMS

Expenditures for Strategic Attack Programs

1. This Annex sets forth the expenditures we believe the USSR has incurred in recent years in providing forces for strategic attack, and the future expenditures implied by the programs estimated as probable in this paper.[25] We estimate that during 1955–1959, average annual Soviet expenditures for programs directly related to strategic attack were about 15 billion rubles. The probable programs estimated in this paper will result in increased outlays for strategic attack, with an average annual expenditure of about 20–22 billion rubles during 1960–1964 (see Table A).

TABLE A

AVERAGE ANNUAL EXPENDITURES FOR SOVIET STRATEGIC ATTACK PROGRAMS, 1955–1964 [a]

(Billion 1955 rubles)

	1955–1959	1960–1964
Total Strategic Attack	15.5	20.4
Personnel	1.3	1.6
Operations and Maintenance	2.5	5.3
Procurement	7.2	6.2
Aircraft and A–S Missiles [b]	6.3	0.8
Submarine-launched Missiles [c]	0.4	2.1
Long range S–S Missiles [d]	0.5	3.3
Construction	0.9	2.6
Nuclear Weapons [e]	3.6	4.9

[a] Figures are rounded. Totals are derived from unrounded data and do not always agree with those based on rounded components.

[b] Includes cost of continued procurement of BISON and air-to-surface missiles and support equipment.

[c] Includes cost of submarine-launched missiles, conversion of existing submarines and procurement of new missile-launching submarines.

[d] Includes cost of SS–4, SS–5, and SS–6 (ICBM) missiles, guidance and support equipment. Costs reflect the lower limit of the probable Soviet ICBM program. In addition, the 1960–1964 entry for construction includes 2.2 billion rubles for constructing on-site facilities for these missile systems.

[e] Expenditures for nuclear weapons for strategic purposes are derived from the illustrative allocations of nuclear materials in NIE 11–2–59. The caveats appearing on pages 63–65 of that estimate apply.

Shifts in Composition

2. Important shifts in the composition of expenditures for strategic attack programs will probably take place. Expenditures related to long range aircraft were responsible for nearly all strategic attack expenditures during the historical period, but will decline sharply in relative weight in the projection period. Procurement of these aircraft including air-to-surface missiles, which represented about 40 percent of cumulative strategic attack expenditures in the historical period, is projected to drop to about four percent of the total. Expenditures for personnel, operations and maintenance, and construction related to aircraft will take diminishing proportions of expenditures for these categories.

3. Procurement and installation of ground-launched missile systems will increase as a share of strategic attack expenditures from 5 percent in the historical period to about 30 percent in the projection period. At the same

[25] Programs which are estimated only as possible have not been included in this Annex. Note also that the analysis in this Annex reflects the lower limit of the ICBM program estimated as probable in Section IV of the main text.

time, the share for submarine systems will increase from about 3 percent to about 10 percent. Operating and maintaining missile systems are relatively costly, and ground-launched and submarine systems are responsible for nearly all of the absolute increase in the operations and maintenance category shown in Table A.

The General Scope of the Major Categories

4. The expenditures for strategic attack forces in this Annex include only direct expenditures made for the following: (a) personnel of Long Range Aviation, long range surface-to-surface missile units and missile launching submarines; (b) operations and maintenance costs for units; (c) procurement of major weapons and of supporting equipment for units using the weapons; (d) construction and maintenance of airfields and missile installations; and (e) nuclear weapons. BADGERs subordinate to Tactical and Naval Aviation have been included with aircraft of Long Range Aviation for costing purposes only.

Ground-Launched Missiles

5. The basis for scheduling the production and deployment of Soviet ICBMs resulted from an analysis of actual and planned US practices modified by what is known and assumed concerning Soviet practice. In light of the estimate that by 1 January 1960 a few series produced ICBMs will probably be operational, and of the discussion in the main text of this estimate, a reasonable production program was postulated which would provide 350–450 ICBMs on launcher in 1963 together with a reasonable additional quantity of missiles (25 percent)[29] to account for maintenance, training, production testing and normal attrition. The production program involves a buildup to a peak rate of about 25 ICBMs per month by the end of 1960.

