DEPARTMENT OF THE AIR FORCE
11TH WING

7 November 2000

11 CS/SCS (FOIA)
1000 Air Force Pentagon
Washington DC 20330-1000

Mr. John Greenewald, Jr.

Dear Mr. Greenewald

This is in response to your 14 August 2000, Freedom of Information Act (FOIA) request for a copy of the document "Soviet Cruise Missiles - An Overview." We received your request on 6 October 2000.

In this instance, we are unable to meet the time limits imposed by the FOIA. We need additional time to search for the records you requested.

Please be assured that your request is being processed as quickly as possible.

If you have any questions, please contact the Ms. Virginia Broadnax at (703) 696-7268 and refer to case # 01-0026.

Sincerely

RHONDA M. JENKINS
Chief, Documentation Information
and Services Branch

DEPARTMENT OF THE AIR FORCE
11TH WING

7 December 2000

11 CS/SCS (FOIA)
1000 Air Force Pentagon
Washington DC 20330-1000

Mr. John Greenewald, Jr.

Dear Mr. Greenewald

This is in response to your Freedom of Information Act (FOIA) request for the document "Soviet Cruise Missiles - An Overview."

The information you requested does not fall under our purview. Therefore, we have forwarded your request to the following Air Force activity. They will reply directly to you.

National Air Intelligence Center
NAIC/SCVMS (FOIA)
4180 Watson Way
Wright-Patterson AFB OH 45433-5648

There are no assessable fees for processing your FOIA request in this instance.

If you have any questions, please contact our action officer Ms. Virginia Broadnax at (703) 696-7268 and refer to case # 01-0026.

Sincerely

RHONDA M. JENKINS
Chief, Documentation Information
and Services Branch

DEPARTMENT OF THE AIR FORCE
11TH WING

24 September 2001

11 CS/SCS (FOIA)
1000 Air Force Pentagon
Washington DC 20330-1000

Mr. John Greenewald, Jr.

Dear Mr. Greenewald

This is in response to your Freedom of Information Act (FOIA) request for the document "Soviet Cruise Missiles - An Overview."

The National Air Intelligence Center reviewed your request and determined that the document is fully releasable. Attached is a copy of the releasable document.

There are no assessable fees for processing your FOIA request in this instance.

If you have any questions, please contact our action officer Ms. Virginia Broadnax at (703) 696-7268 and refer to case # 01-0026.

Sincerely

JOHN M. ESPINAL
Acting Freedom of Information Manager

Attachment:
Releasable Document

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(2)

(9) STRATEGIC DIV[redacted] NOTE

(14) ANSER - SDN-76-5

(6) SOVIET CRUISE MISSILES—AN OVERVIEW (U) ← (8)

August 1976

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(10) Prepared by
E. Jedrziewski

Approved by
J. A. Englund, Manager, Strategic Division

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SUMMARY (U)

(U) ~~(S)~~ During the past 20 years, the Soviets have put into operation 20 cruise missiles. With variations in the types of guidance and warheads, these 20 missiles represent 29 separate mission applications.

(U) ~~(S)~~ The operational requirements and applied technology in these missiles vary widely. However, a careful study of their roles, characteristics, and technology reveals much about Soviet cruise missiles. From a chronological review one can conclude the following about the roles of the cruise missiles:

- The Soviets have not pursued their early interest in land-launched tactical and coastal defense missiles.
- They have a continuing interest in air-launched strategic systems, both air-launched and sea-launched antiship systems, and air-launched home-on radar missiles.

(U) ~~(S)~~ In the same way, a chronological study indicates these characteristics of the missiles:

- The Soviets have emphasized systems in which the launch platform accomplishes target acquisition. However, they have a continuing interest in antiship systems using intermediate platforms for target acquisition.
- They have emphasized precision guidance and use of high-explosive warheads for ship targets and more recently for antiradar missiles but have shown no indication of the use of precision guidance with nuclear-armed strategic missiles.

✓ (~~S~~—Continued)

- Each airborne launch platform carries 1 or 2 missiles; sea platforms carry 4 to 16. Size of the missiles severely limits the number per platform.
- Analysts see no evidence of internally carried cruise missiles on aircraft.
- Survivability considerations seem to have a strong influence on selected performance. Air-launched systems and long-range antiship systems emphasize high speed and high altitude; short-range sea-launched systems use low altitudes.
- Autonomous target acquisition capability restricts the range of all air-launched and most sea-launched antiship systems.
- Target acquisition systems use I-band frequencies primarily; terminal-homing radar systems use both I-band and J-band.

(U) ~~(S)~~ Study of current and projected Soviet technology reveals the following:

- Propulsion technology has had a strong influence on the size of Soviet missiles. Older systems were large because of turbojet technology; newer systems are nearly all rocket powered and consequently heavy. The range of air-launched strategic missiles is currently limited by the large size of rocket-powered systems.
- The airframe technology base is adequate for development of systems capable of Mach 4 at high altitude. Speeds higher than

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Mach 4 will require additional research and development.

- At this time, limited target acquisition capability restricts the operational ranges of turbojet-powered antiship missiles. Improved means of target acquisition, such as the use of space platforms, would result in greater range.
- The greatest potential for improved guidance in antiship systems is the combination of more than one seeker type in the same missile, and the Soviets have already deployed one missile with both infrared and active radar guidance.
- Except for the use of home-on radar, the Soviets have shown no evidence of the application of precision guidance against land targets. The intelligence community does not expect application of such concepts as radiometry and TERCOM in the near term.
- Present Soviet emphasis on rocket propulsion is motivated by simplicity, reliability, adaptability, and predictability of design. The Soviets apparently recognize the benefits of ramjet propulsion, but the future application to long-range cruise missiles has not been established.
- The Soviet preference for use of large warheads (about 1,100 to 2,200 pounds) appears to rule out missiles using small turbofans such as are used on the United States' ALCM.

(U) (S) The major strengths of the Soviet cruise missile program are the consistency of development, variety of

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(U—Continued) missions, use of both inertially guided nuclear and precision-guided high-explosive systems, some use of the remotely piloted vehicle concept, and a willingness to adapt to the limitations of technology.

(U) ~~(S)~~ Weaknesses of the program are the large size and resulting low number of missiles per platform, aircraft performance degradations that result from external carriage, and the short range and poor CEP of inertially guided strategic systems.

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CONTENTS (U)

		Page
I.	INTRODUCTION	1
II.	CURRENT SYSTEMS AND TRENDS	3
III.	TECHNOLOGY—CURRENT AND PROJECTED	23
	A. Airframe	23
	B. Target Acquisition	23
	C. Guidance	24
	D. Propulsion	24
IV.	STRENGTHS AND WEAKNESSES	29
	A. Strengths	29
	B. Weaknesses	29
	BIBLIOGRAPHY	31
	PRIMARY DISTRIBUTION LIST	33

FIGURES (U)

Figure		Page
1	Types of Soviet Cruise Missiles and First Year Operational	7
2	Soviet Cruise Missiles—Means of Target Acquisition and First Year Operational	8
3	Soviet Cruise Missiles—Type of Guidance and First Year Operational	10
4	Soviet Cruise Missiles—Number Per Launch Platform and First Year Operational	11
5	Soviet Cruise Missiles—Average Cruise Speed and First Year Operational	13
6	Soviet Cruise Missiles—Maximum Cruise Altitude and First Year Operational	14
7	Soviet Cruise Missiles—Terminal Speed and First Year Operational	15

CONTENTS (U)—Continued

FIGURES (U)—Continued

Figure		Page
8	Soviet Cruise Missiles—Type of Propulsion and First Year Operational	15
9	Soviet Cruise Missiles—Weight of Engine/Motor and Fuel and First Year Operational	16
10	Soviet Cruise Missiles—Weight Without Propulsion or Fuel and First Year Operational	17
11	Soviet Cruise Missiles—Operational Range and First Year Operational	18
12	Soviet Cruise Missiles—Launch Weight and First Year Operational	20
13	Soviet Cruise Missiles—Radar Frequencies and First Year Operational	21

TABLES (U)

Table		Page
1	Soviet Cruise Missiles	4
2	Requirements, Design Variables, and Acceptable Design Characteristics of Soviet Cruise Missiles	6

I. INTRODUCTION (U)

(U) A significant amount of detailed information on Soviet cruise missiles is available. However, analysts tend to report on the systems in three separate categories: land-launched, air-launched, and naval systems. This separate treatment tends to avoid or obscure the significance of the total cruise missile program.

(U) This overview takes a chronological look at the roles, characteristics, performance, and applied technology evident in Soviet cruise missiles, thus providing some insight into the orientation of the program. It examines detailed characteristics to reveal those requirements that were of most importance during design tradeoffs. Having established both the orientation and the requirements, the study looks at the nature of the systems placed in service to identify the constraints of technology.

(U) We extracted available information from existing publications. Since fighter- and helicopter-launched tactical systems are of limited range, this study does not include them. When publications reflected uncertainty, we made a positive single-value choice on the basis of the views and rationale presented in a particular document. In order to avoid bias in the interpretation, we did not attempt to fill in gaps with author-generated information. Since this is an overview, conclusions and assertions are not necessarily fully substantiated or developed. A significant amount of additional analytical effort could be expended, but we believe that the major findings would not change substantially.

