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Economic Support Project

THE AIRCRAFT INDUSTRY
OF THE SINO-SOVIET BLOC
1960

CIA/RR EP 61-12

March 1961

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FOREWORD

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The primary purpose of this report is to bring up to date CIA/RR ER 60-9, The Aircraft Industry of the USSR, 1954-59, May 1960, SECRET/NOFORN [REDACTED] and CIA/RR ER 60-34, The Aircraft Industries of the European Satellites, 1954-65, November 1960, SECRET/NOFORN [REDACTED]

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[REDACTED] and to study production of aircraft in the Sino-Soviet Bloc during 1960. The annual rate of production is estimated for the industries of the Bloc as a whole as well as for individual plants. Soviet expenditures for procurement of aircraft, including initial spares, are estimated for 1955-60. The current status of the airframe industries of the Bloc is reviewed, and major factors influencing the development of these industries are discussed.

S-E-C-R-E-T

S-E-C-R-E-T

CONTENTS

	<u>Page</u>
Summary	1
I. Technological Level	5
II. Production in the USSR, 1960	6
A. Bombers	6
B. Fighters	8
C. Transports	9
1. Piston	9
2. Turboprop	10
3. Turbojet	11
D. Helicopters, Trainers, and Reconnaissance Aircraft	12
1. Helicopters	12
2. Trainers	14
3. Reconnaissance Aircraft	14
III. Expenditures for Procurement of Aircraft	14
IV. Production in the European Satellites, 1960	15
A. Czechoslovakia	15
B. Poland	16
C. East Germany	16
D. Other European Satellites	17
V. Production in Communist China	17
VI. Effects of Guided Missiles on the Aircraft Industry	18
A. Missile Activity in the Aircraft Industry	18
B. Utilization of Missiles as Replacement for Aircraft	19
C. Soviet Statements Concerning Missiles and Aircraft	19
VII. Future Intentions	20
A. USSR	20
1. Bombers	20
2. Fighters	20
3. Transports	21
4. Helicopters and Miscellaneous Aircraft	21

- v -

S-E-C-R-E-T

S-E-C-R-E-T

	<u>Page</u>
B. Communist China	22
C. European Satellites	22

Appendixes

Appendix A. Statistical Tables	25
Appendix B. Methodology	41
Appendix C. Gaps in Intelligence	43
Appendix D. Source References	45

Tables

1. Estimated Production of Aircraft in the Sino-Soviet Bloc, by Number, 1955-60	26
2. Estimated Production of Aircraft in the Sino-Soviet Bloc, by Weight, Excluding Initial Spares, 1955-60	27
3. Estimated Production of Aircraft in the USSR, by Number, 1955-60	28
4. Estimated Production of Aircraft in the USSR, by Weight, Excluding Initial Spares, 1955-60	29
5. US Military Aircraft Acceptances, by Number, 1955-60	30
6. US Military Aircraft Acceptances, by Weight, Excluding Initial Spares, 1955-60	31
7. Estimated Production of Aircraft in the European Satellites and in Communist China, by Number, 1955-60	32
8. Estimated Production of Aircraft in the European Satellites and in Communist China, by Weight, Excluding Initial Spares, 1955-60	33

S-E-C-R-E-T

S-E-C-R-E-T

	<u>Page</u>
9. Estimated Production of Aircraft in the Sino-Soviet Bloc, by Plant and Number, 1954-60, and the Status as of 1 January 1961	34
10. Estimated Expenditures for Procurement of Soviet Aircraft, Including Initial Spares, 1955-60	39
11. Estimated Expenditures for Procurement of Soviet Aircraft, Excluding Initial Spares, 1955-60	40

Illustrations

	<u>Following Page</u>
Figure 1. USSR: Estimated Expenditures for Procurement of Aircraft, Including Initial Spares, 1955-60 (Chart)	14
Figure 2. USSR: Indexes of Estimated Production of Aircraft, by Number, Airframe Weight, and Value, Excluding Initial Spares, 1955-60 (Chart)	16
Figure 3. USSR: Distribution of Estimated Expenditures for Procurement of Aircraft, Including Initial Spares, 1955-60 (Chart)	16
Figure 4. US and USSR: Production of Combat Aircraft, by Number, 1955 Through 1960 (Chart) <u>inside back cover</u>	
Figure 5. USSR: Airframe Plants (Map) <u>inside back cover</u>	

S-E-C-R-E-T

S-E-C-R-E-T

THE AIRCRAFT INDUSTRY OF THE SINO-SOVIET BLOC*
1960

Summary

During 1960, estimated production of bomber aircraft in the USSR continued the decrease evidenced each year since 1955. Estimated production of fighter aircraft in the USSR increased slightly in 1960 compared with 1959 but remained considerably below production estimated for 1958. A slight decrease was noted in production of transport aircraft in the USSR in 1960 compared with 1959. The decrease was primarily due to the phasing out of a light piston transport in 1960.

In spite of the continued decrease in numbers of bomber aircraft produced in the USSR, production of the Bison (M-4) heavy jet bomber continued at Moscow/Fili Airframe Plant No. 23,** averaging slightly fewer than two aircraft per month in 1960. Evidence received in 1960 disclosed that the USSR had begun production of a second bomber aircraft. [REDACTED]

[REDACTED] Plant No. 22 is believed to have begun series production of the new bomber in 1959.***

During 1960 it became evident that the USSR had selected for series production two, and possibly three, of the fighter aircraft seen in the prototype stage in 1956. One Mikoyan fighter, the Fishbed "C" delta-wing interceptor, is believed to be in quantity production, as are at

* The estimates and conclusions in this report represent the best judgment of this Office as of 1 January 1961.

** Estimated production of aircraft in the Sino-Soviet Bloc from 1955 through 1960 is given by number in Table 1, Appendix A, p. 26, below, and by airframe weight in Table 2, Appendix A, p. 27, below. Estimated production of aircraft in the USSR from 1955 through 1960 is given by number in Table 3, Appendix A, p. 28, below, and by airframe weight in Table 4, Appendix A, p. 29, below. For comparative purposes, US military acceptance figures from 1955 through 1960 are given by number in Table 5, Appendix A, p. 30, below, and by airframe weight in Table 6, Appendix A, p. 31, below. For additional comparison, production of combat aircraft in the USSR, from 1955 through 1960, by number, is compared with that in the US in the chart, Figure 4, inside back cover. For locations of airframe plants, see the map, Figure 5, inside back cover.

*** Estimates of annual and cumulative production at plants in the Sino-Soviet Bloc are given in Table 9, Appendix A, p. 34, below.

S-E-C-R-E-T

25X1

25X1

S-E-C-R-E-T

least one and possibly two fighters of Sukhoy design. As had been expected, with the selection of the models for series production, estimated production of fighter aircraft in the USSR increased in 1960. It is unlikely, however, that the new fighters will be produced in such quantities as those of the preceding models -- the Fresco (MIG-17) and the Farmer (MIG-19).

During 1960 the USSR continued to emphasize the development and production of turbojet and turboprop transport aircraft. Two models of turbojet transports, the Camel A (Tu-104A) and the Camel B (Tu-104B), were produced during the year, as were five models of turboprop transports, the Cleat (Tu-114), the Coot (Il-18), the Camp (An-8), the Cat (An-10), and the Cub (An-12). Continued emphasis on the development of new transport aircraft was illustrated during the year by the introduction of two new models, the Tupolev-designed Cookpot (Tu-124) turbojet transport and the Antonov-designed Coke (An-24) turboprop transport.

During 1955-60 the USSR is estimated to have spent approximately the equivalent of \$20 billion* for the procurement of aircraft including initial spares. Expenditures for procurement of Soviet aircraft decreased from \$5.1 billion in 1955 to \$2.0 billion in 1960. Production in terms of number of aircraft as well as expenditures for procurement of aircraft declined in each succeeding year from 1955. Estimated expenditures for procurement of bomber aircraft decreased from \$3.2 billion in 1955 to \$440 million in 1960. Expenditures for transport aircraft, on the other hand, increased from \$140 million in 1955 to \$970 million in 1960.

At the end of 1960 the effects of the Soviet guided missile program on the Soviet aircraft industry were still not entirely clear. It is evident, however, that some aircraft industry facilities are involved in missile activities. Furthermore, it is likely that the use of missiles has reduced the need for aircraft in the numbers formerly produced. On the other hand, it is believed that through 1960 the USSR has pursued all lines of research in weaponry and that long-range aircraft and jet fighters have received significant although perhaps reduced emphasis.

During 1960 the aircraft industries of the European Satellites appeared to follow closely the recommendations of the Council for Mutual Economic Assistance (CEMA), in that Poland and Czechoslovakia concentrated on production of sport, trainer, and communication/utility aircraft and helicopters and East Germany continued the development of transport aircraft. It is believed that by the end of 1960 all production of

* All monetary values in this report are given in 1959 US dollars.

S-E-C-R-E-T

S-E-C-R-E-T

military aircraft in the Satellites ceased. New production undertaken in the Satellites during 1960 included only native-designed civil aircraft.

Production of aircraft in Communist China in 1960 involved only jet fighters, light piston transports, and helicopters, all of Soviet design. Information available during the year, however, suggests an ambitious program for the future, for the Chinese may be preparing for production of bomber or transport aircraft. Although the Chinese have made significant steps toward the development of an independent aircraft industry, their progress will be heavily influenced by assistance from the USSR.

S-E-C-R-E-T

S-E-C-R-E-T

I. Technological Level

The manufacture of aircraft in the USSR in the postwar period and up to about 1955 was based on structural designs and production techniques similar to those used by the US in World War II. Articles in various publications indicate that the USSR has been aware of the advantages of many new structural design techniques but has been very slow in adopting such features as integrally stiffened and milled or tapered skins, honeycomb structures, large complex forgings, and the use of plastics for secondary and nonstructural parts. The continued use of obsolescent airframe design techniques has resulted in aircraft with increased weight. It is believed that most Soviet high-performance aircraft designed and produced since 1955 have used some of these more sophisticated structural features.

It should be noted that no recently manufactured Soviet military aircraft have been examined. The first Soviet aircraft that the West examined which has departed from the "bits and pieces" method* of aircraft manufacture is the Coot transport aircraft. The outer wing panels, which are reported to be integral fuel tanks, have a one-piece lower skin estimated to be 26 feet long, 6 feet wide at the inboard end, and 3 feet wide at the wing tip. The skin is attached to the internal structure by double rows of spanwise fasteners. The size of the skin and the absence of lateral fasteners indicate a more sophisticated type of structure.

Details appearing in the Soviet aviation press on the Coke aircraft give further indications of more advanced design and manufacturing methods. The wing is said to be of a monolithic type of construction instead of being built up of hundreds of parts, its basic structure is made of four panels, and its skin has integral stiffeners. The fuselage and tail structures are said to be made by spot welding combined with plastic gluing. The flaps, antennae fairings, and numerous small parts are made of glass fiber and bolts and screws of polyamide resins of the nylon type. The welding and plastic gluing have considerably reduced the number of rivets used and have improved the pressurization and drag characteristics.

Some use of honeycomb and plastic-filled structures has been reported on Soviet aircraft, but by Soviet admission their techniques of honeycomb manufacture require much improvement. As yet there is no

* The use of small forgings, short extrusions of simple cross section, light page skin, and small panels. The production breakdown of the aircraft is maximized to facilitate subassembly operations, and the subassemblies are further broken down into detail assemblies.

S-E-C-R-E-T

S-E-C-R-E-T

evidence of the use of stainless steel honeycombs. It is likely, however, that they are under development for use in high-speed aircraft where aerodynamic heating is a problem.

The use of more advanced structural techniques and manufacturing methods will result in aircraft with reduced drag and of lighter weight, with a consequent increase in performance. The quality of the aircraft also should be increased, for the new method of manufacture will result in more exact tolerances and better interchangeability.

II. Production in the USSR, 1960

A. Bombers

Recent information indicates that seven Bison heavy bombers were produced at Moscow/Fili Airframe Plant No. 23 during the fourth quarter of 1959. The total production of the Bison jet bomber aircraft in 1959, therefore, is now estimated to have been 26 aircraft.