6. The production buildup employed in this analysis and reflected in the main text is somewhat different from that employed in previous estimates, in which we considered that an IOC would be established with prototype ICBMs and that series production would begin at IOC date. The present analysis takes into account the estimate, in NIE 11–5–59, that series production would have begun prior to IOC date. Assuming the concurrent scheduling of launching facilities, crews, and logistic support, this change results in a more rapid buildup of operational capabilities in the months following IOC date than was indicated in previous estimates.

7. For purposes of costing the probable ICBM program, hardened fixed sites were assumed; if the Soviet system is rail mobile, the total cost of the program would be about the same or somewhat less, but much of the initial cost now allocated to construction would shift to rail mobile equipment and operational costs would be higher. Construction of launching facilities was scheduled for that portion of the operational inventory expected to be in commission at any given time. It should be noted that these launching, guidance and support facilities would average $11 to $12 million per launcher and account for about 75 percent of the initial costs in the estimated ICBM program. The initial costs of this entire program average about $14 million per missile on launcher.

8. Production of SS–4 and SS–5 missiles was scheduled on a basis similar to that for the ICBM, at peak rates of nine and seven missiles per month respectively. The costing of the SS–4 was based on a road mobile system; that for the SS–5 on rail mobility. About 80 percent of the total estimated ruble cost of these weapon systems is incurred by the ICBM program.

[29] A 15 percent margin between operational inventory and production for operational purposes was used in the requirements examined in Annex A. Such a margin is minimal; the 25 percent margin applied to the probable program is more reasonable, although still on the low side.

ANNEX D

PERFORMANCE CHARACTERISTICS OF SOVIET LONG RANGE BOMBERS

ESTIMATED SOVIET LONG RANGE AIRCRAFT PERFORMANCE UNDER AN OPTIMUM MISSION PROFILE[a]

(Calculated in accordance with US MIL-C-5011A Spec except that fuel reserves are reduced to permit a maximum of 30 minutes loiter at Sea Level and aircraft operate at altitudes permitting maximum radius/range)

	CURRENT MODELS					POSSIBLE FUTURE DEVELOPMENTS[d]	
	BULL	BADGER	BADGER[b] 1959	BISON 1958	BEAR	BISON[b] 1960	MB 1962–1964[c]
Combat Radius/Range (n.m.)							
a. 25,000 lb bombload	....	....	....	2,750/5,200	4,450/8,450	2,950/5,600	....
one refuel[e]	....	....	....	3,700/7,000	....	3,950/7,500	....
b. 10,000 lb bombload	1,850/3,350	1,600/3,100	1,800/3,400	3,000/5,800	4,850/9,500	3,200/6,300	1,770/3,500[h]
one refuel[e]	....	2,300/4,200	2,400/4,600	4,000/7,800	....	4,300/8,500	2,400/4,700[h]
c. 3,300 lb bombload	2,050/3,700	1,800/3,600	2,000/3,900	3,100/6,100	5,050/10,000	3,300/6,600	1,950/4,050[i]
one refuel[e]	....	2,500/4,800	2,650/5,200	4,150/8,200	....	4,450/8,900	2,900/6,000[i]
Speed Altitude (kts/ft)							
a. Maximum Speed at optimum altitude (kts/ft)[f]	350/30,000	550/13,200	555/14,200	535/18,800	500/25,000	535/18,800	1,150/35,000[j]
b. Target Speed/Target Altitude (kts/ft)[f]	310/30,000	475/40,800	475/42,300	460/43,400	425/43,200	460/43,400	1,150/55,000[j]
Combat Ceiling (ft)[f]	36,500	45,400	46,600	46,500	42,000	46,500	56,000[j]
Terminal Target Altitude (ft)[g]							
a. 25,000 lb bombload	....	....	....	54,200	48,400	54,200	....
b. 10,000 lb bombload	41,500	50,000	52,500	55,800	49,700	55,800	59,500
c. 3,300 lb bombload	42,000	51,500	54,300	56,500	50,300	56,500	60,500

[a] It should be noted that these estimates are computed from aircraft dimensions as determined by photographic analysis and estimated airplane, engine, and other basic flight parameters. Because of the limitations of this method, the results are occasionally susceptible to significant errors. There are, for example, reliable indications that BISON altitude capabilities may be considerably less than those estimated above.

[b] Improvements of BISON and BADGER aircraft are based on normal expected improvements in the engines through the 1960 period.

[c] The Assistant Chief of Staff, Intelligence, USAF, believes that the introduction of a supersonic dash bomber into operational units is likely by 1962.

