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POSSIBLE SOVIET LONG RANGE BOMBER DEVELOPMENT, 1958-1962

Submitted by the

DIRECTOR OF CENTRAL INTELLIGENCE

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Concurred in by the

INTELLIGENCE ADVISORY COMMITTEE

on 4 March 1958. Concurring were The Director of Intelligence and Research, Department of State; the Assistant Chief of Staff, Intelligence, Department of the Army; the Director of Naval Intelligence; the Assistant Chief of Staff, Intelligence, USAF; the Deputy Director for Intelligence, The Joint Staff; and the Atomic Energy Commission Representative to the IAC. The Assistant Director, Federal Bureau of Investigation, abstained, the subject being outside of his jurisdiction.

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~~SECRET~~**CONFIDENTIAL****POSSIBLE SOVIET LONG RANGE BOMBER DEVELOPMENT,
1958-1962¹****THE PROBLEM**

To estimate what new long range bomber types the USSR may develop for operational use over the next five years.

CONCLUSIONS

1. The USSR will probably introduce improved bombers into operational Long Range Aviation units during 1958-1962. Research and development toward improved manned bomber weapon systems is under way in the USSR, but the evidence of specific new long range bomber types is inconclusive. (*Paras. 6, 7*)

2. During the period of this estimate, the USSR may introduce into operational units one or more of the following:

a. Improved versions of the BISON jet heavy bomber, having better range and altitude capabilities; (*Paras. 14, 15*)

b. A new subsonic heavy bomber, which could probably be available for operational use in 1959-1960, having performance characteristics somewhat better than those achievable by improving the BISON, especially with regard to range; (*Para. 16*)

c. A new medium bomber, which could probably be available by 1960-1961, having supersonic "dash" capabilities and a range roughly equivalent to that achievable in an improved BADGER. (*Para. 17*)

3. The USSR probably has a continuing requirement for and is working toward aircraft capable of both supersonic speeds and two-way operations against all targets in the continental US. The achievement of both these characteristics would require advanced airframe design as well as high-energy chemical and/or nuclear propulsion. Chemically-powered aircraft with such characteristics will probably not be available for operational use in the USSR until after about 1962, although prototypes having significant propaganda impact may appear earlier. The attainment of a nuclear propulsion system for supersonic aircraft will require an extensive development and test program, probably extending well beyond 1962. (*Paras. 19, 20*)

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4. With a high-priority program, a reactor suitable for nuclear propulsion of subsonic aircraft could be available by 1962.² (*Paras. 21, 22*)

5. We believe that the USSR has attached high priority to a space-flight program encompassing work on extremely high-altitude flight, manned earth

satellites and manned space vehicles. It is probable that experimental manned rocket aircraft for extremely high-altitude research are now or soon will be flying in the USSR, but an operational hypersonic (over Mach 5) glide vehicle will probably not be achieved until some years after 1962. (*Para. 24*)

DISCUSSION

General Considerations

6. As stated in NIE 11-4-57, we believe that the USSR will retain a strong long range bomber force, including both medium and heavy bombers, at least until it has acquired a substantial nuclear delivery capability with more advanced weapon systems. Even thereafter, bombers, especially advanced types, will almost certainly continue to play a considerable role, with emphasis on those functions for which manned bombers are particularly suited, such as attacks on small hardened targets, damage assessment, and reconnaissance.

7. Thus we believe the Soviets have a continuing requirement for improved long range bomber systems capable of penetrating US defenses and of conducting two-way operations against all targets in the continental US. To assist in the penetration of defenses, the USSR will require that operational bomber designs be capable of employing ECM, decoys, air-to-surface missiles, and other specialized equipment. For the same reason, the desired

performance characteristics of improved Soviet long range bombers will include increased speeds, as well as capabilities for very high or very low altitude penetration. For two-way intercontinental operations, Soviet operational forces will require either aircraft with very long unrefueled combat radii or an in-flight refueling capability, with compatible tankers.

8. The continued slow rate of production of the BISON jet heavy bomber, together with an even lower rate of production of the BEAR turboprop heavy bomber, suggest that Soviet planners may not be satisfied with present versions of these bombers. The BISON and BEAR, which went into series production in 1955, represent the level of Soviet airframe and propulsion technology as of the early 1950's. We now believe that the performance characteristics of the BISON are somewhat below our original estimates. They may not measure up to Soviet expectation.³

9. Despite the lagging Soviet heavy bomber program, the USSR has continued to expand certain facilities associated with large military aircraft. Major new construction has been reported at most Soviet airframe plants

² The Assistant Chief of Staff, Intelligence, USAF believes that this conclusion does not give due consideration to the *possibility* of accelerated Soviet developments in nuclear propulsion between now and 1962. In doing so, it does not give enough weight to a factor of particular concern to US security—that the USSR, through determined efforts and concentration of resources, has proved that it is capable of unusual technological accomplishments. He believes, therefore, the paragraph should read as follows: "With a high priority program the Soviets may achieve a nuclear powered subsonic aircraft appreciably before 1962."