II. CURRENT SYSTEMS AND TRENDS (U)

(U) ~~(S)~~ Current Soviet cruise missiles include land-launche and air-launched missiles and surface- and underwater-launched naval systems. Table 1 lists these by type. In some cases, separate and distinct variants of one missile exist and represent more than one application. For example, the AS-5 exists in an autopilot-guided strategic version, an active-radar antiship version, and a home-on-radar version. In addition, the variant of the AS-4 carried by the BACKFIRE bomber is a separate entry because publications indicate tha it probably is modified or improved specifically for this application.

(U) The operational requirements and applied technology evident in these missiles vary widely. However, the data base covers about 20 years, and certain features of the tota program can be isolated by examining graphically both genera and specific characteristics of the missiles and the years they became operational. The figures in this section show information pertinent to this overview.

(U) We can more readily assess the information availabl in Table 1 and in the following figures if we view it in three categories: (1) the information related to identifyin the general operational requirements, (2) the specific performance characteristics and component technologies that wer considered and selected during design studies, and (3) the total characteristics and performance that resulted. Table shows the items constituting the three categories.

(U) ~~(S)~~ Figure 1 identifies Soviet missiles by type and the year they first became operational. Systems with more than one mission—such as the AS-5 with strategic, antiship, and home-on-radar variants—appear as more than one entry.

TABLE 1
SOVIET CRUISE MISSILES (U)

(Table ~~SECRET~~) UNCLASSIFIED

Designator	IOC	Role	Range (NM)	Guidance
Land-Launched				
SSC-2a	1957	Army tactical	45	Preprogrammed autopilot, beam rider
SSC-2b	1956	Coastal defense	50	Preprogrammed autopilot, beam rider, semiactive radar
SSC-1a	1962	Army tactical	280	Inertial
SSC-1b	1963	Coastal defense	150	Command or inertial, active radar
Air-Launched				
AS-1	1956	Antiship	55	Preprogrammed autopilot, beam rider, semiactive radar
AS-2	1961	Antiship	100	Preprogrammed autopilot, command correction, active radar
AS-3	1960	Strategic	350	Preprogrammed autopilot, command correction
AS-4	1967	Strategic	250	Inertial
		Antiship	150	Active radar
		Antiradar	150	Passive home-on-radar
AS-5	1965	Strategic	125	Preprogrammed autopilot
		Antiship	80	Active radar
		Antiradar	80	Passive home-on-radar
AS-6	1969	Strategic	300	Preprogrammed autopilot
		Antiship	150	Active radar
		Antiradar	150	Passive home-on-radar
AS-4 (BACKFIRE)	1975	Strategic	300	Inertial
		Antiship	150	Active radar
		Antiradar	150	Passive home-on-radar

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TABLE 1 – Continued
SOVIET CRUISE MISSILES (U)

(Table SECRET)

Designator	IOC	Role	Range (NM)	Guidance
Sea-Launched				
SS-N-1	1958	Antiship	30	Preprogrammed autopilot, active radar
SS-N-2	1959	Antiship	25	Preprogrammed autopilot, active radar
SS-N-3	1960	Antiship	250	Inertial
	1962	Antiship	150-220	Preprogrammed autopilot, active radar
SS-N-7	1968	Antiship (underwater-launched)	30	Preprogrammed autopilot, active radar
SS-N-9	1968	Antiship	60	Preprogrammed autopilot, active radar, infrared
SS-N-11	1969	Antiship	25	Preprogrammed autopilot, active radar, infrared
SS-N-12	1976	Antiship	320	Preprogrammed autopilot, active radar
SS-N-14	1974	Antisubmarine	30	Command, homing torpedo payload
SS-N-16	1976	Antisubmarine (underwater-launched)	30	Inertial, homing torpedo payload

TABLE 2
REQUIREMENTS, DESIGN VARIABLES, AND ACCEPTABLE DESIGN CHARACTERISTICS OF SOVIET CRUISE MISSILES (U)

(Table UNCLASSIFIED)

Operational Requirements	Design Variables	Acceptable Design
Size, weight, and configuration constraints	Configuration	Number per platform
Launch-platform target-acquisition dependency (autonomous or dependent)	Cruise altitude	Operational range
Number per platform (initial goal)	Cruise speed	Size
Operational range (initial goal)	Guidance type (CEP)	Weight
Reliability	Launch altitude	
Resistance to countermeasures	Propulsion type	
Survivability	Target-acquisition means	
Warhead type (nuclear or high-explosive)	Terminal speed	
	Warhead size	

(U) ~~(S)~~ Figure 1 shows the following:

- They have shown a recent interest in antisubmarine cruise missiles with homing torpedo payloads
- The Soviets show a continuing interest in air-launched home-on-radar missiles
- They have developed one underwater-launched antiship system and one underwater-launched antisubmarine missile
- They have a strong and continuing interest in both air-launched and sea-launched antiship systems

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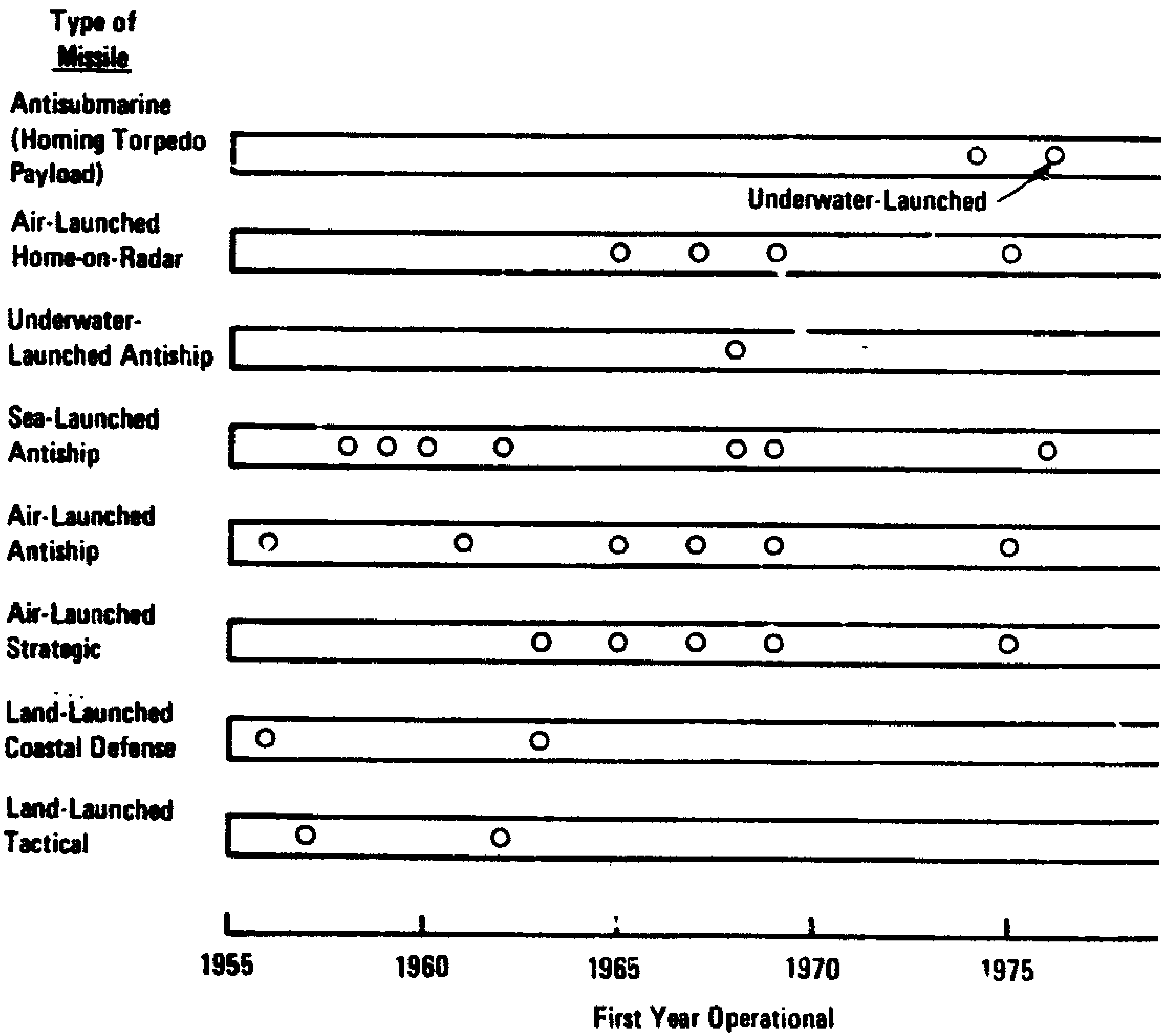
FIGURE 1
TYPES OF SOVIET CRUISE MISSILES AND FIRST YEAR OPERATIONAL (U)

(Figure [redacted])