[d] The Assistant Chief of Staff, Intelligence, USAF, believes that by 1964 the USSR may have a few subsonic nuclear powered bombers in operational status.

[e] Refueling estimates based upon use of compatible tankers which provide approximately 35 percent increase in radius/range.

[f] For 10,000 lb bombload unless otherwise indicated.

[g] Service ceiling at maximum power with one hour fuel reserve plus bombload aboard. No range figure is associated with this altitude.

[h] Capable of carrying 350 n.m. air-to-surface missile (AS-2) with approximately 10 percent degradation in radius/range capability.

[i] Includes 500 n.m. "dash" at Mach 2.0.

[j] For 3,300 lb bombload.

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ANNEX E

DEPLOYMENT AND TARGET COVERAGE OF BOMBERS AND MISSILES

CAPABILITY OF 1959 BADGER

From Anadyr' and Murmansk

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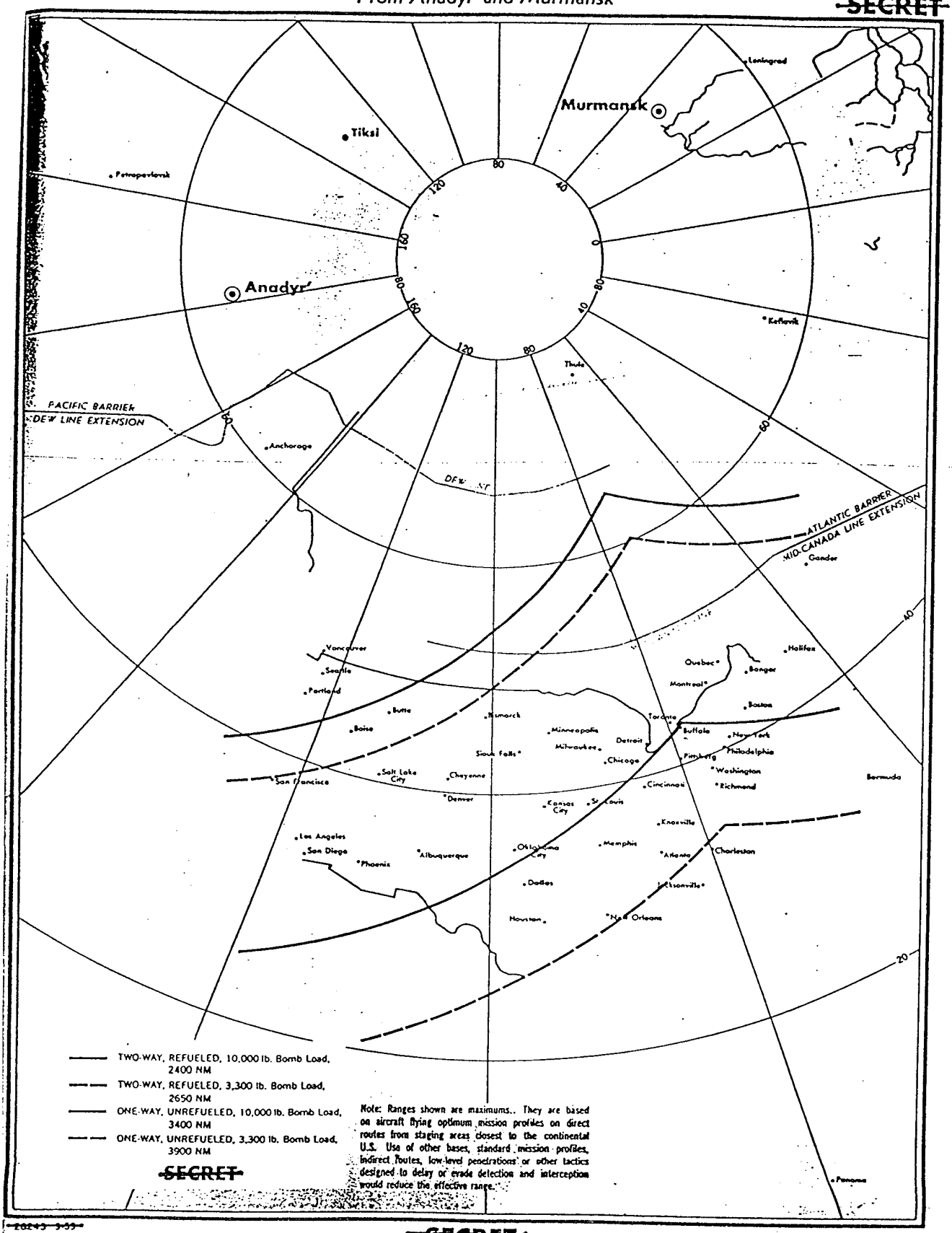