³ Our current estimates of the performance characteristics of operational Soviet long range bombers are presented in detail in revised Table 6 of the ANNEX to NIE 11-4-57: MAIN TRENDS IN SOVIET CAPABILITIES AND POLICIES, 1957-1962. A simplified table of performance characteristics, for purposes of comparison among present and alternative future Soviet long range bombers for operational use by 1962, is presented as an ANNEX to this paper.

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over the past four years. Construction at bomber plants has been characterized by large, high-bay buildings; estimated completion dates at various plants range from 1956 to 1959. Some of this added capacity is believed to be for the production of the large transports developed over the past few years. During the same period, the USSR has undertaken the construction or expansion of a number of military airfields. Runways of well over 10,000 feet in length have been provided in several areas, including a few of the potential bomber staging bases in the Arctic.

10. The USSR has adequate research and development capacity for more advanced long range bombers. We estimate that Soviet capabilities in aerodynamics and structures through 1962 will permit the design and construction of airframes capable of supersonic and hypersonic (above Mach 5) flight. Soviet propulsion capabilities during the period will probably support bomber development in the subsonic and supersonic regions up to about Mach 2.5. We also believe that the USSR is now actively developing high energy chemical fuels and nuclear propulsion systems for aircraft. Experiments are being conducted on structural techniques that permit more advanced and efficient airframes. Nevertheless, we believe that the USSR will probably not be able to develop for operational use during the period of this estimate a bomber capable of both supersonic speed and unrefueled two-way intercontinental operations.⁴

Evidence of New or Improved Long Range Bombers

11. The Soviets have made efforts to improve existing models of long range bombers, to adapt them to inflight refueling and better bombing navigation equipment, and to modify them for transport use. Some of the delay in BISON production, at least until about mid-1956, was probably accounted for by technical difficulties necessitating extensive modification of the airframe. Engine improvements noted in the CAMEL transport in 1957

⁴ See the characteristics of the 1960-1961 medium bomber in the ANNEX.

presumably reflect similar work on the BISON and BADGER, which employ the same basic engine.

12. Since mid-1957, we have received some fragmentary information which could be related to new Soviet bombers. Among these items are the following: several observers in the Kola Peninsula area in October reported seeing large, high-speed aircraft of delta-wing configuration; an enigmatic *Red Star* article in December described the test flight in "high latitudes" of a "colossal" jet heavy bomber, which allegedly covered an unrefueled distance exceeded only by one other type of Soviet bomber. An analysis of the October sightings does not establish whether the observers saw known Soviet aircraft or a new type. The *Red Star* article was studiously vague as to just how new the aircraft was and when the flight occurred. The article could relate either to a completely new subsonic bomber or to one of the USSR's existing heavy bomber types, possibly modified (see paras. 14 and 16). Other fragmentary data suggest that a large new Soviet aircraft or a modified existing bomber has been undergoing flight tests since early 1957. In sum, the above evidence could indicate that new types of long range bombers are now flying in the USSR, but it is insufficient to justify a firm conclusion that this is the case and it is inconclusive as to what specific types are under development. We therefore remain largely dependent upon estimated Soviet capabilities and requirements in assessing Soviet long range bomber development.

Bomber Development for Operational Use by 1962

13. The USSR will probably introduce improved bombers into operational Long Range Aviation units during 1958-1962. Since the evidence of specific new long range bomber types is inconclusive, we remain largely dependent upon estimated Soviet capabilities and requirements in assessing the USSR's bomber development programs. Soviet research and development establishments are probably working on various alternative ap-

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proaches to interim manned bomber systems, and past experience has indicated that the USSR may display experimental or prototype aircraft which will not be developed further into series production models.

14. *Improvement of Present Types.* The USSR could still elect to improve the BISON by normal refinements, especially in propulsion. Soviet planners probably are not satisfied with the range of this aircraft, whose two-way capabilities against the continental US now appear to be marginal, even with refueling and staging from advanced bases in the Arctic. The BISON's combat radius could probably be improved by 1960 to about 4,450 n.m., with inflight refueling and a reduced payload commensurate with probable Soviet improvement in nuclear weapons technology. This combat radius would give it greater tactical flexibility but probably still not an optimum two-way intercontinental capability. Target speeds of 460 knots and target altitudes of about 44,000 feet could probably be achieved. Increased capabilities to penetrate to target areas could be achieved through the use of ECM, decoys, defensive armament and air-to-surface missiles.