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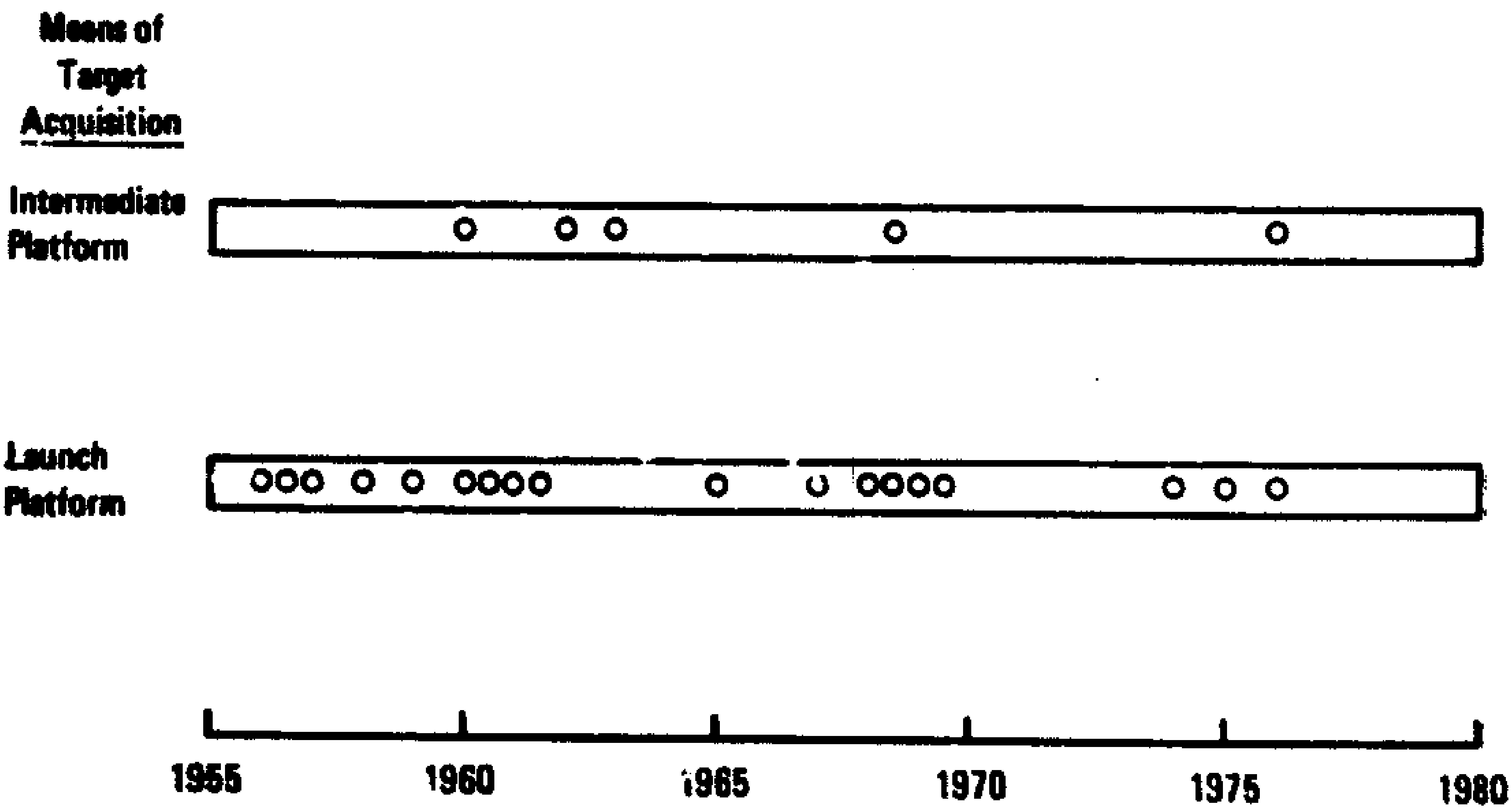
- Their interest in air-launched strategic systems continues
- The Soviets have not pursued their early interest in land-launched and coastal defense tactical systems.

(U) ~~(S)~~ Figure 2 shows Soviet means of target acquisition, whether accomplished by the launch platform or by an intermediate means (such as a non-missile-carrying aircraft).

FIGURE 2
SOVIET CRUISE MISSILES—MEANS OF TARGET ACQUISITION AND FIRST YEAR OPERATIONAL (U)

(Figure ~~SECRET~~)



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(U—Continued) If a missile can be launched either way, it appears as two entries. The figure reveals that the Soviets have emphasized systems in which the launch platform accomplishes target acquisition; however, some interest in the use of intermediate platforms for acquisition of ship targets continues.

(U) ~~(S)~~ Figure 3 presents the primary guidance type for each Soviet missile; the plotted points indicate the type of guidance used during the terminal portion of flight. For example, all of the missiles shown have some type of autopilot, but those using active-radar terminal homing appear on the active-radar line, not the autopilot line. If one basic missile exists with more than one type of terminal guidance, either separate or in a hybrid form, it appears on more than one guidance line. For example, the AS-5 has inertial, active-radar, and home-on-radar variants and appears as three entries. The figure indicates the emphasis that the Soviets have placed on precision guidance systems using high-explosive warheads. Although the application has been continuous, there are a relatively small number of inertially guided systems with nuclear warheads. They early abandoned the less attractive beam-rider and semiactive-radar guidance schemes.

(U) ~~(S)~~ Figure 4 shows the number of missiles per launch platform, including any reloads for naval vessels. If more than one type of platform carries different numbers of one type of missile, the figure shows the lowest and highest number carried, connected by a straight line. (The figure does not depict land-launched systems.) This figure shows that the number of missiles per launch platform has remained at one or two for aircraft. Again, this probably does not reflect a desired number but rather an acceptable one after

FIGURE 3
SOVIET CRUISE MISSILES—TYPE OF GUIDANCE AND FIRST YEAR OPERATIONAL (U)

(Figure ~~SECRET~~)

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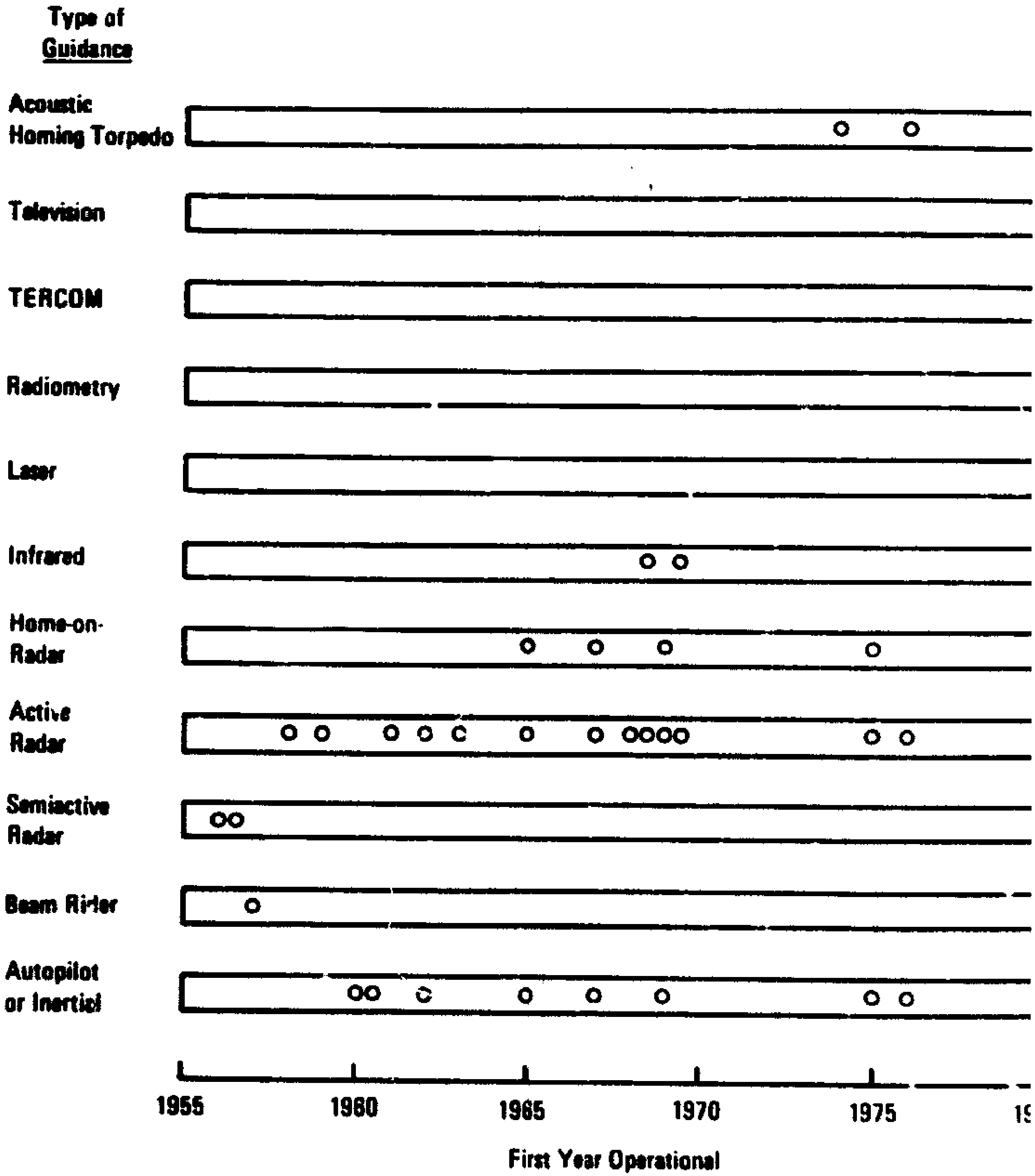