Observations of Moscow/Fili Airframe Plant No. 23 during the fourth quarter of 1960 were hindered by poor visibility. Although a strong possibility exists that only five Bison aircraft were produced during the fourth quarter, the observations indicate that six could have been completed by 19 December 1960. For this report, therefore, six Bison aircraft are estimated to have been produced during the fourth quarter. Production of Bison in the first, second, and third quarters is estimated to have been four, nine, and three aircraft, respectively. Cumulative production of Bison aircraft is estimated to have totaled 143 aircraft as of 1 January 1961. This estimate is believed to be reliable within plus six or minus nine aircraft.

S-E-C-R-E-T

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S-E-C-R-E-T

[REDACTED]

A Hook helicopter has been seen at the plant on nearly every observation since 27 April 1960. On 19 December 1960, two Hook helicopters were observed, and, on 22 December 1960, four Hook helicopters were observed. These four Hook helicopters had no identification, and the wings appeared larger than any previously seen on the helicopter. A strong possibility exists that Moscow/Fili Airframe Plant No. 23 is now producing the Hook. Observations during early 1961 should indicate whether or not production of the Bison is being replaced by production of the Hook.

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[REDACTED]

The new aircraft is believed to have been developed from a prototype aircraft that was photographed at Ramenskoye in April 1957. An article in Sovetskaya aviatsiya described a routine test flight of an unnamed high-speed bomber piloted by Valentin Fedorovich Kovalev, Tupolev's chief test pilot. 2/ The article indicated that the aircraft had only two engines and was capable of supersonic speed. The description of this unnamed aircraft fits that of the new bomber aircraft [REDACTED] at Kazan' Airframe Plant No. 22. The article therefore is believed to be reporting the test flight of the prototype of the new aircraft.

25X1

Two more prototypes probably were constructed by mid-1958. Series production is estimated to have begun in April 1959. On the basis of an airframe weight of 60,000 pounds,** the total production of the new aircraft is estimated to be 28 aircraft as of 1 January 1961. This estimate, however, probably is no more accurate than plus or minus 10 aircraft.

Kazan' Airframe Plant No. 22, as well as Kuybyshev Airframe Plant No. 1 and Voronezh Airframe Plant No. 64, is still engaged in the overhaul and/or modification of Badger (Tu-16) aircraft. Kuybyshev Airframe Plant No. 18 continues to overhaul and/or to modify Bear (Tu-95) aircraft and to produce the Cleat (Tu-114) transport.

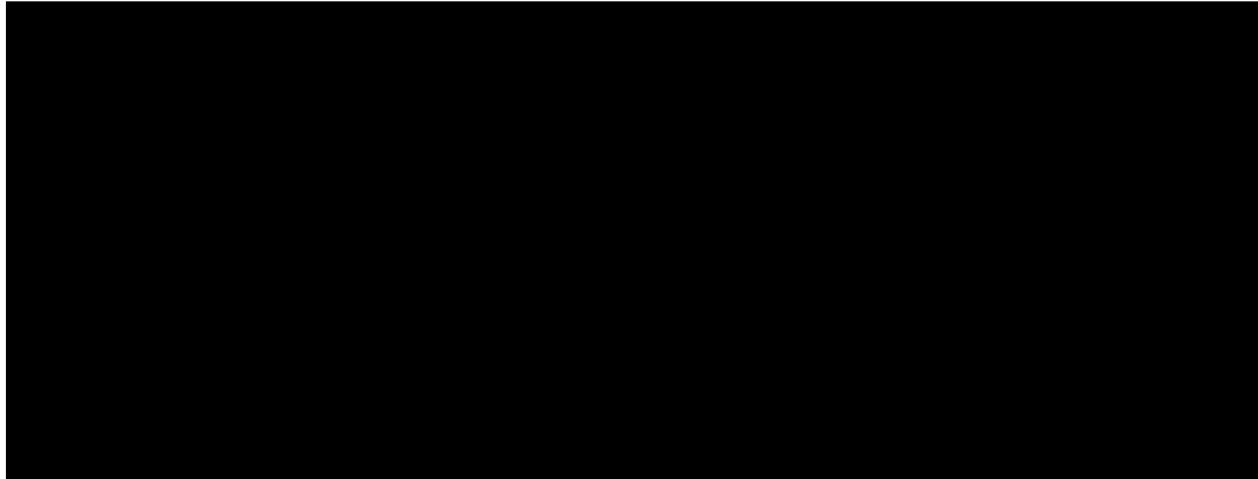
* For serially numbered source references, see Appendix D.

** An estimate derived from dimensions taken from the photography.

S-E-C-R-E-T

S-E-C-R-E-T

Photographs of Plant No. 18 ^{3/} show that part of the modification to the Bear aircraft consists of replacing the horizontal stabilizer. The Badger and Bear aircraft probably are being modified to carry air-to-surface missiles.



25X1

B. Fighters

Information received during 1960 clarifies in part the situation regarding production of fighter aircraft in the USSR. It has become clear that at least two and possibly three improved variants of the prototype interceptors first seen in 1956 are in quantity production in the USSR. These include the Mikoyan-designed Fishbed "C" delta-wing fighter and either or both the swept-wing Sukhoi-designed Fitter and delta-wing Fishpot. Both the Mikoyan-designed Faceplate, also seen in 1956, and the Yakovlev twin-jet Yak-27 appear to have been produced in small quantities only.

Sightings of the Fishbed jet fighters at Zerbst Airfield in East Germany in 1960 ^{4/} established the identity of the Fishbed "C" and strengthened the position taken that the fighter has been selected for quantity production. Distinguishing features of the "C" variant include a clipped wing like that of Fishbed "B," a horizontal stabilizer configuration like that of Fishbed "A," and a larger aft section than was observed on the "A" and "B" models. ^{5/}

The Fishbed "C" is estimated to be in series production in Gor'kiy Airframe Plant No. 21 and Tbilisi Airframe Plant No. 31. Plant No. 21 historically has served as the pilot plant for Mikoyan-designed jet fighters, and it is believed that the plant has continued in this role. Plant No. 31 also is believed to be producing Fishbed aircraft. Fighters of the Fishbed "B" type were sighted at Plant No. 31 in 1958, ^{6/} and this type of aircraft has been sighted at the plant periodically since that time, although such sightings have never

S-E-C-R-E-T

S-E-C-R-E-T

revealed more than four of the delta-wing fighters on any occasion. In fact, late in 1959 the factory area was reported as "completely bare." 7/ Furthermore, it has been estimated that Plant No. 31 is involved in the missile program. 8/ This estimate, together with the low number of Fishbed aircraft seen at the plant and the reported absence of activity at the facility, leaves some doubt as to the status of production of Fishbed aircraft at Plant No. 31. Until receipt of further intelligence on Plant No. 31, however, it will be assumed that production of Fishbed "C" aircraft has replaced Fishbed "B" aircraft and continues at a low rate.

Two Soviet airframe plants that have produced fighter aircraft in the past, Komsomol'sk Airframe Plant No. 126 and Novosibirsk Airframe Plant No. 153, are believed to be involved in production of Sukhoy-designed fighters. An improved variant of the swept-wing Fitter is believed to have been produced in some quantity at Plant No. 126, and a delta-wing version of the Fitter or an improved variant of the Fishpot is believed to be in production at Plant No. 153. The identity of the specific aircraft in production at Plant No. 153 remains in doubt. Both the Fitter and the Fishpot have been seen in Novosibirsk. Three Fitter aircraft were sighted at Novosibirsk West airfield in June 1960, 9/ and approximately eight aircraft of the Fishpot type were sighted on the same airfield in July. 10/ The aircraft of the Fishpot type were described as having the Fishpot fuselage, wing, and tail configuration but as lacking the large high-positioned nose cone. Pending clarification of the identity of the specific aircraft in production at the plant, production of a new Sukhoy fighter of undetermined model is estimated for Plant No. 153.

The Yak-27/29, an improved version of the Flashlight (Yak-25) twin-jet all-weather fighter, appears to have been produced in limited numbers only. Reportedly produced at Saratov Airframe Plant No. 292, the Yak-27 has not been sighted by Western observers. The sighting of tactical missiles in the plant area in the spring of 1960 revealed that the plant was engaged in this activity at that time. No series production of aircraft is currently estimated for Plant No. 292.

C. Transports

1. Piston

Only two piston-engine transport models, the Creek (Yak-12) and Clod (An-14), are believed to have been in production or under development during 1960. The production status of both aircraft, however, is obscure.

- 9 -

S-E-C-R-E-T

S-E-C-R-E-T

Little firm information about production of the Creek is available. Frequent Soviet statements concerning the need for a new small transport aircraft, as well as infrequent sightings of the small transport at the producing plant, Leningrad Airframe Plant No. 458, suggest that production of the Creek has ceased. Recent new construction of factory-like buildings at the plant may presage production of new aircraft.

The production status of the Clod also is in doubt. Statements in the Soviet press indicating continued interest in the aircraft and sightings at Kiev Airframe Plant No. 473 of unidentified aircraft, possibly the Clod, suggest that development of the Clod continues. Only 10 of the aircraft are estimated to have been produced by the end of 1960.

2. Turboprop

Soviet emphasis on the development and production of turboprop transports has continued during 1960. Five of the transports, the Cub, the Cat, the Camp, the Coot, and the Cleat were produced during the year, even though serious operational and production difficulties were encountered with all of these models. A sixth turboprop transport, the Coke, was introduced during 1960.

A steady decline in the number of Cub turboprop transports observed on the plant airfield at Irkutsk Airframe Plant No. 39 suggests that production may have ended recently. This opinion is strengthened by the fact that several of the airplanes were only partly assembled. It would appear that the final assembly area is being cleared of Cub aircraft to make way for production of new aircraft. In light of current developments the estimated production of the Cub has been reduced.

On the basis of reports received during the past several months, it appears that the Cat aircraft is used only to a limited degree. It is interesting to note also that Soviet publications seldom mention the aircraft. The possibility should be considered, therefore, that production of Cat aircraft has ceased. Until receipt of further information, however, it will be assumed that production is continuing at the rate of three aircraft per month at Voronezh Airframe Plant No. 64. Approximately 100 Cat aircraft have been produced as of 1 January 1961.

In view of the possible difficulties with the Cub and the Cat, production of the Camp, which is basically similar, also may be declining. As was true of the Cat, it is assumed that production of

S-E-C-R-E-T

S-E-C-R-E-T

the Camp is continuing. The assault transport is produced at an estimated rate of six aircraft per month at Tashkent Airframe Plant No. 84. Approximately 150 Camp aircraft are believed to have been produced by the end of 1960.

Production of the Coot turboprop transport is believed to have continued throughout 1960 at Moscow Airframe Plant No. 30, although it is suspected that difficulties which forced the grounding of most of the aircraft have not been entirely corrected. The Coot is produced at an estimated rate of four aircraft per month. Approximately 140 of the transports have been produced to date.

It is believed that after years of apparent frustrations with the Cleat four-engine turboprop transport the USSR has corrected many of the problems of this giant aircraft and that Cleat aircraft soon will be used on scheduled routes of the Chief Directorate of the Civil Air Fleet (Glavnoye Upravleniye Grazhdanskogo Vozdushnogo Flota -- Aeroflot).

[REDACTED] this transport is in series production and that an estimated total of 23 Cleat aircraft (including 1 prototype) has been completed.

25X1

In February 1960 a new Antonov-designed turboprop transport identified as an An-24 was observed in the USSR. An article in the Soviet press in June 1960 described the aircraft, which is slightly smaller than the Camp, as capable of cruising within a range of 1,250 miles at a speed of 270 knots. The An-24, which has been given the NATO designation of the Coke, is still believed to be in the prototype state. Two flying prototypes of the Coke are believed to have been constructed at Kiev Airframe Plant No. 473, which also serves as the Special Design Bureau of Oleg Antonov. Recent additions to the plant suggest that series production of the Coke may take place at Plant No. 473.