15. Improvement of the Bison would be consistent with the effort the Soviets devoted to getting the BISON into series production in a relatively short time, and with their frequent practice of settling on a weapon system and producing it in large quantities. It would permit the most efficient buildup of heavy bomber production and would impose relatively little drain on Soviet aviation research and development resources, which could thus be concentrated on more advanced aircraft. The same relatively modest development efforts could somewhat improve the performance characteristics of the BADGER.

16. *New Subsonic Heavy Bomber.* On the other hand, if the USSR had an entirely new subsonic heavy bomber in advanced flight-test status by the fall of 1957, a preliminary design would probably have been started in about 1954 and the aircraft could probably be ready for operational use by 1959 or 1960. Considering the estimated state of the art in

the USSR during this time period, in conjunction with a requirement of about 5,000 n.m. refueled combat radius for adequate coverage of the continental US, we believe that such an aircraft, employing improved turbo-jet engines, could probably achieve target speeds of 480-490 knots at 46,000-48,000 feet. The use of turbo-fan engines would result in slightly greater range capabilities, at some sacrifice in speed and altitude performance. A heavy bomber of the type described would possess generally the same advantages and disadvantages as the BISON relative to Western defensive capabilities during this time period, but its greater combat radius would permit much more flexibility in intercontinental operations. A Soviet decision to press ahead with such a bomber would imply dissatisfaction with the growth potential of BISON and BEAR.

17. *New Supersonic "Dash" Medium Bomber.* The USSR has been working on military aircraft capable of supersonic speeds for a number of years. Considerable progress in delta-configuration supersonic fighters and supersonic "dash" light bombers was apparent in the display of prototypes in 1956 and 1957; delta-configuration fighters are probably now in production. There are also fairly reliable indications of Soviet development of jet engines with thrusts well beyond those of current engines. A logical next step would be a medium bomber capable of supersonic "dash" at speeds up to about Mach 1.5. We believe that such a project may have been started by early 1955. If so, a prototype could probably be flown in 1958 and the first operational aircraft be available in 1961.⁵ An aircraft of this type might have been the subject of the October 1957 sightings in the Kola Peninsula, in which case the project might be sufficiently far along to permit first operational availability as early as 1960. The speed and altitude capabilities of this type aircraft would provide it great advantages over present Soviet long range bombers in its ability to penetrate to target areas. Its range would be roughly equivalent to that achievable by an

⁵ This aircraft is designated "MB-61" in NIE 11-4-57.

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improved BADGER, i.e., with one inflight refueling and staging from the Chukotski Peninsula, it could probably conduct two-way operations against a few targets in northwestern US and one-way operations against all US targets.

18. The USSR may introduce one or more of the above types into operational units as interim manned bomber systems. In the subsonic heavy bomber field, either an improved BISON or a new jet heavy bomber would help the USSR cope with the geographic disadvantages it faces in the application of strategic air power against the continental US. The supersonic "dash" medium bomber would probably be considered by Soviet planners primarily as a replacement for or supplement to the BADGER. On the other hand, considering that neither a new subsonic bomber nor a supersonic "dash" medium bomber would add substantially to Soviet capabilities for intercontinental attack, the USSR may have elected not to develop either or both these types to the point of operational use, but may be proceeding directly to the more advanced types discussed in the following paragraphs.

Development for Operational Use Beyond 1962

19. Soviet aviation research and development establishments are probably already working toward considerably advanced manned aircraft, the development of which will require solutions to a wide range of technical problems. These include aerodynamic heating and other problems associated with continuous flights at extremely high speeds, the development and production of practical, high-energy chemical fuels, and/or the development of nuclear reactors suitable for aircraft propulsion. At present, three avenues of research and development toward advanced manned aircraft seem open to the USSR. Soviet pursuit of any or all these avenues may become evident during the period of this estimate.

20. *Supersonic Chemical Bomber.* The Soviets have probably undertaken preliminary design studies of a fully supersonic, chemical-powered heavy bomber. If this project were actively pursued, a prototype could probably

be flight-tested, using conventional fuels, late in 1960-1962. Among the critical problems the USSR will encounter are those of high-energy chemical fuels, as well as inflight refueling of this type of aircraft. Soviet statements show that the USSR has considered liquid hydrogen as a propellant but has found it unsuitable at present for practical application. Since 1949, Soviet scientists have synthesized and studied boron compounds in an extensive research program, and have probably achieved pilot plant production of diborane, an intermediate step in the production of more desirable boron fuels. While we have no evidence of the testing of boron in turbojets, ramjets, or afterburners, the Soviet need for a high-energy fuel to permit the achievement of both supersonic speeds and intercontinental ranges leads us to estimate a Soviet program in boron fuel development, which could probably make it available for limited operational use in about 1962. However, its first use is likely to be restricted to afterburners or ramjets, because of limited availability of fuel and problems of toxicity, engine design, and combustion product removal.