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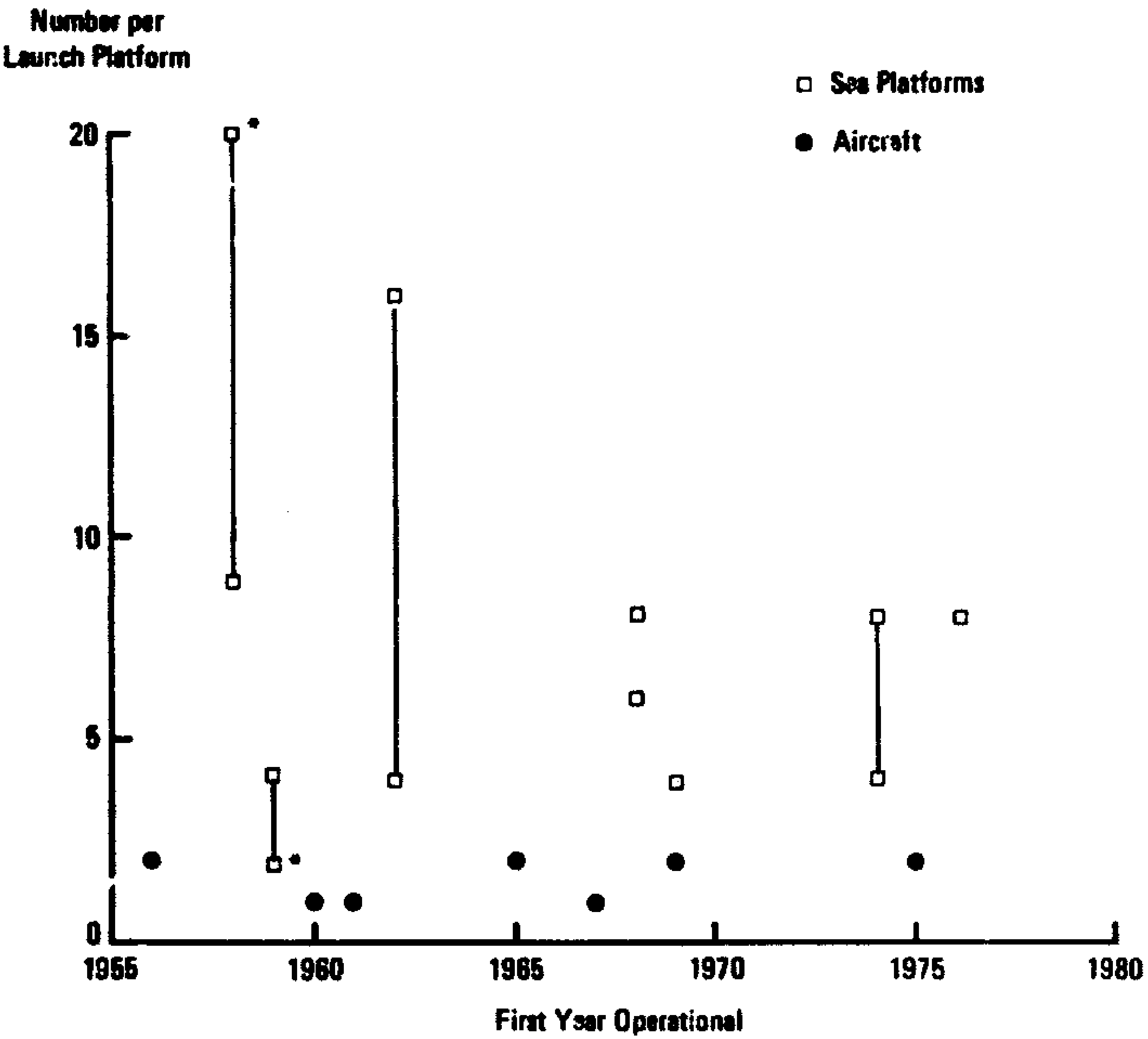
FIGURE 4
SOVIET CRUISE MISSILES—NUMBER PER LAUNCH PLATFORM AND FIRST YEAR OPERATIONAL (U)

(Figure SECRET)



*The SS-N-1 missile is obsolete, and the KOMAR patrol boat (which was armed with two SS-N-2 missile) is obsolescent.

(U) ~~(S~~—Continued) other constraints were applied. Excluding the obsolete SS-N-1 and the obsolescent KOMAR patrol boat, the number of missiles per sea platform varies from 4 to 16.

(U) ~~(S)~~ Survivability considerations appear to have influenced significantly the design of Soviet cruise missiles. Figures 5, 6, and 7 show the primary influencing factors: cruise speed, cruise altitude, and terminal speed. (The values shown represent either design requirements or technological constraints.) The current emphasis is on high cruise speed (Mach 3) and high altitude (about 70,000 feet) for air-launched antiship and land-target missiles. Rocket-powered sea-launched antiship missiles remain slightly subsonic, but current systems use lower cruise altitudes than earlier models. Turbojet-powered longer range antiship missiles have developed to the extent that the SS N-12 uses a cruise speed of about Mach 2.5 and a maximum altitude of almost 50,000 feet. Terminal speed varies from about Mach 0.9 to about Mach 1.5, the sea-launched low-altitude systems using the slower speeds.

(U) ~~(S)~~ Figure 8 shows the type of propulsion, and Figure 9 shows the weight of the powerplant and fuel used in the basic missile. (These figures do not include any externally attached auxiliary rocket boost.) The type of propulsion system has influenced the size of Soviet missiles more than any other factor, and there has been a nearly total transition from turbojet to rocket propulsion (the SS-N-12, a follow-on to the SS-N-3, is the exception). As shown in Figure 9, the weights of rocket motors and fuel (including oxidizer) are greater than the weights of engines and fuel for turbojet-powered systems, except for the 1960 vintage AS-3. The AS-3 displays what can best be referred to as brute-force application of technology: combining a heavy (5,000 pound)

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FIGURE 5
SOVIET CRUISE MISSILES—AVERAGE CRUISE SPEED AND FIRST YEAR OPERATIONAL (U)

(Figure [redacted])