3. Turbojet

During 1960 the USSR continued to emphasize production and development of turbojet transports. Two variants of the Tupolev-designed Camel (Tu-104) twin-jet transport were produced in the USSR during 1960. It is believed, however, that production of the 70-passenger version, the Tu-104A, at Omsk Airframe Plant No. 166 probably ceased by the end of the year. The cessation of the Camel A program at Plant No. 166 has been expected since that aircraft was phased out at Khar'kov Airframe Plant No. 135 in June 1959. Recent additions to Plant No. 166, which include a new final-assembly building completed late in 1957 or early in 1958 and a new runway completed in 1960, indicate that a new aircraft will be produced at Plant No. 166 and should appear during 1961.

- 11 -

S-E-C-R-E-T

S-E-C-R-E-T

25X1

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the production rate of Camel B, which is the 100-passenger version of the Camel aircraft, at Kazan' Airframe Plant No. 22 decreased considerably during the latter half of 1959 and then accelerated during 1960 until approximately September 1960, when a rate of four Camel B aircraft per month was reached. During this period, there have been noted two significant occurrences that are believed to account for, at least in part, the fluctuations in the rate of production of the Camel B aircraft. These occurrences are (a) the modifications observed on newly produced Camel B aircraft and (b) production of the new bomber at Plant No. 22. Recent information indicates that Camel B aircraft produced during 1960 have been slightly modified in that their interiors have been improved and their baggage-carrying capacity has been increased. 11/ It is not believed, however, that these modifications are extensive enough to have influenced as large a cutback in production as is indicated. It appears more likely that the main reason for the decrease in the rate of production of the Camel B aircraft was the phasing into production of the new bomber.

The USSR has announced that a new version of the Camel, the Tu-104E, set six new world records on 2 April 1960. The Tu-104E was claimed to differ from other Camel models in that it was equipped with more economical and more powerful engines. It is anticipated that production of this improved Camel will replace that of the Camel A and possibly the Camel B aircraft, but no evidence has been forthcoming to indicate where this new Camel will be produced.

The long-awaited new Tupolev light twin-jet transport, the Cookpot, was seen during the summer of 1960. According to the Soviet press, the transport can fly at speeds of up to 486 knots and can cruise at an altitude of 32,800 feet. The general appearance of the Cookpot aircraft is similar to other transports in the Camel family, but it is approximately only one-half as large. Although the aircraft is subsonic rather than slightly supersonic, its prestige value lies in the claim that it is "the world's first airliner with turbofan engines." The effect of the turbofan engines is to increase the engine propulsion efficiency and to reduce the fuel consumption. Test flights of the Cookpot aircraft are being carried out, and series production is believed to be underway at Khar'kov Airframe Plant No. 135.

D. Helicopters, Trainers, and Reconnaissance Aircraft

1. Helicopters

Six types of helicopters are estimated to have been in production in the USSR throughout 1960. These types include the Mil'-designed Hare (Mi-1), Hound (Mi-4), and Hook (Mi-6); the Kamov-designed Hen (Ka-15) and Hog (Ka-18); and the Yakovlev-designed Horse (Yak-24).

- 12 -

S-E-C-R-E-T

S-E-C-R-E-T

a. Mil' Helicopters

Since 1959, little information has been available concerning production of the Mil'-designed Hare helicopter at Rostov Airframe Plant No. 168 and Chkalov Airframe Plant No. 47. The helicopter has not been observed at Plant No. 168 in 1960, and there are no [REDACTED] production in 1960 at either facility. Until the receipt of further information, however, production of the Hare is tentatively assumed to be continuing at both plants, although it is considered possible that production of the small helicopter has ceased.

25X1

[REDACTED] it is estimated that 1,326 Hound helicopters had been produced by 26 April 1960. 12/ The Hound is believed to be continuing in production at Kazan' Airframe Plant No. 387 at the rate of approximately 20 helicopters per month. More than 1,500 Hound helicopters are believed to have been produced by the end of 1960.

25X1

[REDACTED] some Hook helicopters were produced in 1959 at Rostov Airframe Plant No. 168. 13/ The Hook has never been seen, however, at Rostov North airfield, which serves the plant. Moreover, the recent observations of the Hook at Moscow/Fili Airframe Plant No. 23 cast doubt on continued production of the Hook at Plant No. 168, for it is likely that requirements could be met at one facility. Furthermore, reported difficulties with the Hook suggest that it has been produced in very limited numbers. Until the receipt of further information, however, it will be assumed that production of the Hook at Plant No. 168 is continuing at a low rate.

25X1

b. Kamov Helicopters

Ulan-Ude Airframe Plant No. 99 is the production site of both the Hen and the Hog Kamov-designed helicopters. It is believed that they are produced there concurrently. [REDACTED] 157 of the coaxial helicopters had been produced before 12 April 1960. 14/ About 260 of each of the helicopters are believed to have been produced as of 1 January 1961.

25X1

c. Yakovlev Helicopters

Only one Yakovlev-designed helicopter, the Horse, is believed to be in series production in the USSR. Produced at Lenin-grad Airframe Plant No. 272, the Horse has been sighted in increasing numbers in the USSR during 1960. Approximately 130 Horse helicopters are believed to have been produced as of 1 January 1961.

- 13 -

S-E-C-R-E-T

S-E-C-R-E-T

2. Trainers

Production of all trainer types of aircraft is believed to have ceased in the USSR by 1 January 1961. The Midget (U-MIG-15) jet trainer is believed to have been phased out of production at Ulan-Ude Plant No. 99 during 1959, and the Max (Yak-18) piston trainer is believed to have been phased out during 1960. No recent information is available concerning the status of production of aircraft at Sememovka Airframe Plant No. 116, where the Max was produced for more than a decade.

It is believed that both the Midget and the Max will be replaced by a new jet trainer. The Soviet press has indicated that the USSR, Czechoslovakia, and Poland were competing in the development of a new jet trainer. During 1960 the Czechoslovak "Kbely" (L-2) and the Polish "Iskra" (TS-11) student trainers were introduced. As yet, no new Soviet trainer has been announced, nor has there been announcement of a new trainer designed by Communist China, which reportedly also had entered the competition.

3. Reconnaissance Aircraft

It is estimated that a new turbine-powered flying boat, an improved version of the Madge (Be-6), has entered production at Taganrog Airframe Plant No. 49/86. To date, the aircraft is believed to be produced at a low rate (only 12 of the patrol bombers are believed to have been produced as of 1 January 1961).

III. Expenditures for Procurement of Aircraft

The USSR is estimated to have spent approximately the equivalent of \$20 billion for procurement of Soviet aircraft including initial spares during 1955-60. The estimated expenditures for procurement of Soviet aircraft during 1955-60 are detailed, by major type of aircraft, in Table 10* and Table 11** and are shown graphically in Figure 1.*** Expenditures are estimated for the aircraft and for initial spares. The cost of the aircraft includes the cost of the basic airframe, the engine, electronics, armament, accessories, and propellers. Initial spares are those spare parts manufactured in conjunction with the aircraft and provide the basic stock on hand with the aircraft, in depots, and in the pipelines. Procurement of initial spares naturally follows the same pattern as procurement of aircraft.

* Estimated expenditures for aircraft, including initial spares, are shown in Table 10, Appendix A, p. 39, below.

** Estimated expenditures for aircraft, excluding initial spares, are shown in Table 11, Appendix A, p. 40, below.

*** Following p. 14.

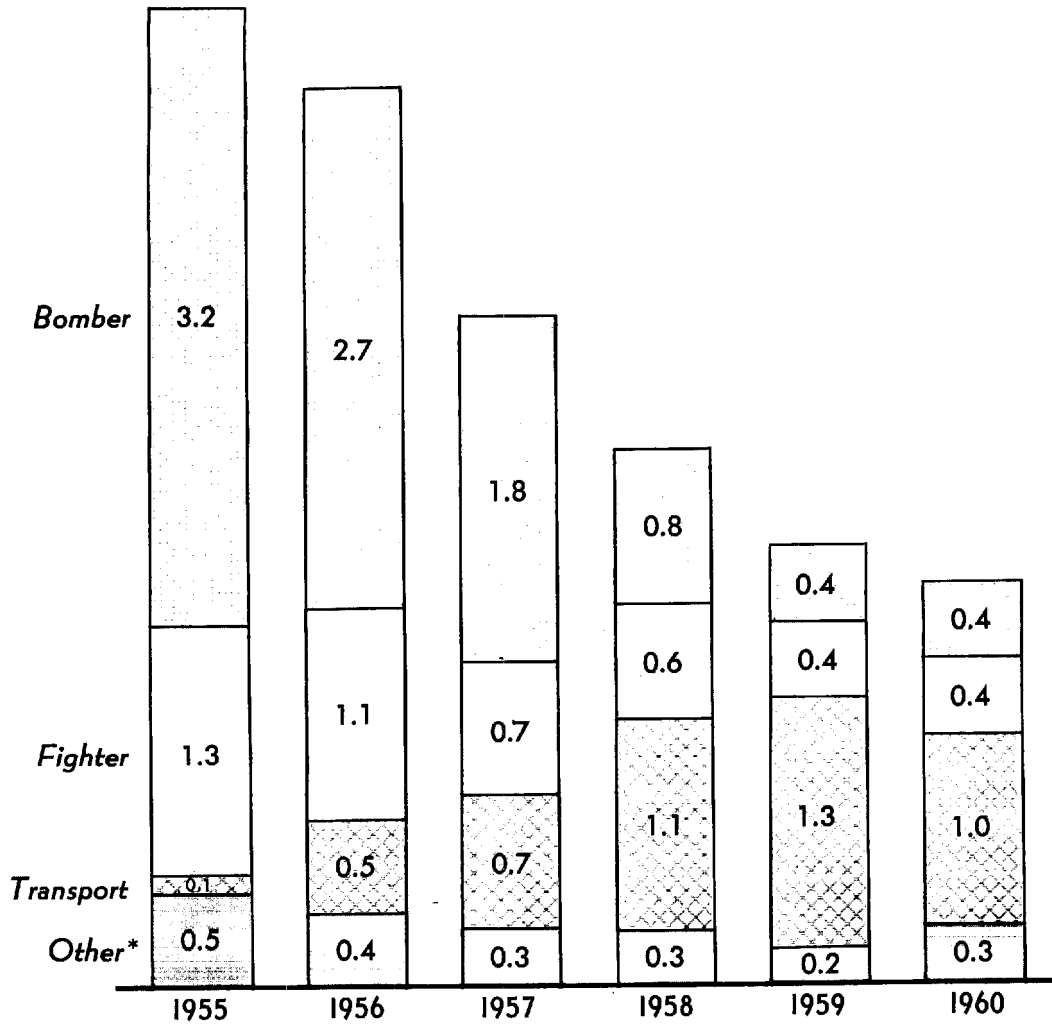
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Figure 1

USSR
Estimated Expenditures for Procurement of Aircraft
Including Initial Spares, 1955-60

Billion 1959 US dollars



**Refers to Trainers, Helicopters, and Reconnaissance Aircraft*

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Expenditures for procurement of Soviet aircraft, including initial spares, decreased from \$5.1 billion in 1955 to \$2.0 billion in 1960. Production of aircraft in numbers and expenditures for procurement of aircraft declined in each succeeding year from 1955 (see the chart, Figure 2*). Airframe weight, however, reached a peak in 1956 and then declined.

Estimated expenditures for production of the major categories of aircraft, including initial spares, are shown graphically in Figure 3* as a percentage of the total annual expenditure for aircraft. The percentage of expenditures for bomber aircraft decreased from 64 percent in 1955 to 18 percent in 1959 and then increased to 22 percent in 1960, whereas the percentage for transport aircraft increased from 3 percent in 1955 to 58 percent in 1959 and then decreased to 48 percent in 1960. Expenditures for the procurement of bomber aircraft including initial spares decreased from \$3.2 billion in 1955 to \$440 million in 1960. Expenditures for the procurement of transport aircraft including initial spares increased from \$140 million in 1955 to \$1.3 billion in 1959 and then decreased to \$970 million in 1960.