TWO-WAY, REFUELED, 10,000 lb. Bomb Load, 2400 NM

TWO-WAY, REFUELED, 3,300 lb. Bomb Load, 2650 NM

ONE-WAY, UNREFUELED, 10,000 lb. Bomb Load, 3400 NM

ONE-WAY, UNREFUELED, 3,300 lb. Bomb Load, 3900 NM

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Note: Ranges shown are maximums.. They are based on aircraft flying optimum mission profiles on direct routes from staging areas closest to the continental U.S. Use of other bases, standard mission profiles, indirect routes, low-level penetrations or other tactics designed to delay or evade detection and interception would reduce the effective range.

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CAPABILITY OF 1958 BISON

From Anadyr' and Murmansk

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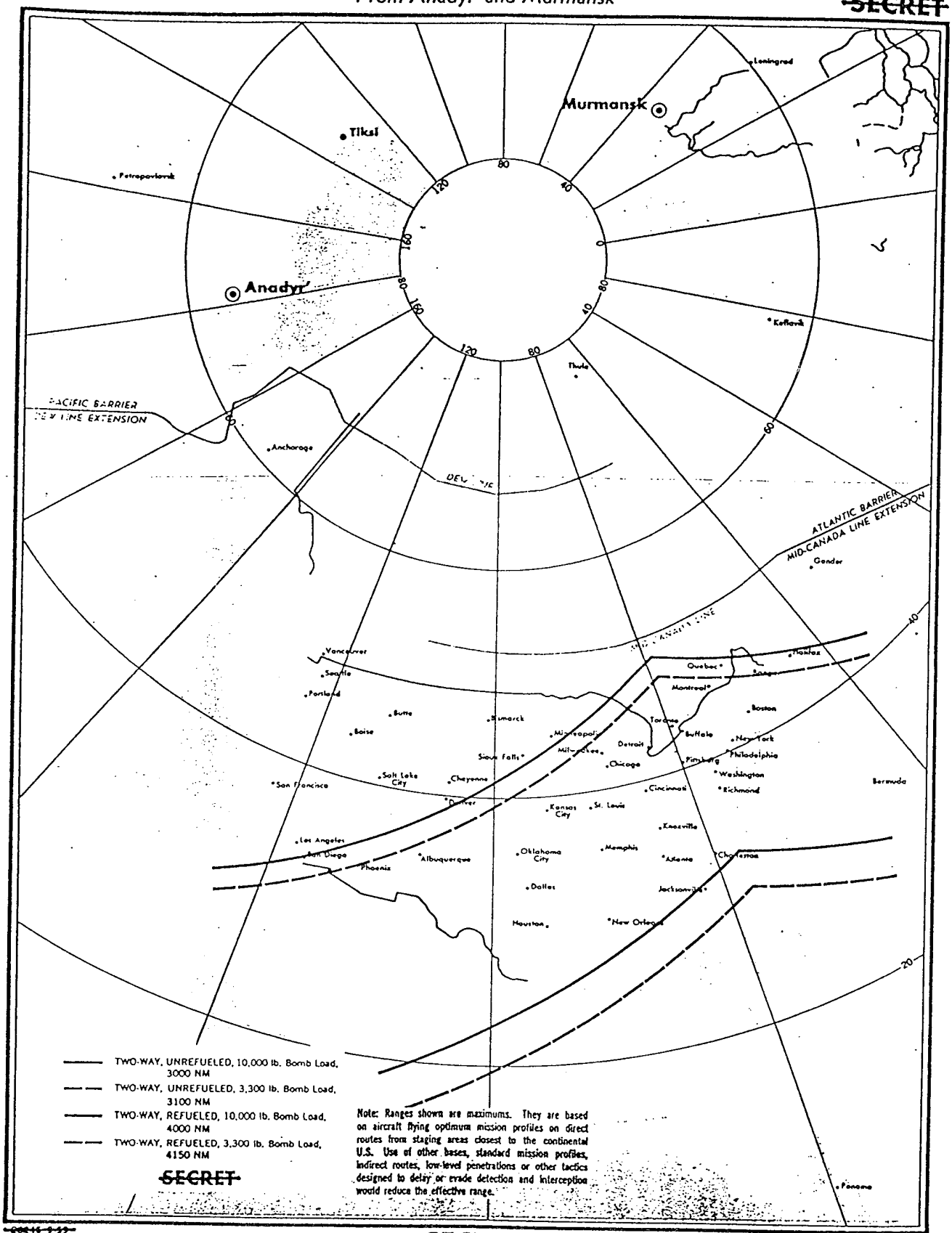