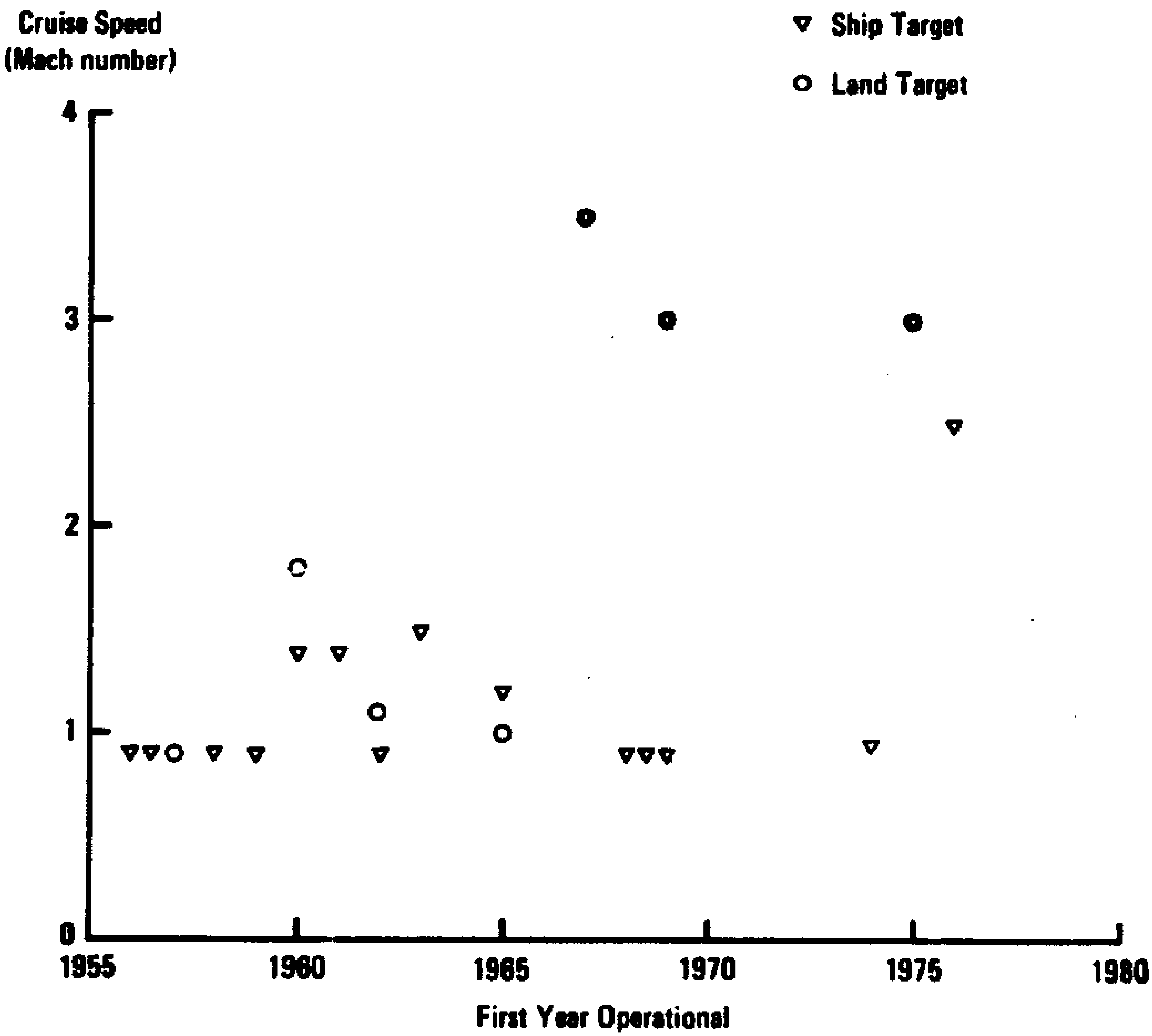

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FIGURE 6
SOVIET CRUISE MISSILES–MAXIMUM CRUISE ALTITUDE AND FIRST YEAR OPERATIONAL (U)

(Figure ~~SECRET~~)

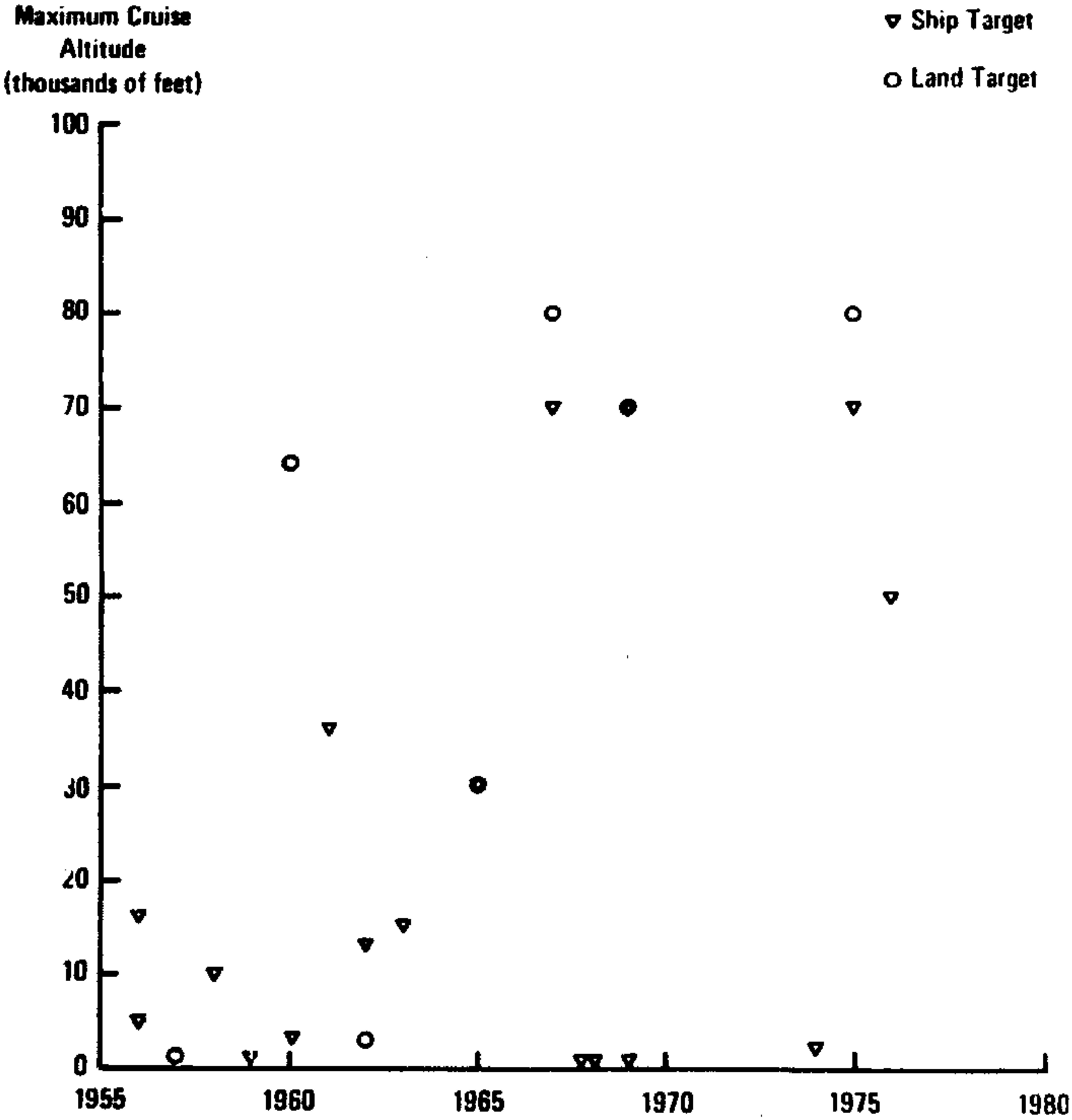

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FIGURE 7
SOVIET CRUISE MISSILES--TERMINAL SPEED AND FIRST YEAR OPERATIONAL (U)

(Figure SECRET)

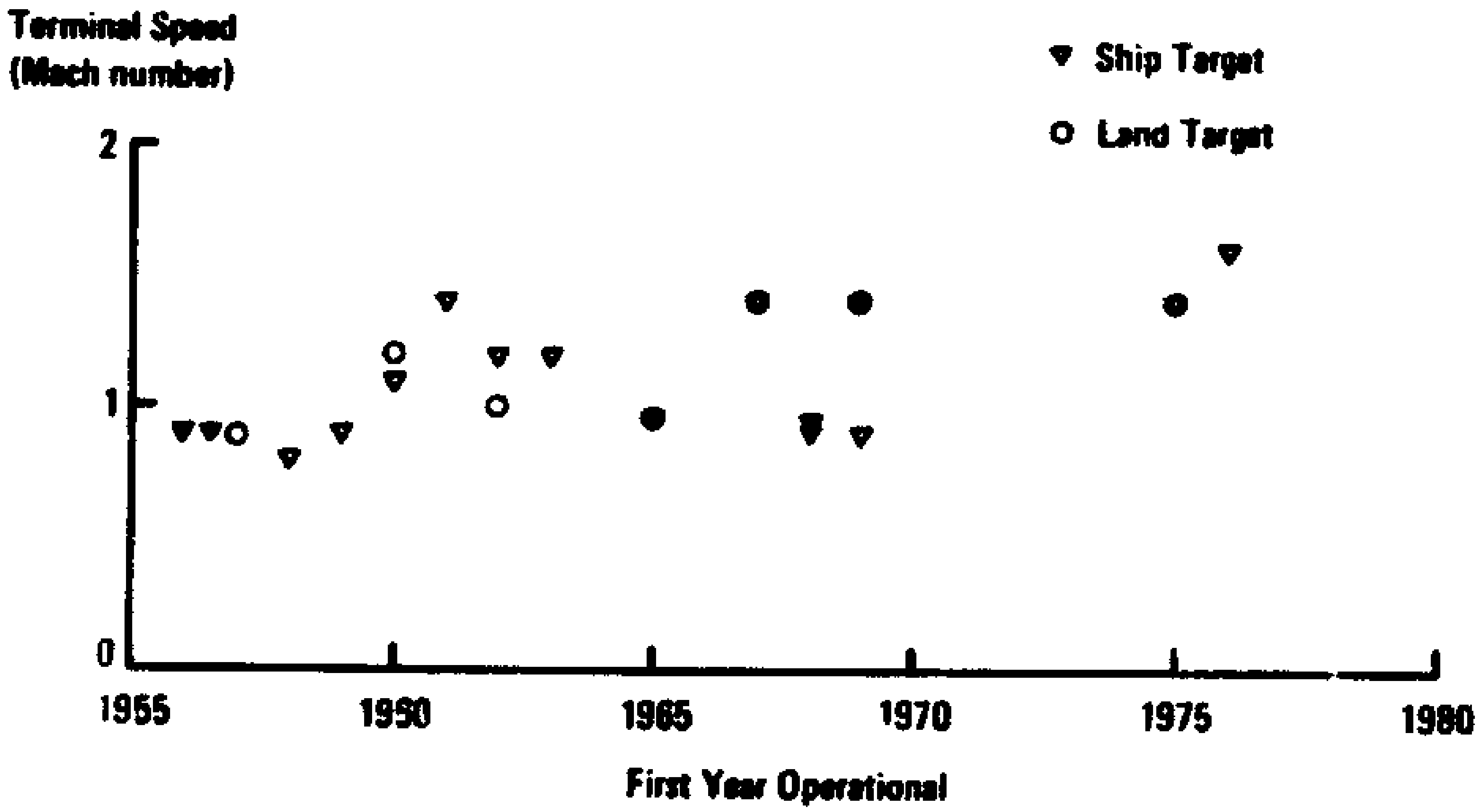

FIGURE 8
SOVIET CRUISE MISSILES--TYPE OF PROPULSION AND FIRST YEAR OPERATIONAL (U)