IV. Production in the European Satellites, 1960**

A. Czechoslovakia

In Czechoslovakia the Soviet-designed Midget (U-MIG-15) jet trainer aircraft is estimated to have been phased out of production at the Prague/Vodochody Airframe Plant late in the second quarter of 1960. Soviet publications report that the airframe plant at Cakovice has stopped production of the Soviet-designed Crate (Avia-14) twin piston-engine transport aircraft. 15/

The trend toward production of small aircraft is shown by the introduction of the new Kbely (L-2) jet trainer and the HC-3 helicopter and by the continuation in production of the Morava (L-200), the Super Aero and Aero-145 twin piston-engine communication/utility aircraft, the Meta Sokol (L-40), the Akrobat single seat and Trener-Master tandem seat (Zlin-326) single-engine sport aircraft, and the HC-2 helicopter. All these light aircraft are of Czechoslovak design, and all are believed to be in series production. The one possible exception is the Kbely jet trainer, which has not been seen in other than prototype versions, although it is believed to have entered series production

* Following p. 16.

** Estimated production of aircraft in the European Satellites and in Communist China from 1955 through 1960 is given by number in Table 7, Appendix A, p. 32, below, and by airframe weight in Table 8, Appendix A, p. 33, below.

S-E-C-R-E-T

S-E-C-R-E-T

late in the fourth quarter of 1960, probably at the airframe plant at Letnany. Because no recent reports have been received concerning the Jet Sokol (XL-440) twin-jet communication/utility aircraft, it is not believed to be in production. The possibility exists, however, that the Jet Sokol may enter series production at the airframe plant at Chocen and replace production of the Brigadyr (L-60) communications aircraft, which was discontinued during the first quarter of 1960.

B. Poland

Production of the Soviet-designed Fresco (MIG-17) jet fighter aircraft at the airframe plant in Mielec in Poland is believed to have ended late in 1960. Although there is no firm evidence of the phaseout of the Fresco aircraft, the fact that Farmer (MIG-19) jet fighter aircraft are being supplied to air force units of nearly all the European Satellites and are being exported to the United Arab Republic (UAR) and possibly to Iraq and Indonesia 16/ while the Soviet Air Force units in the European Satellites are being equipped with Fishbed jet fighter aircraft strongly suggests that the Fresco aircraft may be dropped from production because it is obsolete. Furthermore, the lack of sightings of Fresco aircraft in the area of the Mielec plant tends to indicate at least a lowered rate of production. In addition, the statement by General Frey-Bielecki that the Bies (TS-8) piston-engine trainer aircraft and the new Iskra (TS-11) jet trainer aircraft will be used as standard student trainers 17/ indicates that both will be produced in series. The airframe plant at Mielec almost certainly will be the production site of these trainer aircraft, thus increasing the probability that the Fresco aircraft will be phased out.

Poland also continued the trend toward production of small aircraft. The one new aircraft believed to have entered into series production is the Iskra (TS-11) jet trainer aircraft. Continuing in production are the Bies (TS-8) piston engine trainer aircraft, the PZL-101 (believed to be in production at a low rate), the KOS (PZL-102) sports communication/utility aircraft, and the Hare (SM-1 and SM-2) helicopters. The MD-12 four-engine short-range transport aircraft has been mentioned infrequently, and only the prototype has been observed. Therefore, the aircraft is not believed to be in production, nor is it considered likely that it will enter series production. All aircraft estimated to be continuing in or entering into series production in Poland (except the Hare) are of native design.

C. East Germany

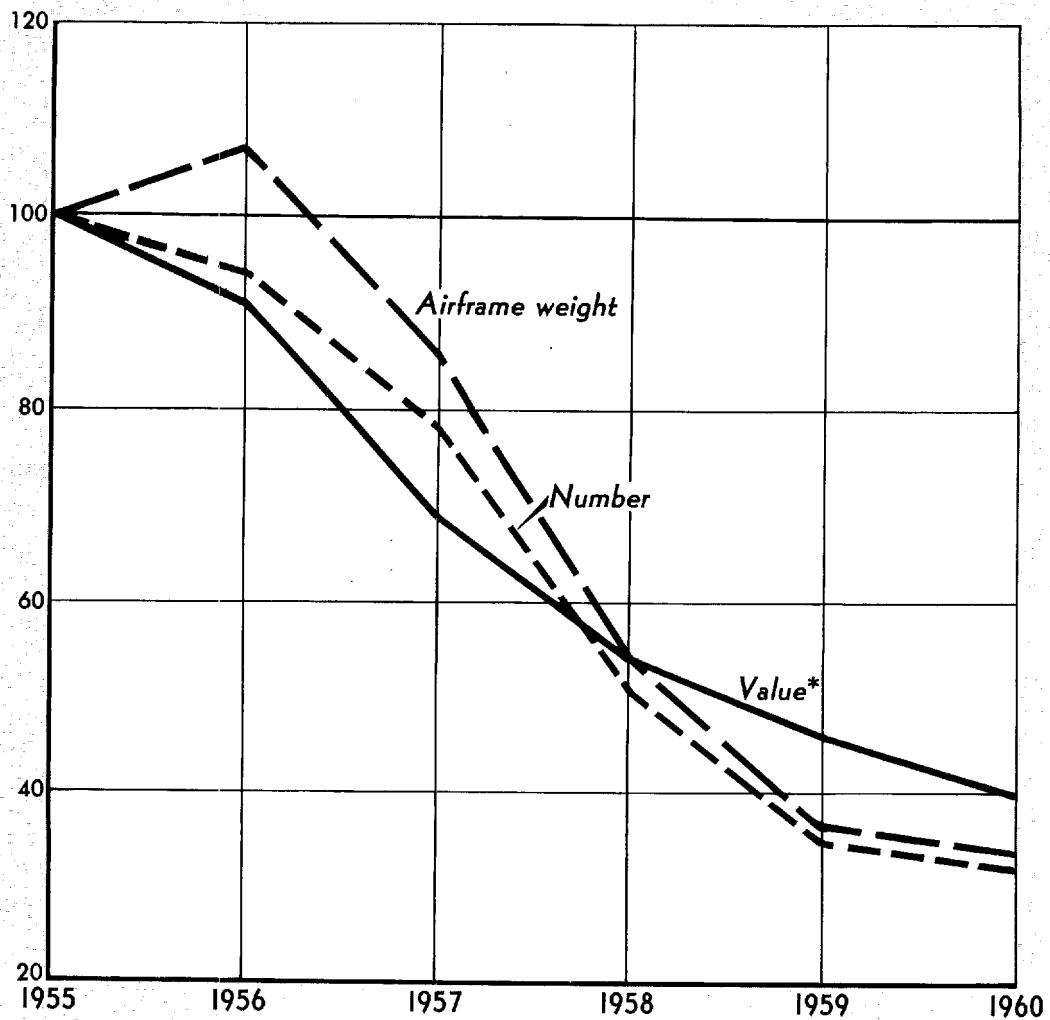
The Soviet-designed Crate (Il-14) twin-piston-engine transport aircraft, which was phased out of production in 1959, is the only aircraft to be put into full series production by East Germany. The type-152

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Figure 2

USSR: Indexes of Estimated Production of Aircraft, by Number, Airframe Weight, and Value* Excluding Initial Spares, 1955-60



*Value is defined as the expenditure for the procurement of the aircraft.

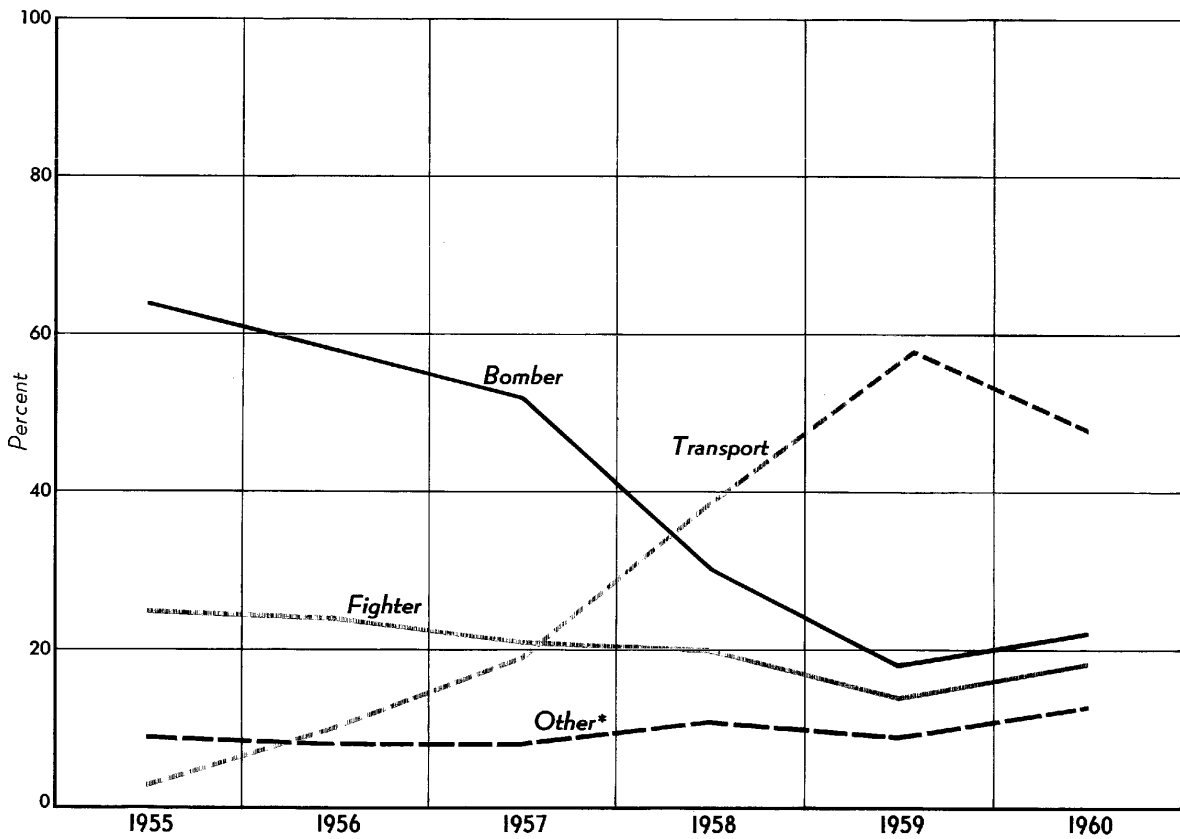
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Figure 3

USSR: Distribution of Estimated Expenditures for Procurement of Aircraft, Including Initial Spares, 1955-60



*Refers to Trainer, Helicopter, and Reconnaissance Aircraft

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S-E-C-R-E-T

jet transport aircraft, an East German design, was given a test flight in August 1960. 18/ It was reported to be in series production as of October 1960, 19/ although continued flight testing of the aircraft may have been postponed until 1961. 20/

Thus the aircraft industry of East Germany had no aircraft in full series production during 1960. The industry, however, continued the development of medium-range and short-range jet transport aircraft of East German design. The type-152 medium-range jet transport aircraft is believed to have been in the first stages of series production at the end of 1960. The type-155 short-range, short-takeoff-and-land (STOL) aircraft reportedly is still under development, with series production programed for 1964. 21/ The type-154 medium-range jet transport aircraft, which was believed to have been dropped, now appears only to have been delayed. Reports received toward the end of 1960 indicate that the type 154 is still under development as a replacement for the type 152. 22/ Nothing, however, is expected of this aircraft until 1963 or later.

D. Other European Satellites

Of the four remaining European Satellites -- Rumania, Bulgaria, Hungary, and Albania -- only Rumania is believed to have produced aircraft during 1960. Rumania probably continued production of a very limited number of IAR 813/817 and RG-6 piston trainer aircraft.