TWO-WAY, UNREFUELED, 10,000 lb. Bomb Load, 3000 NM

TWO-WAY, UNREFUELED, 3,300 lb. Bomb Load, 3100 NM

TWO-WAY, REFUELED, 10,000 lb. Bomb Load, 4000 NM

TWO-WAY, REFUELED, 3,300 lb. Bomb Load, 4150 NM

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Note: Ranges shown are maximums. They are based on aircraft flying optimum mission profiles on direct routes from staging areas closest to the continental U.S. Use of other bases, standard mission profiles, indirect routes, low-level penetrations or other tactics designed to delay or evade detection and interception would reduce the effective range.

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DEPLOYMENT OF SOVIET LONG RANGE AVIATION, MID 1959

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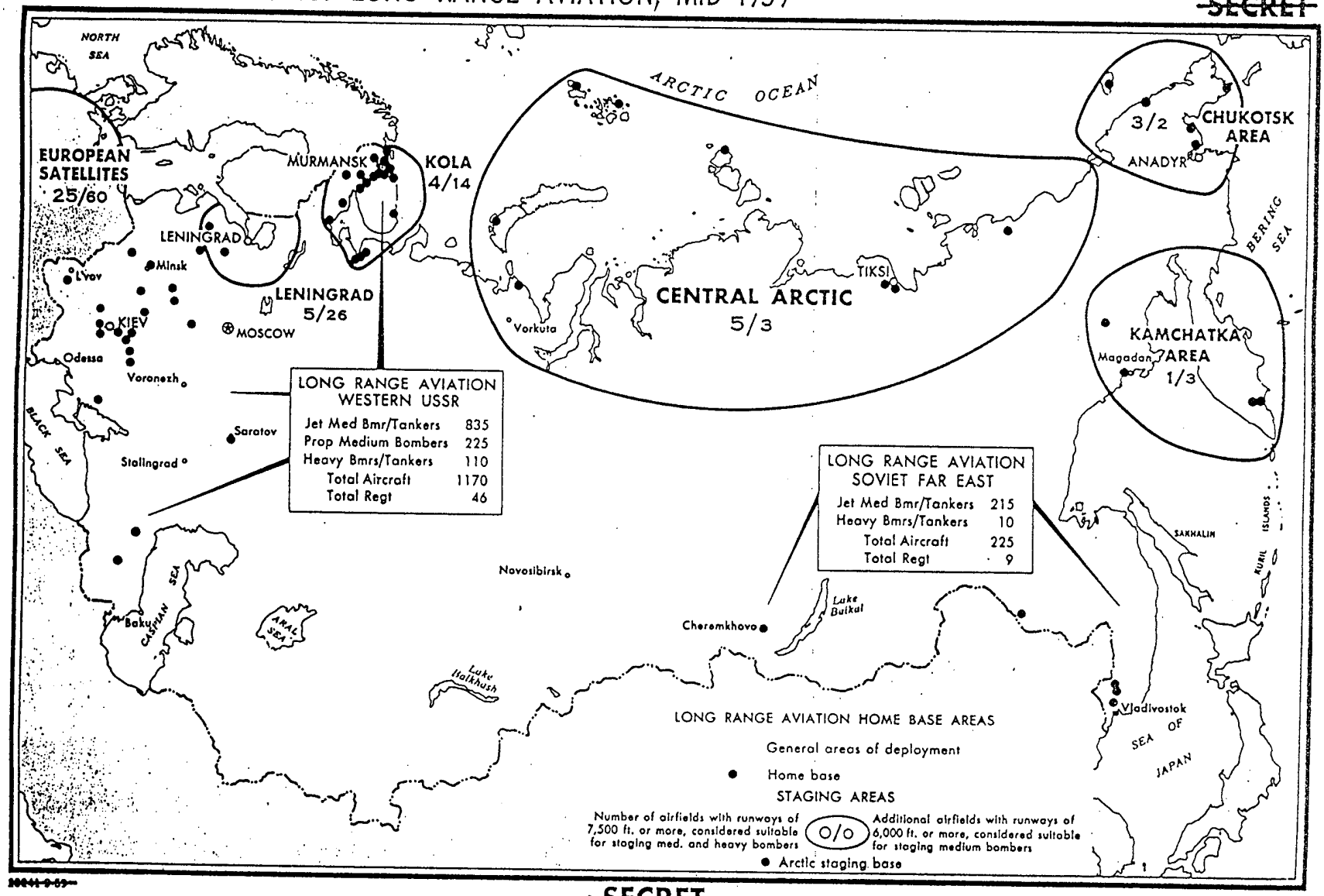