21. *Nuclear-propelled Aircraft.* We believe that the USSR also has an active nuclear aircraft propulsion program, judging from statements by leading Soviet scientists and officials, the continuing appearance of semi-technical popular articles on this subject, and a few technical articles on subjects directly related to nuclear aircraft propulsion activities. We have not identified any specific Soviet program, but the USSR's capabilities in reactor and shielding technology, high temperature materials, and engine and airframe technology are sufficient for the conduct of an advanced program in this field.

22. We therefore estimate that the Soviets are probably now engaged in development and testing of reactor components and sub-systems. This effort, if given a high priority, could result in the development of a reactor suitable for nuclear propulsion of subsonic

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aircraft by 1962.⁶ The ability of such an aircraft to fly extremely long distances at very low altitudes would make it a useful vehicle for some military missions. The attainment of a nuclear propulsion system for a supersonic aircraft will require an extensive development and test program, probably extending well beyond 1962.

23. The Soviets, for propaganda and research reasons, may have undertaken on a "crash" basis to develop a nuclear power plant which could be carried in an aircraft. If this is the case, we believe they could have a flying test-bed airborne appreciably before 1962. Such a vehicle could have at least one nuclear power unit providing useful thrust during some phase of the flight.

⁶The Assistant Chief of Staff, Intelligence, USAF believes that this effort, if given a high priority, could result in a subsonic nuclear propelled aircraft reaching test flight stage appreciably before 1962. (See footnote to paragraph 4, Conclusions.)

24. *Hypersonic Aircraft.* We believe that the USSR has attached high priority to a space-flight program encompassing work on extremely high-altitude flight, manned earth satellites, and manned space vehicles. It is probable that experimental manned rocket aircraft for limited exploration of extremely high altitude flight problems are now or soon will be flying in the USSR. One outgrowth of such a program may be a hypersonic glide vehicle capable of reconnaissance and possibly weapons delivery. A vehicle of this type would receive an initial rocket boost to a sufficient altitude and velocity to enable it to glide through the upper atmosphere to its target. In advanced stages of development it could return to its base by encircling the globe. Initial flight-tests of the manned stage of such a Soviet vehicle could take place by about 1962, but an operational vehicle could probably not be achieved until some years thereafter.

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ANNEX

**SIMPLIFIED PERFORMANCE
COMPARISON**

**Current and Alternative Future
Soviet Long Range Bombers
to 1962**

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OPTIMUM MISSION PROFILE¹

(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			ALTERNATIVE FUTURE DEVELOPMENT		
	BADGER 1957	BISON 1957	BEAR 1957	BISON 1960	Heavy Bomber 1959-1960 ³	Medium Bomber 1960-1961
Take-off weight (lbs.)	160,000	395,000	300,000	395,000	425,000-475,000	190,000
Radius (n.m.)	1,800	2,950	4,400	3,300	3,600-3,800	1,950 ⁴
3,300 lb. payload one refuel ²	2,450	3,950	6,100	4,450	4,850-5,150	2,650 ⁴
Range (n.m.)	3,600	5,800	8,700	6,600	7,000-7,400	3,800 ⁴
3,300 lb. payload one refuel ²	4,800	7,800	8,900	9,450-10,000	5,100 ⁴
Target Speed (knots)	475	460	410	460	480-490	865
Target Altitude (ft.)	41,400	41,300	42,500	43,700	46,000-48,000	47,000

¹ Optimum mission profiles and 3,300 lb. payloads have been selected for comparison on this simplified chart in order to show the reasonable maximum performance to be expected from Soviet long range bombers during this time period. The use of standard US mission profiles, increased bombloads, or large air-to-surface missiles would reduce performance characteristics, particularly in radius/range capabilities. Table 6 of the ANNEX to NIE 11-4-57 contains full performance characteristics for these aircraft, with the exception of the 1959-1960 Heavy Bomber for which no details are available.

² Refueling estimates based upon use of compatible tankers which provide approximately 35 percent increase in radius/range.

³ Performance estimated on the basis of improved turbo-jet engines. The use of turbo-fan engines would result in slightly greater range capabilities, at some sacrifice in speed and altitude capabilities.

⁴ Radius/range figures include 500 n.m. supersonic "dash." Maximum "dash" speed is estimated at 1,085 knots at 35,000 ft. altitude.

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