V. Production in Communist China

In 1960 the aircraft industry of Communist China was limited to production of jet fighters, small piston transports, and helicopters. Aircraft in production during the year include the Fresco (MIG-17) jet fighter, the Colt (An-2) piston transport, and the Hound (Mi-4) medium helicopter. Recent information indicates that a fourth aircraft, probably the Farmer (MIG-19), may have entered production in 1960 and that the Chinese may be preparing for production of a Tupolev-designed bomber or transport in Sian in Shensi Province.

Three airframe plants and two aircraft engine plants have been identified in Communist China. Airframe plants identified include the following: Shen-yang Plant No. 112, the site of production of the Fresco; Harbin Plant No. 122, which produced the Hound; and Nan-chang Plant No. 320, the Chinese center for production of the Colt. Piston engines for the Colt are produced at Plant No. 331 in Chu-chou, and the engine for the Fresco is believed to be produced at Plant No. 410 in Shen-yang.

S-E-C-R-E-T

S-E-C-R-E-T

Unlike the aircraft industries of the European Satellites, the Chinese Communist industry produces only Soviet-designed aircraft. Furthermore, the Chinese have continued to stress production of military types, whereas the Satellites have phased out of production of military aircraft during the past 12 months.

In the past 10 years the Chinese Communists have developed a modest but increasingly important aircraft industry. In spite of the progress attained, however, as of the end of 1960 the Chinese aircraft industry remained dependent on the USSR. In the fields of design, research, and development, especially in regard to military aircraft, continued Soviet aid is necessary. Assistance from the USSR has been vital in developing the Chinese aircraft industry, and without such aid it would have been impossible for China to develop an aircraft industry within such a short time. This assistance has involved aid in constructing the plants and in tooling for the facilities and guidance in production activities. Although significant strides have been made by the Chinese toward the establishment of an independent, integrated aircraft industry, their progress will be heavily influenced by the degree of assistance received from the USSR.

VI. Effects of Guided Missiles on the Aircraft Industry

Information that has become available during 1960 does not completely clarify the effect of missile activity on the Soviet aircraft industry. However, several facts concerning the effect of missile utilization and the effect of missile development and production on the aircraft industry are clear. First, some Soviet airframe and aircraft engine plants are known to be involved in some aspects of the missile program. Second, the introduction of missiles has considerably reduced the need for such large-scale production of military aircraft as was previously achieved. Third, in spite of Soviet pronouncements on the subject, development and production of bomber aircraft has continued.

A. Missile Activity in the Aircraft Industry

Several plants of the aircraft industry reportedly have been converted wholly to missile programs or are at least involved in missile activity. Moscow Airframe Plants Nos. 82, 456, 301, and possibly 464 were transferred to missile production early in the 1950's. More recently, there has been evidence that Saratov Airframe Plant No. 292 is involved with short-range tactical missiles and that Tbilisi Airframe Plant No. 31 is engaged in the missile program. Ufa Aircraft Engine Plant No. 26, Molotov Aircraft Engine Plant No. 19, and Moscow Aircraft Engine Plant No. 45 reportedly also are involved in some aspect of the missile program.

S-E-C-R-E-T

S-E-C-R-E-T

Saratov Airframe Plant No. 292 is the most important of the Soviet airframe plants firmly associated with missile production. More than 100 onion-shaped warheads and square fins were observed at the plant in the spring of 1960. ^{23/} It is likely that these may be free-flight ballistic missiles of the "Honest John" type, which have a nuclear capability and an estimated range of 15 nautical miles. Objects similar to the "Guideline" surface-to-air missile also were observed at Plant No. 292. The Saratov plant has been one of the most important centers of production of fighters in the USSR and until recently produced Yakovlev-designed fighter aircraft. It also appears that a second facility for production of fighters, Tbilisi Airframe Plant No. 31, also may be engaged in some phase of missile production. ^{24/} In neither case, however, is there information as to the amount of floor-space or effort devoted to the missile program. Although there is evidence relating other Soviet airframe and some aircraft engine plants to the missile program, there is no information indicating reduced capacity for production of aircraft in the industry as a whole.

B. Utilization of Missiles as Replacement for Aircraft

Decreased production of military aircraft for the past several years may be due in part to the use of missiles as functional replacements for aircraft. It appears that the Soviet decision not to develop a large force of heavy bombers and the apparent decision not to replace the light bomber force with modern aircraft indicate increasing dependence on missiles. The failure to produce a replacement for the Beagle (Il-28) light jet bomber probably is attributable to the success of the missile program, as may be the decline in the production rate of the Bison heavy jet bomber in late 1957. Similarly the increased effectiveness of fighter aircraft equipped with missiles and the utilization of surface-to-air missiles may account for some of the decline in production of fighter aircraft.

C. Soviet Statements Concerning Missiles and Aircraft

Statements made by Khrushchev as early as 1957 have indicated that production programs for bomber aircraft would be relegated to minor roles and even would cease. As recently as January 1960, Khrushchev stated that the USSR had rocket equipment at its disposal and that the manufacture of bombers would continue to be cut sharply and even discontinued. Such statements probably were made partly for propaganda purposes, for some production of bombers has continued in the USSR.

In spite of probable increasing reliance on missiles, the appearance of the Bounder in 1958 and the sighting of new supersonic medium bombers in 1960 indicate continued Soviet interest in both the

S-E-C-R-E-T

S-E-C-R-E-T

development and production of manned bombers. For the past decade the USSR has pursued all lines of research in weaponry in its efforts to gain superiority over the West. Long-range aircraft and jet fighter aircraft have received significant emphasis, although perhaps less than formerly.

VII. Future Intentions

A. USSR

1. Bombers

The sighting of a new medium bomber in 1960 indicates continued Soviet interest in the development and production of bomber aircraft. The new bomber is believed to have entered series production at a low rate. The sighting during 1960 of possible mockup sections at Moscow/Fili Airframe Plant No. 23 of an unidentified aircraft in the experimental area of the plant, together with their apparent removal from a plant building, also may indicate the impending appearance of a new aircraft in 1961. Production of the Bison heavy jet bomber continues at a low rate at Plant No. 23.

The appearance of the new medium bomber and the prolonged production run of the Bison indicate that the USSR intends to continue the development and production of bomber aircraft. It is likely, however, that considerable selectivity regarding production will be exercised and that production will be at much lower rates than formerly. The USSR undoubtedly will continue research in the fields of chemical and nuclear-powered bombers, and prototypes of these types may be flown by 1962.

2. Fighters

As anticipated, estimated production of fighter aircraft increased during 1960. Production of fighter aircraft, however, remained very low even in comparison with estimated production of the preceding Soviet fighters, the Flashlight (Yak-25) and the Farmer (MIG-19).

During 1960 it became apparent that variants of at least two and possibly three of the fighters first displayed in 1956 had entered into production. The Fishbed "C" has entered into service with the Soviet 24th Tactical Air Army in East Germany and probably in units within the USSR as well. Both the swept-wing Fitter and the delta-wing Fishpot have been sighted in the USSR, and variants of both aircraft probably were under development or in production in the USSR in 1960. It is estimated, therefore, that, along with production of

- 20 -

S-E-C-R-E-T

S-E-C-R-E-T

the Fishbed "C," at least one and possibly two Sukhoy-designed fighters are currently in production in the USSR.

The USSR has indicated a high degree of interest in the improved variants of the fighter aircraft displayed in 1956, as demonstrated by the fact that three of these aircraft are now in development or production. It is noted, however, that there is no evidence of very high rates of production of the new fighters in terms of the production rates of the older Fagot, Fresco, and even Farmer aircraft. It is believed that the increased effectiveness of the new generation of fighters together with the use of missiles will preclude the high rates of production characteristic of the earlier jet fighters.

3. Transports

The high priority evidenced by the USSR since 1954 in the development and production of transport aircraft continued in 1960. Two new transports, the turbojet Cookpot and turboprop Coke, were introduced during the year, and both are believed to have been in some stage of production by the end of 1960.

Of the turbojet and turboprop transport aircraft in production at the end of 1959 (the Camel, the Cat, the Cub, the Camp, the Cleat, and the Coot), only the Cub is believed to have been phased out of production. The Camel B and the Camel A, both of which appeared to be being phased out at the end of 1959, continued through 1960. The production rate of the Camel B actually increased during 1960.

It appears evident that the very intensive Soviet programs for research, development, and production of high-performance transport aircraft will continue in the future.

4. Helicopters and Miscellaneous Aircraft

During 1960, increased emphasis was placed on production of rotary-wing aircraft, and it is believed that this trend will continue. All helicopters in production at the end of 1959 (the Hare, the Hound, the Hook, the Horse, the Hen, and the Hog) are believed to have been produced as of the end of 1960. Of these models, only the Hare reportedly may be phased out of series production in the near future.

A new reconnaissance aircraft is believed to have replaced the older Madge in production. As yet there is no evidence of large-scale production of the patrol bomber, nor is there evidence of Soviet intentions to emphasize the development of such an aircraft.

S-E-C-R-E-T

S-E-C-R-E-T

B. Communist China

The intentions of the Chinese Communist aircraft industry must be viewed in the light of continued Soviet aid to the industry. The progress of the Chinese toward developing an independent aircraft industry will be heavily influenced by the degree of assistance received from the USSR.

With the acceptance of this consideration, it is believed that the Chinese Communists will manufacture both military and civil aircraft and helicopters of Soviet design. Information received in 1960 indicates that the Chinese intend to produce a medium jet bomber or a jet transport. It is believed that if this production were to occur, it would require heavy reliance on the USSR and that the Chinese would assemble Soviet-fabricated parts for some time before initiating domestic manufacture. In the fighter category the Chinese probably will concentrate on production of the Farmer for the next few years. It is not anticipated that a Chinese-designed fighter will enter into production in the near future.

It is believed that during the next 5 years the Chinese Communists will place heavy emphasis on production of transport aircraft and helicopters. Turboprop transports are well suited for use in China, and the Chinese may begin production of one of the new turboprops of Il'yushin or Antonov design. Some turbojet transports also may be produced by the Chinese. Production of piston transports also is expected to continue in China, and the manufacture of the Colt may be replaced or supplemented by the fabrication of a newer aircraft.

Along with production of transports, the Chinese Communists probably will emphasize manufacture of helicopters. The versatile Hound, which entered into production in late 1959 in China, probably will reach a peak rate in 1961 and is expected to continue in production throughout the period under consideration.

It is apparent that present endeavors reveal ambitious intentions for the aircraft industry of Communist China during the next 5 years. By the end of the period the industry may rank second in importance only to the USSR within the Sino-Soviet Bloc.

C. European Satellites

Among the seven European Satellites, only Poland, Czechoslovakia, and East Germany possess aircraft industries of any proportion. The trend of the aircraft industries of these three countries during 1960 appears to follow the recommendations of CEMA, which is demonstrated by the fact that the aircraft industries of Poland and Czechoslovakia

S-E-C-R-E-T

S-E-C-R-E-T

have concentrated on the development and production of sport, trainer, and communication/utility aircraft and light and medium helicopters, whereas East Germany has continued the development of medium-range transport aircraft.

Production of military aircraft by the European Satellites is believed to have ceased. All of the military aircraft produced by the European Satellites in the past year have been of Soviet design.

The new production undertaken by the European Satellites during 1960 has been solely of native-designed aircraft. It is too early to determine definitely whether this trend toward production of nonmilitary aircraft of native design will continue or whether the year 1960 was a period of transition from subsonic jet fighter and trainer aircraft to the introduction of new transonic and supersonic jet fighter and trainer aircraft. The possibility remains that one or all of the three countries -- Poland, Czechoslovakia, and East Germany -- will produce military aircraft of Soviet design sometime during 1961. It is considered more likely, however, that the aircraft industries will become more self-sufficient and will follow the recommendations of CEMA in the development and production of aircraft. Eventually these aircraft industries may undertake some development and production of military aircraft, but such a program is not considered likely for the next several years.