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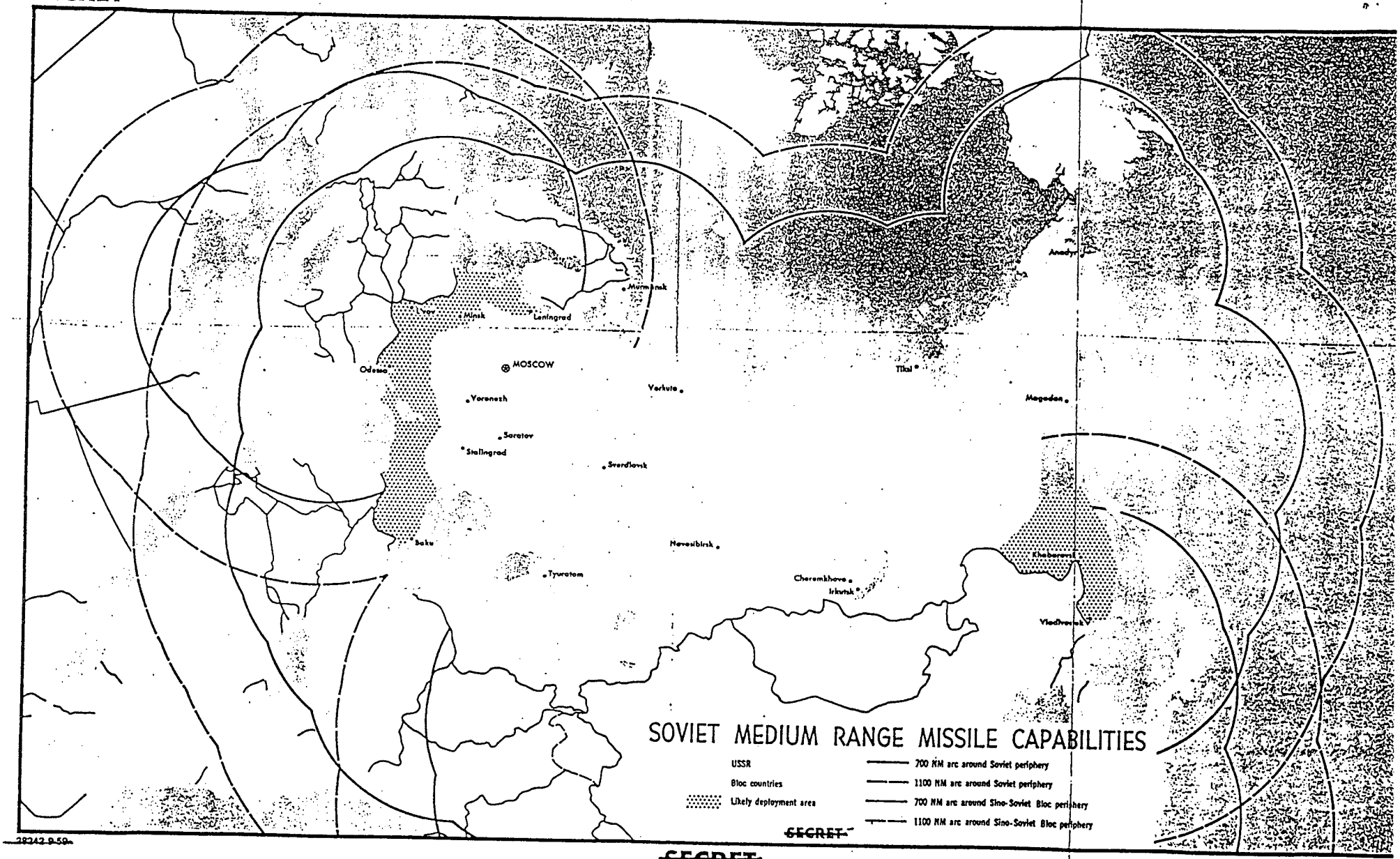