(Fig[redacted]T)

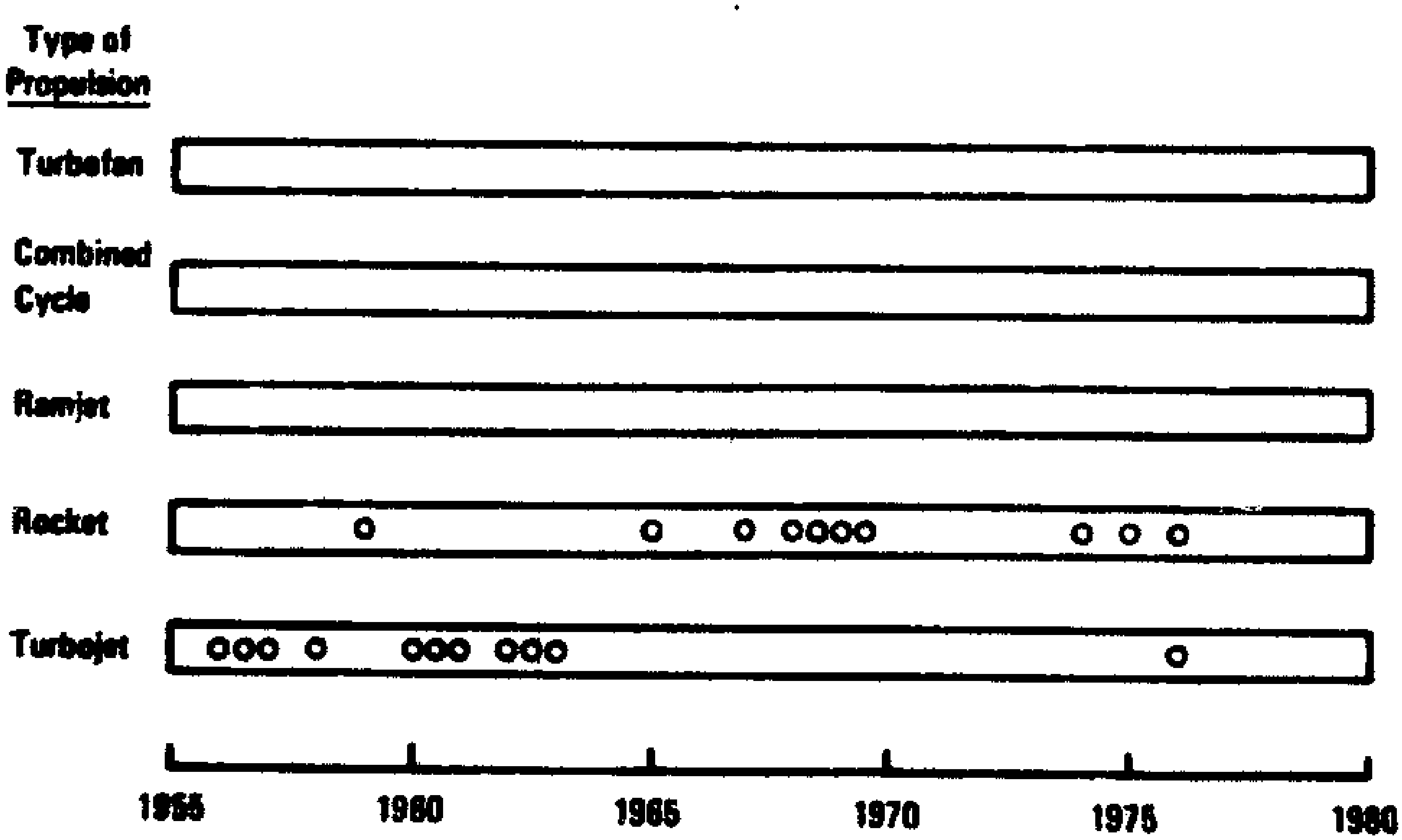

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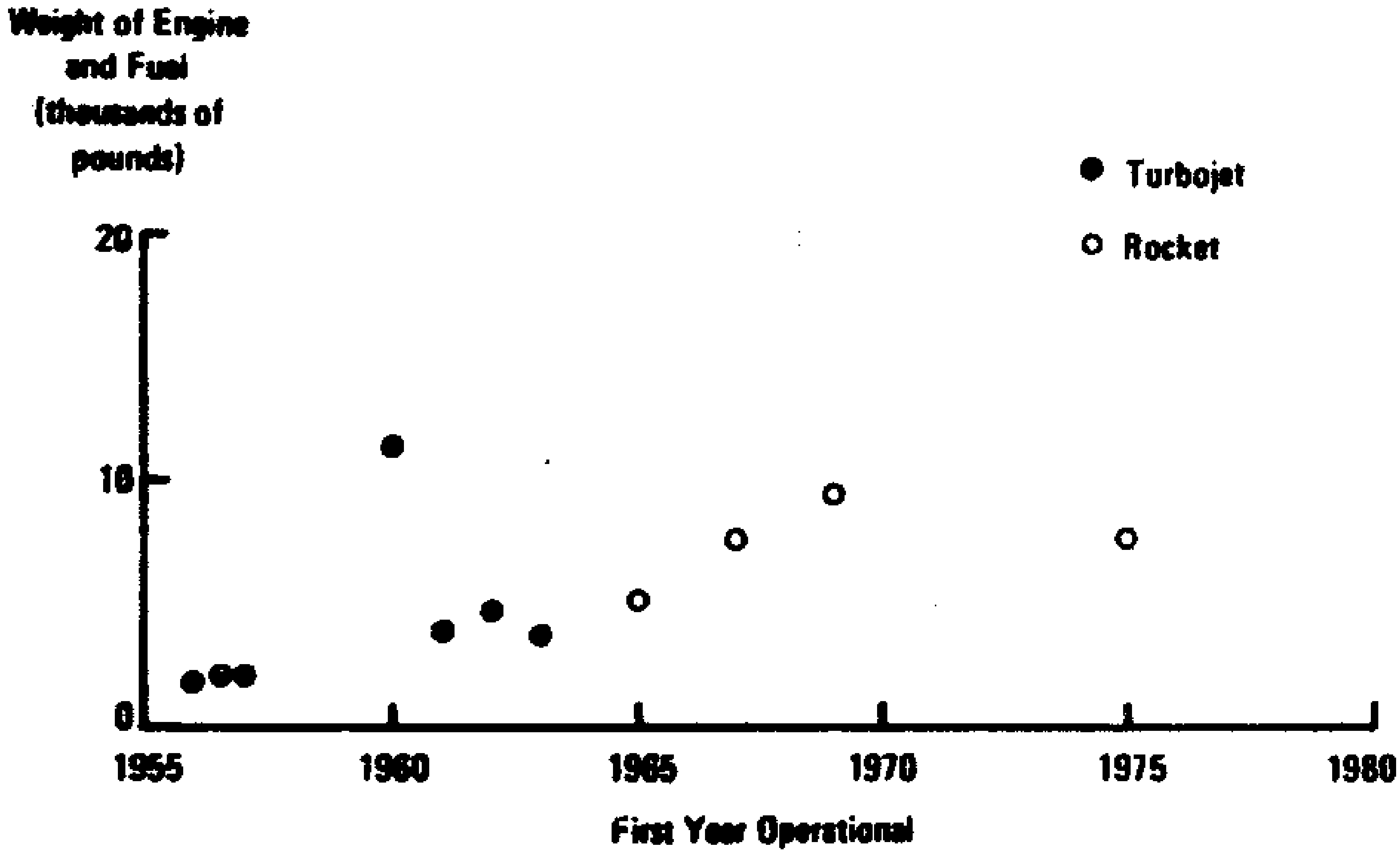
FIGURE 9

SOVIET CRUISE MISSILES-WEIGHT OF ENGINE/MOTOR AND FUEL AND FIRST YEAR OPERATIONAL (U)

(Figure [redacted])