S-E-C-R-E-T

S-E-C-R-E-T

APPENDIX A

STATISTICAL TABLES

S-E-C-R-E-T

S-E-C-R-E-T

Table 1

Estimated Production of Aircraft in the Sino-Soviet Bloc, by Number a/
1955-60

Type of Aircraft	1955	1956	1957	1958	1959	Units 1960
Jet bomber						
Heavy	21	25	33	14	26	22
Medium	450	530	460	230	19	18
Light	600	360	160	0	0	0
Turboprop bomber						
Heavy	17	35	0	0	0	0
Jet fighter	3,700	3,100	2,000	1,300	780	740
Transport						
Jet	4	14	20	57	72	52
Turboprop	0	3	18	110	220	200
Piston	600	1,000	1,300	840	490	340
Trainer						
Jet	700	570	440	340	240	49
Piston	560	610	520	550	460	380
Helicopter	400	440	540	690	840	1,000
Reconnaissance	60	60	48	28	9	8
Communication/utility	68	140	220	290	210	290
Total	<u>7,200</u>	<u>6,900</u>	<u>5,700</u>	<u>4,400</u>	<u>3,400</u>	<u>3,100</u>

a. Figures are rounded to two significant digits. Because of rounding, components may not add to the totals shown.

S-E-C-R-E-T

S-E-C-R-E-T

Table 2

Estimated Production of Aircraft in the Sino-Soviet Bloc
by Weight, Excluding Initial Spares a/
1955-60

Type of Aircraft	Thousand Pounds of Airframe Weight					
	1955	1956	1957	1958	1959	1960
Jet bomber						
Heavy	2,200	2,600	3,400	1,400	2,700	2,300
Medium	21,000	25,000	22,000	11,000	980	1,100
Light	10,000	6,000	2,700	0	0	0
Turboprop bomber						
Heavy	1,400	2,900	0	0	0	0
Jet fighter	25,000	22,000	14,000	9,600	6,000	5,900
Transport						
Jet	210	740	1,100	3,000	3,900	2,800
Turboprop	0	90	890	4,600	9,000	8,200
Piston	2,100	8,600	10,000	5,000	2,100	1,100
Trainer						
Jet	4,300	3,500	2,500	1,700	1,200	240
Piston	740	780	510	560	490	410
Helicopter	2,200	2,700	2,900	3,200	3,700	4,700
Reconnaissance	1,200	1,200	980	750	180	520
Communication/utility	71	170	280	380	250	340
Total	70,000	76,000	61,000	41,000	30,000	28,000

a. Figures are rounded to two significant digits. Because of rounding, components may not add to the totals shown. Initial spares are those spare parts which are manufactured in conjunction with the aircraft and which provide the basic stock on hand with the aircraft, in depots, and in the pipeline.

S-E-C-R-E-T

S-E-C-R-E-T

Table 3

Estimated Production of Aircraft in the USSR, by Number a/
1955-60

Type of Aircraft	Units					
	1955	1956	1957	1958	1959	1960
Jet bomber						
Heavy	21	25	33	14	26	22
Medium	450	530	460	230	19	18
Light	600	360	160	0	0	0
Turboprop bomber						
Heavy	17	35	0	0	0	0
Jet fighter	3,300	2,800	1,900	1,000	410	530
Transport						
Jet	4	14	20	56	69	50
Turboprop	0	3	18	110	220	200
Piston	600	1,000	1,200	680	300	160
Trainer						
Jet	460	330	200	140	60	0
Piston	340	360	360	360	360	270
Helicopter	400	440	500	580	700	740
Reconnaissance	60	60	48	28	9	8
Total	<u>6,300</u>	<u>5,900</u>	<u>4,900</u>	<u>3,200</u>	<u>2,200</u>	<u>2,000</u>

a. Figures are rounded to two significant digits. Because of rounding, components may not add to the totals shown.

S-E-C-R-E-T

S-E-C-R-E-T

Table 4

Estimated Production of Aircraft in the USSR
by Weight, Excluding Initial Spares a/
1955-60

Type of Aircraft	Thousand Pounds of Airframe Weight					
	1955	1956	1957	1958	1959	1960
Jet bomber						
Heavy	2,200	2,600	3,400	1,400	2,700	2,300
Medium	21,000	25,000	22,000	11,000	980	1,100
Light	10,000	6,000	2,700	0	0	0
Turboprop bomber						
Heavy	1,400	2,900	0	0	0	0
Jet fighter	23,000	20,000	13,000	7,600	3,600	4,500
Transport						
Jet	210	740	1,100	3,000	3,700	2,700
Turboprop	0	90	890	4,600	9,000	8,200
Piston	2,100	8,300	9,300	3,200	290	150
Trainer						
Jet	3,000	2,200	1,300	690	310	0
Piston	340	360	360	360	360	270
Helicopter	2,200	2,700	2,800	3,000	3,400	3,800
Reconnaissance	1,200	1,200	980	750	180	520
Total	<u>67,000</u>	<u>72,000</u>	<u>58,000</u>	<u>36,000</u>	<u>25,000</u>	<u>23,000</u>

a. Figures are rounded to two significant digits. Because of rounding, components may not add to the totals shown. Initial spares are those spare parts which are manufactured in conjunction with the aircraft and which provide the basic stock on hand with the aircraft, in depots, and in the pipeline.

S-E-C-R-E-T

S-E-C-R-E-T

Table 5

US Military Aircraft Acceptances, by Number a/
1955-60

<u>Type of Aircraft</u>	<u>Units</u>					
	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960 <u>b/</u></u>
Bomber						
Heavy	34	75	173	156	118	74
Medium	530	505	199	31	15	17
Light	155	105	14	0	0	0
Ground attack	631	469	339	400	319	312
Fighter	4,017	2,656	2,569	1,574	938	632
Transport	536	362	223	337	107	61
Trainer	1,439	843	784	567	614	268
Other <u>c/</u>	701	1,098	1,316	1,174	873	781
Total	<u>8,043 <u>d/</u></u>	<u>6,113</u>	<u>5,617</u>	<u>4,239</u>	<u>2,984</u>	<u>2,145</u>

a. 25/

b. Including preliminary data for the fourth quarter of 1960.

c. Tankers; helicopters; flying boats; and antisubmarine warfare, warning, liaison, utility, amphibian, and lighter-than-air aircraft.

d. Figures are not rounded, because they were obtained from official US military acceptances.

S-E-C-R-E-T

S-E-C-R-E-T

Table 6

US Military Aircraft Acceptances, by Weight, a/ Excluding Initial Spares b/
1955-60

Type of Aircraft	Thousand Pounds of Airframe Weight					
	1955	1956	1957	1958	1959	1960 <u>c/</u>
Bomber						
Heavy	3,853	8,442	19,462	17,638	12,740	7,882
Medium	26,377	22,525	7,340	1,250	480	544
Light	2,724	1,975	268	0	0	0
Ground attack	6,034	4,803	3,720	3,680	3,361	3,196
Fighter	43,161	30,588	30,427	18,562	12,945	9,434
Transport	20,697	13,104	9,319	8,134	4,116	3,468
Trainer	7,453	3,283	4,050	3,107	3,468	1,111
Other <u>d/</u>	4,397	5,292	4,853	13,758	14,643	10,362
Total	<u>114,696 e/</u>	<u>90,012</u>	<u>79,439</u>	<u>66,129</u>	<u>51,753</u>	<u>35,997</u>

a. 26/

b. Initial spares are those spare parts which are manufactured in conjunction with the aircraft and which provide the basic stock on hand with the aircraft, in depots, and in the pipeline.

c. Including preliminary data for the fourth quarter of 1960.

d. Tankers; helicopters; flying boats; and antisubmarine warfare, warning, liaison, utility, amphibian, and lighter-than-air aircraft.

e. Figures are not rounded, because they were obtained from official US military acceptances.

S-E-C-R-E-T

S-E-C-R-E-T

Table 7

Estimated Production of Aircraft in the European Satellites
and in Communist China, by Number a/
1955-60

		Units					
Country	Type of Aircraft	1955	1956	1957	1958	1959	1960
Czechoslovakia	Jet fighter	130	0	0	10	0	0
	Piston transport	0	17	46	60	60	30
	Jet trainer	240	240	240	200	180	45
	Piston trainer	120	120	6	0	0	0
	Light helicopter	0	0	2	0	23	65
	Communication/utility (piston)	68	140	220	290	210	260
	Communication/utility (jet)	0	0	0	0	1	1
Total		<u>560</u>	<u>510</u>	<u>520</u>	<u>570</u>	<u>470</u>	<u>400</u>
Poland	Jet fighter	240	340	130	180	180	100
	Piston transport	0	0	0	0	1	0
	Light jet trainer	0	0	0	0	1	4
	Light piston trainer	36	36	36	62	67	78
	Light helicopter	0	0	41	110	120	120
	Communication/utility	0	0	0	1	0	30
	Total		<u>270</u>	<u>380</u>	<u>210</u>	<u>350</u>	<u>370</u>
Rumania	Light piston trainer	<u>24</u>	<u>24</u>	<u>44</u>	<u>69</u>	<u>24</u>	<u>27</u>
Bulgaria	Light piston trainer	<u>20</u>	<u>36</u>	<u>36</u>	<u>20</u>	<u>0</u>	<u>0</u>
Hungary	Light piston trainer	<u>24</u>	<u>30</u>	<u>36</u>	<u>36</u>	<u>12</u>	<u>0</u>
East Germany	Jet transport	0	0	0	1	3	2
	Piston transport	0	2	19	41	28	0
Total		<u>0</u>	<u>2</u>	<u>19</u>	<u>42</u>	<u>31</u>	<u>2</u>
Communist China	Jet fighter	0	0	1	120	190	110
	Piston transport	0	0	1	50	100	150
	Helicopter	0	0	0	0	3	85
Total		<u>0</u>	<u>0</u>	<u>2</u>	<u>170</u>	<u>290</u>	<u>340</u>
Grand total		<u>900</u>	<u>980</u>	<u>860</u>	<u>1,300</u>	<u>1,200</u>	<u>1,100</u>

a. Figures are rounded to two significant digits. Because of rounding, components may not add to totals shown.

S-E-C-R-E-T

S-E-C-R-E-T

Table 8

Estimated Production of Aircraft in the European Satellites and in Communist China
by Weight, Excluding Initial Spares a/
1955-60

		Thousand Pounds of Airframe Weight					
Country	Type of Aircraft	1955	1956	1957	1958	1959	1960
Czechoslovakia	Jet fighter	670	0	0	84	0	0
	Piston transport	0	270	740	960	960	480
	Jet trainer	1,200	1,200	1,200	1,000	920	230
	Piston trainer	310	310	16	0	0	0
	Light helicopter	0	0	1	0	15	32
	Communication/utility (piston)	71	170	280	380	250	320
	Communication/utility (jet)	0	0	0	0	1	1
Total		<u>2,300</u>	<u>2,000</u>	<u>2,300</u>	<u>2,500</u>	<u>2,100</u>	<u>1,100</u>
Poland	Jet fighter	1,200	1,800	850	1,200	1,200	660
	Piston transport	0	0	0	0	7	0
	Light jet trainer	0	0	0	0	2	8
	Light piston trainer	33	33	37	98	110	120
	Light helicopter	0	0	94	250	280	280
	Communication/utility	0	0	0	1	0	16
Total		<u>1,200</u>	<u>1,800</u>	<u>980</u>	<u>1,500</u>	<u>1,600</u>	<u>1,100</u>
Rumania	Light piston trainer	<u>18</u>	<u>18</u>	<u>32</u>	<u>49</u>	<u>17</u>	<u>19</u>
Bulgaria	Light piston trainer	<u>19</u>	<u>35</u>	<u>35</u>	<u>19</u>	<u>0</u>	<u>0</u>
Hungary	Light piston trainer	<u>23</u>	<u>24</u>	<u>34</u>	<u>34</u>	<u>11</u>	<u>0</u>
East Germany	Jet transport	0	0	0	41	120	82
	Piston transport	0	32	300	660	450	0
Total		<u>0</u>	<u>32</u>	<u>300</u>	<u>700</u>	<u>570</u>	<u>82</u>
Communist China	Jet fighter	0	0	6	770	1,200	730
	Piston transport	0	0	4	180	350	520
	Helicopter	0	0	0	0	23	640
Total		<u>0</u>	<u>0</u>	<u>10</u>	<u>950</u>	<u>1,600</u>	<u>1,900</u>
Grand total		<u>3,600</u>	<u>3,900</u>	<u>3,700</u>	<u>5,700</u>	<u>5,900</u>	<u>4,100</u>

a. Figures are rounded to the nearest one thousand pounds or to not more than two significant digits. Because of rounding, components may not add to the totals shown. Initial spares are those spare parts which are manufactured in conjunction with the aircraft and which provide the basic stock on hand with the aircraft, in depots, and in the pipeline.