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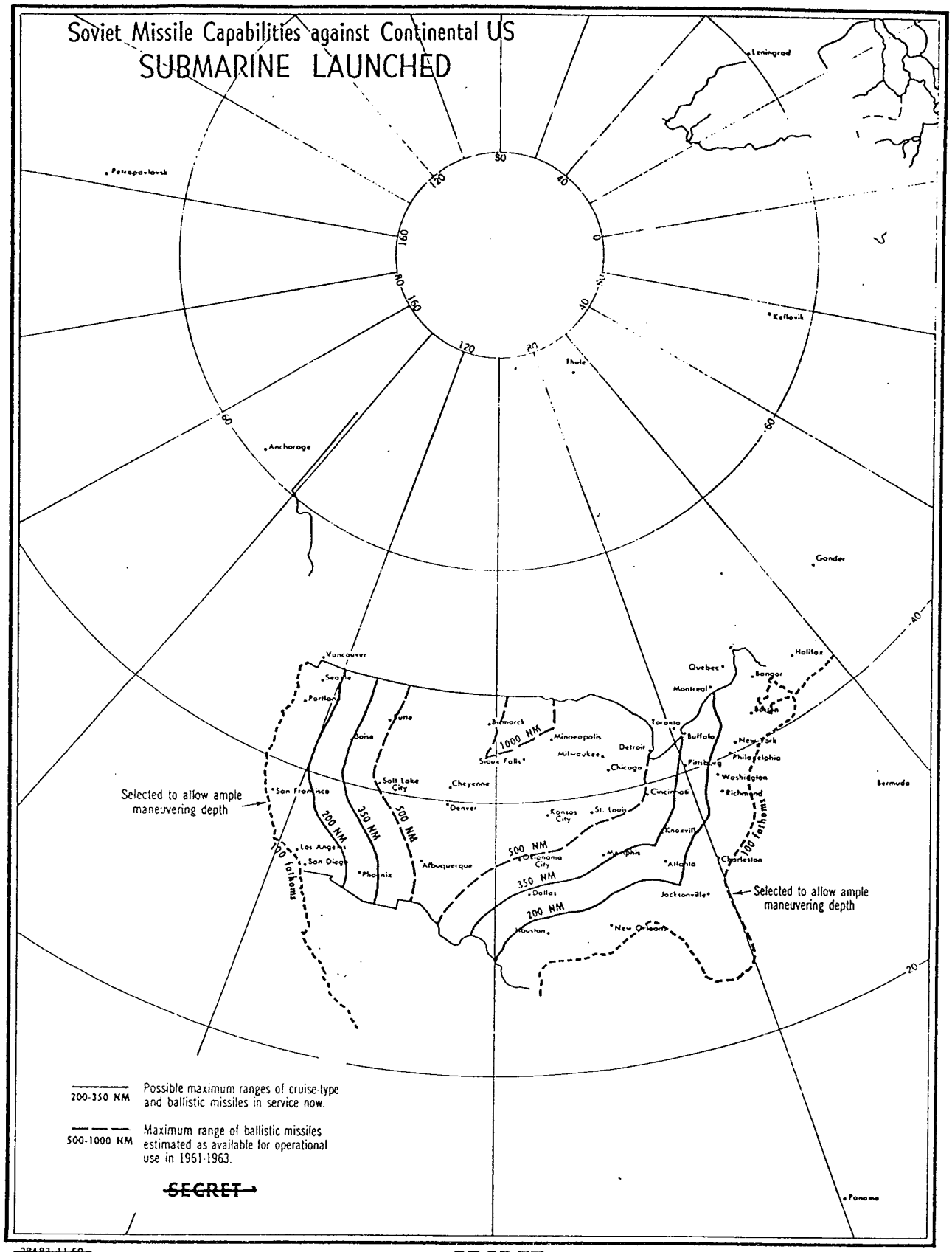

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