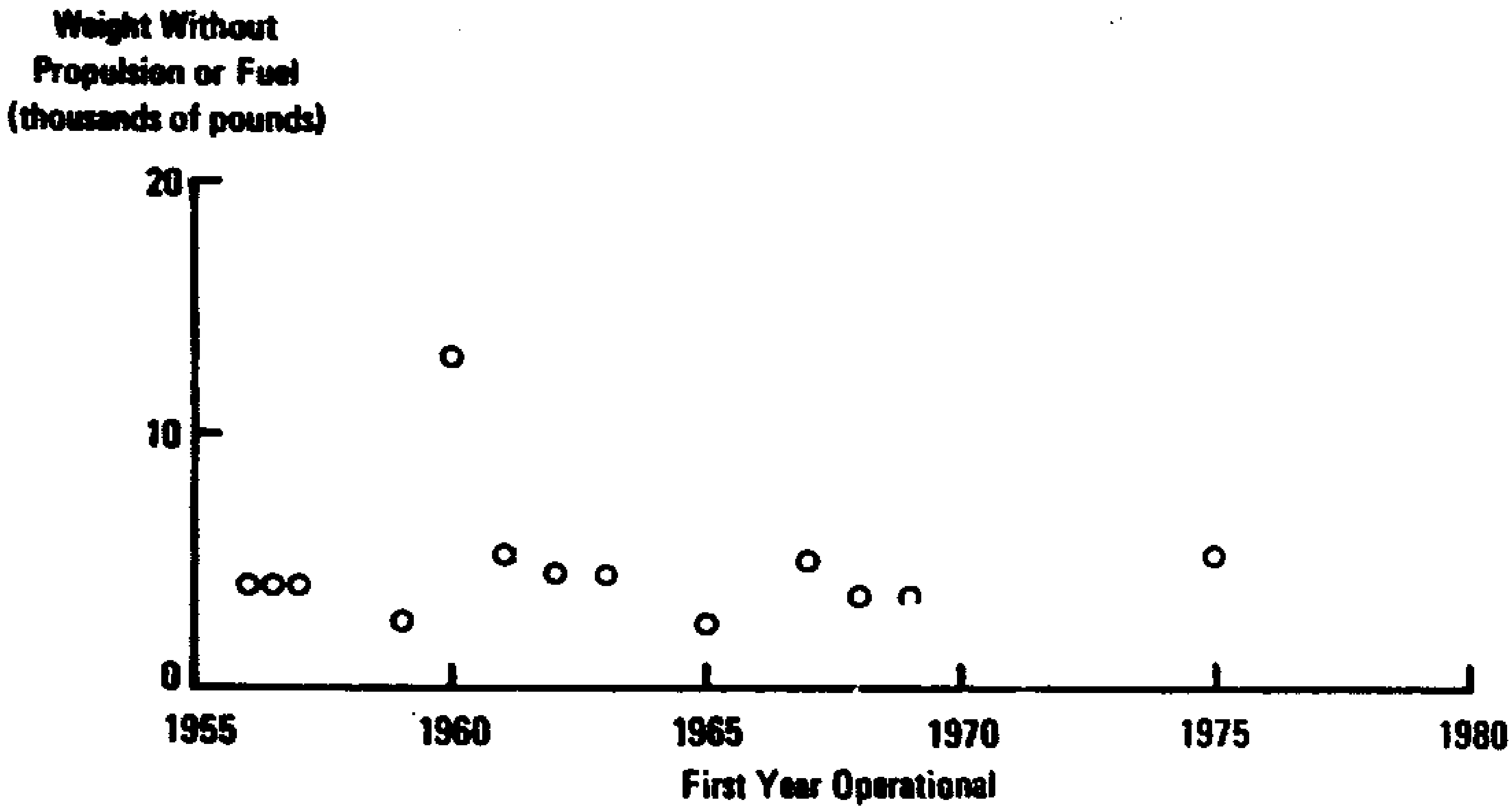
(U) (S-Continued) warhead, autopilot guidance, late 1950s afterburning turbojet technology, a cruise speed of Mach 1.8, and a maximum altitude of about 60,000 feet. Only one of these missiles (weighing 24,000 pounds) can be carried by the BEAR bomber (weighing nearly 400,000 pounds).

(U) (S) Figure 10, showing system weights without boosters, engines, or fuel, basically represents the airframe, guidance, and warhead weight. System weights without propulsion and fuel have remained relatively constant with time. This indicates that propulsion weights account for the large sizes and weights of the missiles.

FIGURE 10 UNCLASSIFIED

SOVIET CRUISE MISSILES—WEIGHT WITHOUT PROPULSION OR FUEL AND FIRST YEAR OPERATIONAL (U)

(Figure ~~SECRET~~)



(U) ~~(S)~~ Figure 11 is a chronological plot of the ranges that result after all the variables and constraints have been accommodated. The ranges shown represent the best available assessment of likely operational range considering such factors as target-acquisition capability and design speeds and altitudes. These are probably not Soviet desired operational ranges but rather compromised or acceptable capabilities for operational deployment. Some of the missiles shown are capable of greater ranges if alternate means of target acquisition are developed or if operational speeds and altitudes are changed.

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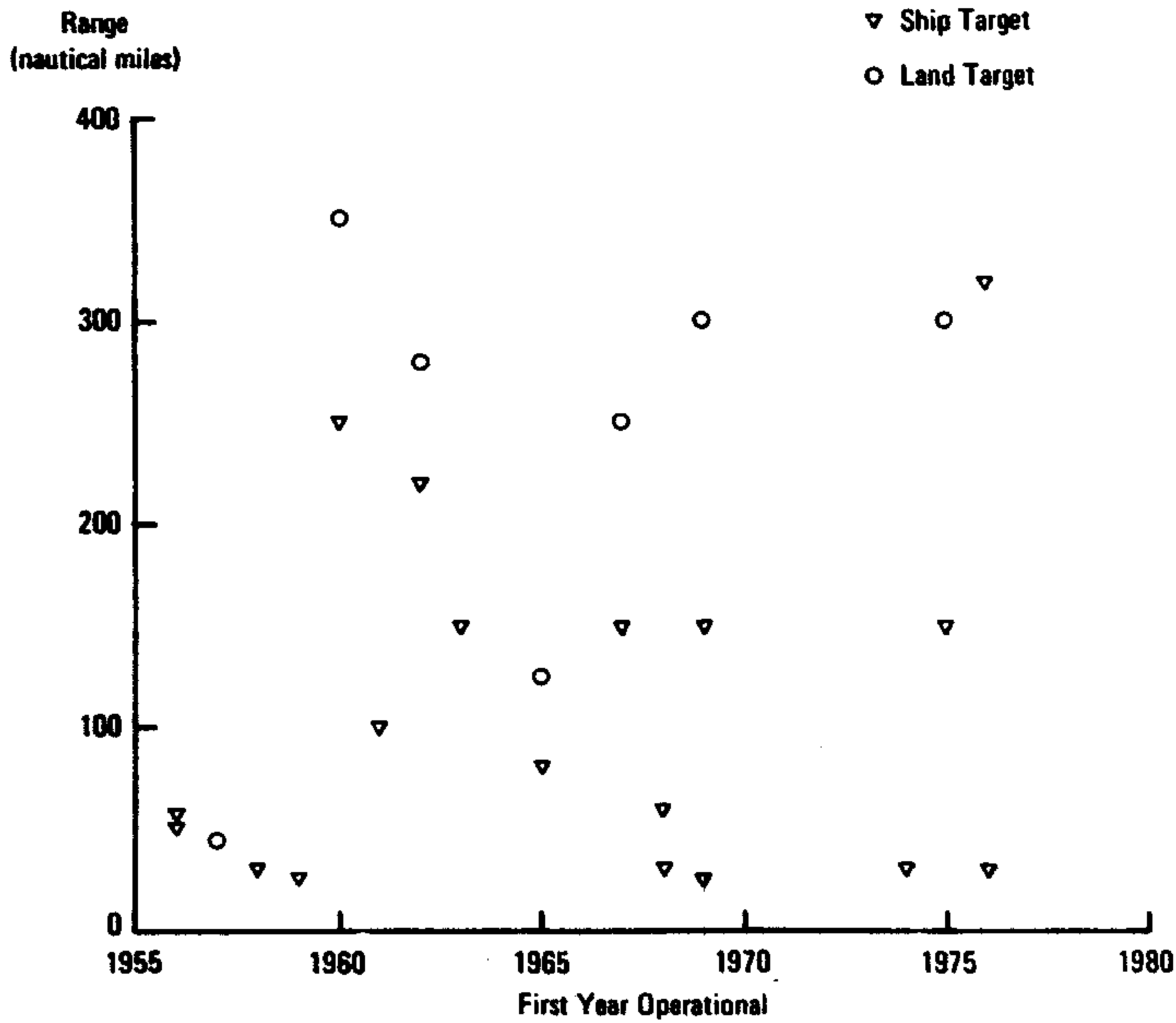
FIGURE 11
SOVIET CRUISE MISSILES—OPERATIONAL RANGE AND FIRST YEAR OPERATIONAL (U)

(Figure [redacted])



(U) (S) For example, autonomous target acquisition capability limits the range of air-launched antiship systems. With maximum radar detection ranges on the order of 200 nautical miles, operational ranges of about 150 nautical miles result. The radar horizon restricts ranges for sea-launched systems using autonomous target acquisition to 25 to 30 nautical miles, and the restriction will probably remain.

(U) (S) The range of the air-launched strategic systems is constrained to 250 to 350 nautical miles by the vehicle size that results from inclusion of supersonic cruise speed at high altitude. The range could be much greater for the same size vehicle if the cruise speed were subsonic.