S-E-C-R-E-T

S-E-C-R-E-T

Table 9

Estimated Production of Aircraft in the Sino-Soviet Bloc, by Plant and Number
1954-60 and the Status as of 1 January 1961

Country	Type of Aircraft	Model	Airframe Plant	Cumulative Production Through 1954	1955	1956	1957	1958	1959	1960	Total	Units	
												Status 1 January 1961	
USSR	Jet bomber												
	Heavy	Bison (M-4)	Moscow No. 23	2	21	25	33	14	26	22	143	2 aircraft per month (the total includes 3 prototypes)	
	Medium	Badger (Tu-16)	Kuybyshev No. 1	29	154	180	180	135	12		690	Ceased	
		Badger (Tu-16)	Kazan' No. 22	122	234	240	231	95			920	Ceased	
		Badger (Tu-16)	Voronezh No. 64		63	108	47	2			220	Ceased	
		Total Badger		151	451	528	458	230	12		1,830		
		Bounder Blinder	Moscow/Fili No. 23 Kazan' No. 22					1	1 a/ 2	1 a/ 7	18	2 28	Prototypes 2 aircraft per month (the total includes 3 prototypes)
	Light	Blowlamp	Moscow No. 30				3 a/						3 Prototypes
		Beagle (IL-28)	Moscow No. 30	1,380	120							1,500	Ceased
		Beagle (IL-28)	Irkutsk No. 39	345	360	359	161					1,225	Ceased
		Beagle (IL-28)	Voronezh No. 64	1,200								1,200	Ceased
		Beagle (IL-28)	Omsk No. 166	981	119							1,100	Ceased
		Total Beagle		3,906	292	352	161				5,025		
	Turboprop bomber												
	Heavy	Bear (Tu-95)	Kuybyshev No. 18	3	17	35						55	Ceased (the total includes 3 prototypes)
Jet fighter													
Twin-jet	Farmer (MiG-19)	Gor'kiy No. 21	19	249	300	142					710	Ceased	
	Farmer (MiG-19)	Novosibirsk No. 153		11	296	474	425	31			1,237	Ceased	
	Total Farmer		19	260	596	616	425	31			1,947		
Single-jet	Flashlight (Yak-25)	Saratov No. 292	48	264	312	46					670	Ceased	
	Yak-27/29	Saratov No. 292			2 a/		32	18			52	Preseries run; ceased	
Single-jet	Faceplate	Gor'kiy No. 21			2 a/						2	Ceased	
	Fishbed (all types)	Gor'kiy No. 21			2 a/	12	42	48	111		215	10 aircraft per month	
	Fishbed (all types)	Tbilisi No. 31			2 a/	1	52	25	56		136	5 aircraft per month	
	Total Fishbed				4	13	94	73	167		321		

* Footnotes for Table 9 follow on p. 38.

S-E-C-R-E-T

S-E-C-R-E-T

Table 9

Estimated Production of Aircraft in the Sino-Soviet Bloc, by Plant and Number
1954-60 and the Status as of 1 January 1961
(Continued)

Country	Type of Aircraft	Model	Airframe Plant	Cumulative Production Through 1954	1955	1956	1957	1958	1959	1960	Total	Status 1 January 1961	
USSR	Jet fighter												
	Single-jet (Continued)	Fitter	Komsomol'sk No. 126			2 a/	4	63	150	180	399	15 aircraft per month	
		Fitter/Fishpot	Novosibirsk No. 153			2 a/		27	138	180	347	15 aircraft per month	
		Fresco (MIG-17)	Gor'kiy No. 21	1,448	51	636	203				1,499	Ceased	
		Fresco (MIG-17)	Tbilisi No. 21	1,153	660	1,020	992	354			2,652	Ceased	
		Fresco (MIG-17)	Komsomol'sk No. 126	1,022	1,020						5,208	Ceased	
		Fresco (MIG-17)	Khar'kov No. 135	518	290	7					915	Ceased	
		Fresco (MIG-17)	Novosibirsk No. 153	1,419	771	181					2,371	Ceased	
		Total Fresco		6,460	2,722	1,844	1,195	354			12,643		
	Transport												
	Jet	Camel (Tu-104)	Kazan' No. 22		3 a/							3	Prototypes
		Camel (Tu-104 and Tu-104A)	Khar'kov No. 135			6	8	24	7			45	Ceased
		Camel (Tu-104 and Tu-104A)	Omsk No. 166		1	8	12	20	17	12		70	Phasing out
		Camel B (Tu-104B)	Kazan' No. 22					12	45	38		95	4 aircraft per month
		Total Camel			4	14	20	56	62	50		213	
		Cookpot (Tu-124)	Khar'kov No. 135						1 a/	1 a/		2	Prototypes
	Turboprop	Camp (An-8)	Tashkent No. 84			3	2	18	57	72		147	6 aircraft per month
		Camp (An-8)	Kiev No. 473									5	Prototypes a/
		Total Camp				3	2	18	57	72		152	
		Cat (An-10)	Voronezh No. 64					4	1	36	36	95	3 aircraft per month
	Cat (An-10)	Kiev No. 473									5	Prototypes a/	
	Total Cat						4	1	36	36	100		
	Tu-114D	Kuybyshev No. 18					2 b/				2	Prototypes	
	Cleat (Tu-114)	Kuybyshev No. 18					1	9	12		23	1 aircraft per month	
	Coot (Il-18)	Moscow No. 30					8	37	48	48	141	4 aircraft per month	
	Cub (An-12)	Irkutsk No. 39					1	33	67	30	131	Ceased	
	Coke (An-24)	Kiev No. 473							1 a/	1 a/	2	Prototypes	

S-E-C-R-E-T

S-E-C-R-E-T

Table 9

Estimated Production of Aircraft in the Sino-Soviet Bloc, by Plant and Number
1954-60 and the Status as of 1 January 1961
(Continued)

Country	Type of Aircraft	Model	Airframe Plant	Cumulative Production Through 1954	1955	1956	1957	1958	1959	1960	Total	Status 1 January 1961	Units	
USSR	Transport (Continued)													
	Piston	Crate (Il-14)	Moscow No. 30			6	320	314	95				735	Ceased
		Crate (Il-14)	Tashkent No. 84		69	43	102	167	35				416	Ceased
		Total Crate			69	49	422	481	130				1,151	
	Crate	Colt (An-2)	Kiev No. 473		400	325	400	400	261	14			1,800	Ceased
		Creek (Yak-12)	Leningrad No. 458		13	226	192	305	288	288			1,471	Phasing out
		Clod (An-14)	Kiev No. 473						5	1	159	4	10	Prototypes
	Trainer													
	Jet	Mascot (U-11-28)	Moscow No. 39		173	15							188	Ceased
		Mascot (U-11-28)	Irkutsk No. 39		43	45	45	20					153	Ceased
		Total Mascot			216	60	45	20					341	
	Midget (U-MIG-15)	Ulan-Ude No. 99		1,373	396	288	180	135	60			2,432	Ceased	
	Piston	Max (Yak-18)	Semenovka No. 116		3,872	336	360	360	360	273		5,921	Ceased	
	Helicopter	Hare (Mi-1)	Chkalov No. 47		76	168	180	180	180	180	180	1,144	15 helicopters per month	
		Hare (Mi-1)	Rostov No. 168				11	53	60	60	60	184	5 helicopters per month	
		Total Hare			76	168	180	191	233	240	240	1,328		
		Hound (Mi-4)	Kazan' No. 387		81	222	240	240	240	240	240	1,503	20 helicopters per month	
Hook (Mi-6)	Rostov No. 168					1	3	10	21	35	2 helicopters per month			
												(the total includes 4 prototypes)		
Horse (Yak-24)	Leningrad No. 272			10	24	24	24	24	24	24	130	2 helicopters per month		
Hen (Ka-15)	Ulan-Ude No. 99				1	45	70	72	72	260	6 helicopters per month			
Hog (Ka-18)	Ulan-Ude No. 99						8	113	144	265	12 helicopters per month			
Reconnaissance	Madge (Be-6)	Taganrog No. 49/86		130	60	60	48	24	9		331	Ceased		
	New patrol bomber	Taganrog No. 49/86						4		8	12	1 aircraft per month (the total includes 4 prototypes)		

- 36 -

S-E-C-R-E-T

S-E-C-R-E-T

Table 9

Estimated Production of Aircraft in the Sino-Soviet Bloc, by Plant and Number
1954-60 and the Status as of 1 January 1961
(Continued)

Country	Type of Aircraft	Model	Airframe Plant	Cumulative Production Through 1954	1955	1956	1957	1958	1959	1960	Total	Status 1 January 1961
Czechoslovakia c/	Piston transport	Crate (Avia-14)	Čakovice-Letnany			17	46	60	60	30	213	Phased out
	Trainer											
	Jet	Midjet (U-MIG-15) Khely (L-2)	Prague/Vodochody Letnany	75	240	240	240	204	180 3	45 0	1,224 3	Ceased Prototypes. Probably entering series pro- duction early in 1961
	Helicopter	Helibaby (HC-2) Helibaby (HC-3)	Otrokovice "Moravan" Otrokovice "Moravan"				2	0	20 3	60 5	82 8	5 aircraft per month Entered series production in the fourth quarter; 3 prototypes in 1959
	Communication/utility								1 g/	1 g/	2	Test probably continuing
Poland	Jet	Jet Sokol (XL-440)	Choczen "Orlican"									
	Piston	Aero-45 series	Kunovice		16	69	90	130	55	60	420	5 aircraft per month
		Morava (L-200)	Kunovice				1	3	21	80	105	7 aircraft per month
		Brigadyr (L-60)	Choczen "Orlican"		1	16	78	95	43	15	248	Ceased
		Meta Sokol (L-40)	Choczen "Orlican"		1	1	5	14	43	60	124	5 aircraft per month
		Trener (Zlin-26 series)	Otrokovice "Moravan"	350	50	50	50	50	48	40	638	3 aircraft per month
	Jet fighter	Fresco (MIG-17)	Mielec			9	131	180	180	100	600	Believed to have been phased out
	Trainer											
	Jet	Iakra (TS-11)	Mielec							1	4	5 Estimated to be entering series production
	Piston	Bies (TS-8)	Mielec					61	66	60	187	5 aircraft per month
	Bies (TS-8)	Warsaw/Okecie					1	1	18	20	Prototypes Perhaps discontinued	
	PZL-101	Warsaw/Okecie										
Helicopter	Hare (SM-1 and SM-2)	Lublin/Swidnik				41	110	120	120	391	10 aircraft per month	

S-E-C-R-E-T

Table 9

Estimated Production of Aircraft in the Sino-Soviet Bloc, by Plant and Number
1954-60 and the Status as of 1 January 1961
(Continued)

Country	Type of Aircraft	Model	Airframe Plant	Cumulative Production Through 1954	1955	1956	1957	1958	1959	1960	Total	Units	
												Status 1 January 1961	
Poland (Continued)	Communication/ utility	KOS (PZL-102)	Warsaw/Okecie					1	0	30	31	3	aircraft per month
				102	24	24	43	45	12	15	265	Sporadic	
Rumania	Piston trainer	IAR-813/817 RG-6	Orasul Stalin Reghin				1	24	12	12	49		Sporadic
East Germany	Transport							1	3	2	6		Entering series produc- tion
	Jet	Type 152	Dresden/Klotzsche										
Communist China	Jet fighter						1	119	190	90	400		Ceased
	Single-jet	Fresco (MIG-17)	Shen-yang No. 112							18	18		3 aircraft per month
	Twin-jet	Farmer (MIG-19)	Shen-yang No. 112										
	Transport						1	50	100	149	300		10 aircraft per month, including 1 prototype
	Piston	Colt (An-2)	Nan-chang No. 320							3	85	88	
	Helicopter	Hound (MI-4)	Harbin No. 122										

a. Production of the prototypes of aircraft that have not gone into series production is not included in Tables 1, 2, 3, 4, 7, and 8 (pp. 26, 27, 28, 29, 32, and 33, respectively, above) but is included in this table in order to show the status of the prototypes and the producing plants.
b. Estimated production of the Tu-114D is included in Tables 1, 2, 3, 4, 7, and 8.
c. All aircraft estimated to have been produced in the USSR during 1955-60 are shown in Table 9 because their costs also are estimated. The only aircraft produced in the Satellites shown in Table 9 are aircraft produced in 1960 or aircraft believed to be currently under development.

S-E-C-R-E-T

S-E-C-R-E-T

Table 10

Estimated Expenditures for Procurement of Soviet Aircraft
Including Initial Spares a/
1955-60

	Million 1959 US \$					
Type of Aircraft	1955	1956	1957	1958	1959	1960
Bomber						
Heavy	737	642	318	122	213	172
Medium	1,933	1,737	1,340	710	199	267
Light	550	353	135	0	0	0
Subtotal	<u>3,220</u>	<u>2,732</u>	<u>1,793</u>	<u>832</u>	<u>412</u>	<u>439</u>
Fighter	<u>1,253</u>	<u>1,118</u>	<u>725</u>	<u>550</u>	<u>322</u>	<u>356</u>
Transport	<u>136</u>	<u>483</u>	<u>671</u>	<u>1,082</u>	<u>1,318</u>	<u>966</u>
Other						
Helicopter	106	108	110	118	140	145
Trainer	221	167	105	68	52	33
Reconnaissance	127	108	65	102	14	81
Subtotal	<u>454</u>	<u>383</u>	<u>280</u>	<u>288</u>	<u>206</u>	<u>259</u>
Total	<u>5,100</u>	<u>4,700</u>	<u>3,500</u>	<u>2,800</u>	<u>2,300</u>	<u>2,000</u>

a. Figures are rounded to the nearest million except for the totals, which are rounded to two significant digits. Initial spares are those spare parts which are manufactured in conjunction with the aircraft and which provide the basic stock on hand with the aircraft, in depots, and in the pipeline.

S-E-C-R-E-T

S-E-C-R-E-T

Table 11

Estimated Expenditures for Procurement of Soviet Aircraft
Excluding Initial Spares a/
1955-60

	Million 1959 US \$					
Type of Aircraft	1955	1956	1957	1958	1959	1960
Bomber						
Heavy	539	460	227	86	149	121
Medium	1,358	1,196	915	487	144	202
Light	376	244	92	0	0	0
Subtotal	<u>2,273</u>	<u>1,900</u>	<u>1,234</u>	<u>573</u>	<u>293</u>	<u>323</u>
Fighter	<u>822</u>	<u>719</u>	<u>461</u>	<u>367</u>	<u>224</u>	<u>234</u>
Transport	<u>95</u>	<u>337</u>	<u>474</u>	<u>764</u>	<u>921</u>	<u>665</u>
Other						
Helicopter	78	76	78	85	101	102
Trainer	156	117	73	48	37	24
Reconnaissance	97	80	48	80	10	62
Subtotal	<u>331</u>	<u>273</u>	<u>199</u>	<u>213</u>	<u>148</u>	<u>188</u>
Total	<u>3,500</u>	<u>3,200</u>	<u>2,400</u>	<u>1,900</u>	<u>1,600</u>	<u>1,400</u>

a. Figures are rounded to the nearest million except for the totals, which are rounded to two significant digits. Initial spares are those spare parts which are manufactured in conjunction with the aircraft and which provide the basic stock on hand with the aircraft, in depots, and in the pipeline.

- 40 -

S-E-C-R-E-T

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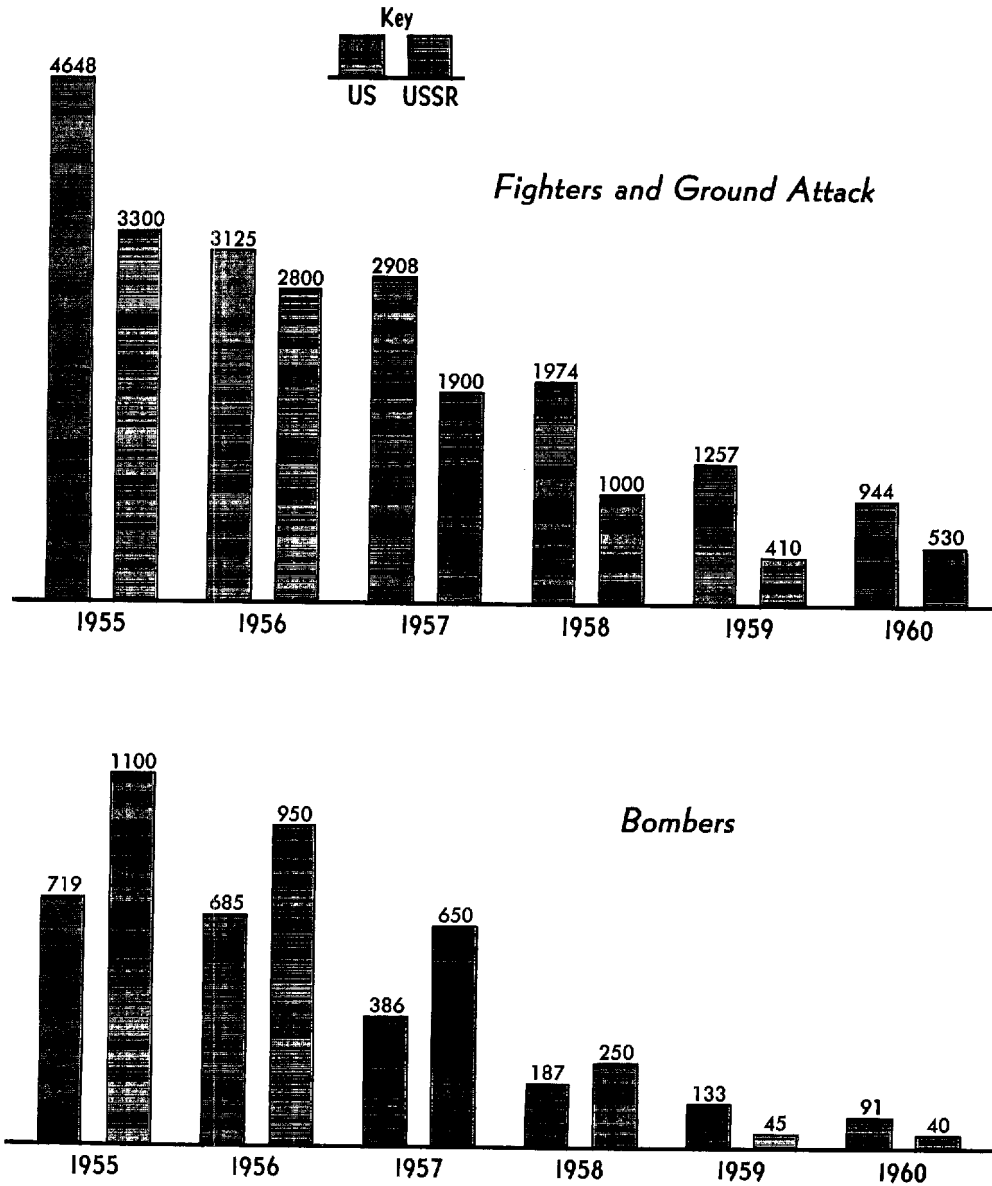
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Figure 4

US* and USSR**
Production of Combat Aircraft, by Number
1955 through 1960

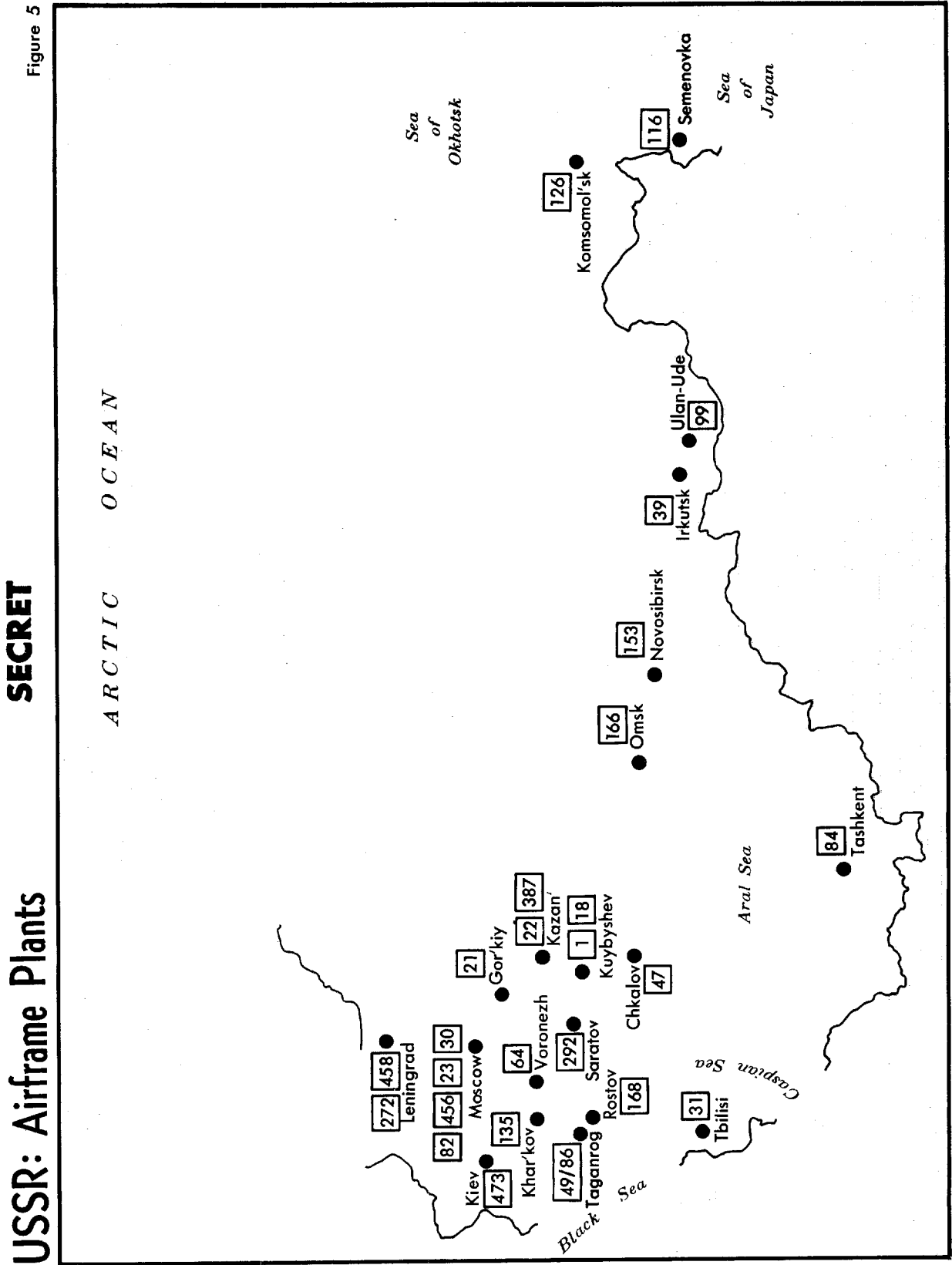


*US totals include preliminary data for December 1960.

**USSR totals are rounded.

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