(U) (S) Soviet sea-launched turbojet missiles, such as the SS-N-3 and SS-N-12, use intermediate target acquisition platforms, such as the BEAR D and HORMONE B. The current missile ranges are apparently the result of operating within reasonably high reliability limits of target acquisition and data links. The potential for missile range increases is high, especially if space-based acquisition systems should become available.

(U) (S) Figure 12 shows total missile launch weights, including the weight of any auxiliary rocket booster. The missile launch weights appear to group well between 5,000 and 14,000 pounds, except for the AS-3, which was previously shown to be atypical. Most of the sea-launched systems have weights of less than 10,000 pounds; however, the SS-N-12, first operational in 1976, weighs about 13,000 pounds.

(U) (S) Figure 13 shows the electronic frequencies used for both target acquisition and terminal homing. There has been some interest in J-band for target acquisition, but I-band frequencies are the most frequently used. Terminal homing

(S—Continued) shows a strong application of J-band and a continuing use of I-band frequencies.

FIGURE 12
SOVIET CRUISE MISSILES—LAUNCH WEIGHT AND FIRST YEAR OPERATIONAL (U)

(Figure SECRET)

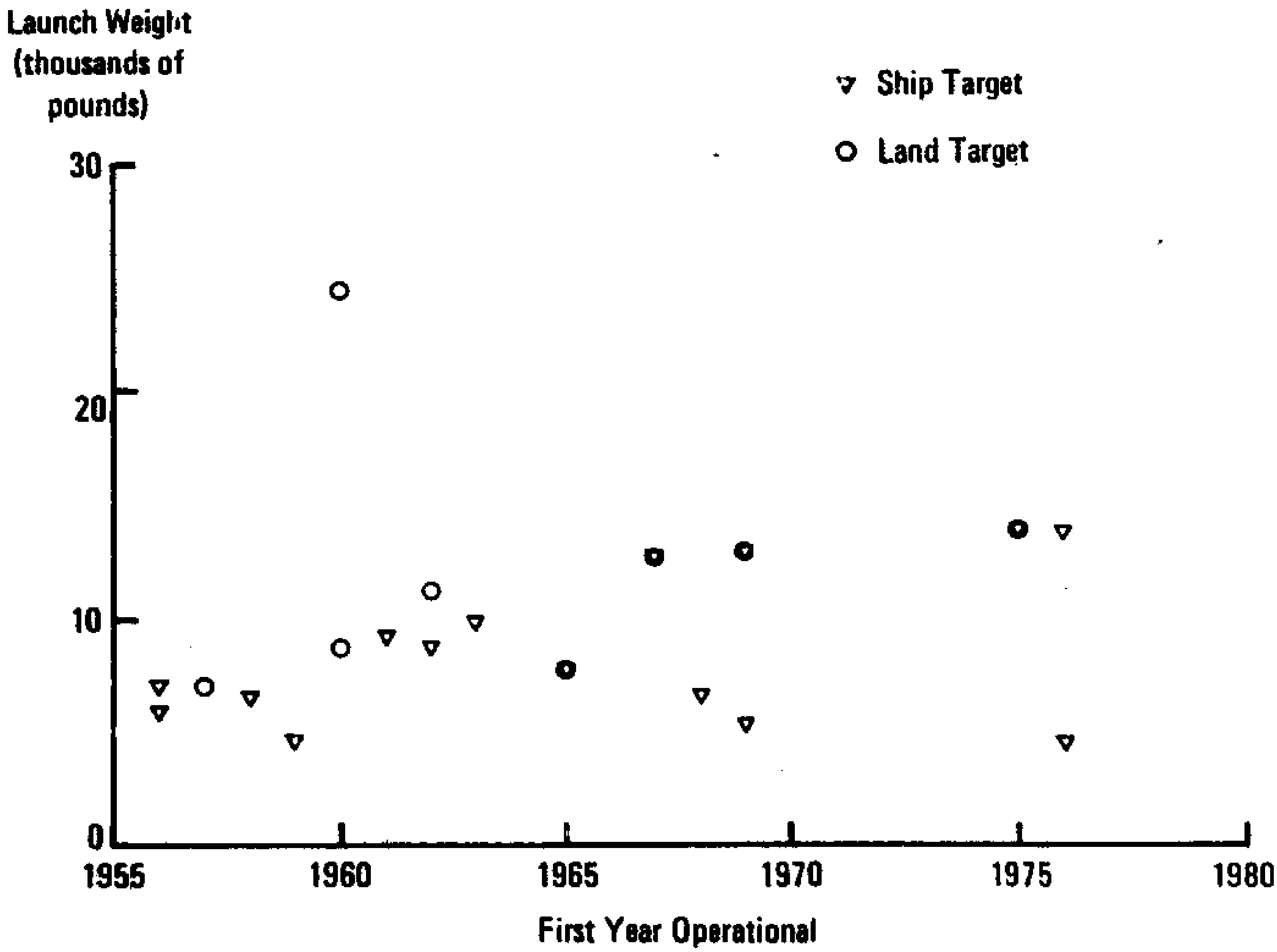


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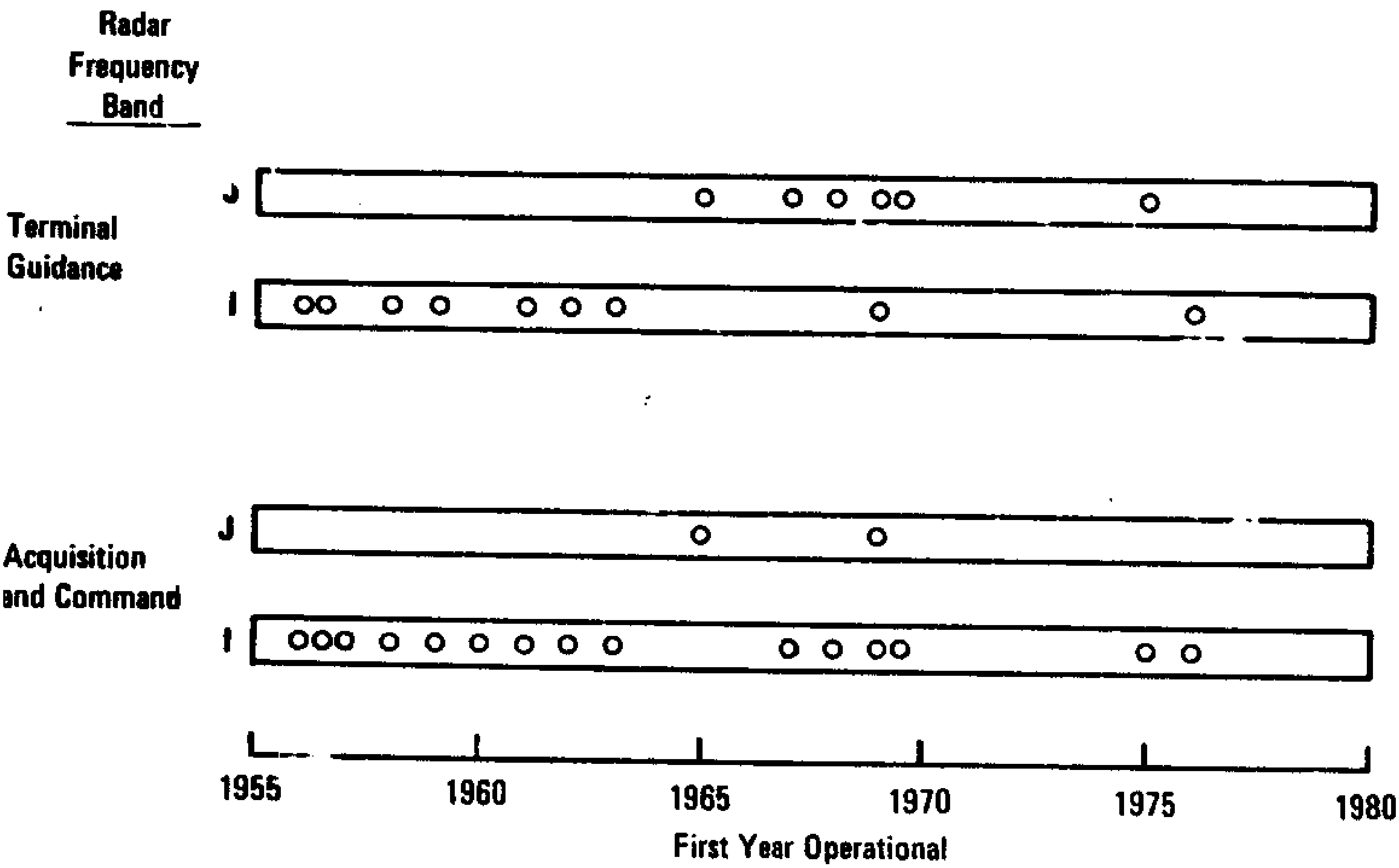
FIGURE 13
SOVIET CRUISE MISSILES—RADAR FREQUENCIES AND FIRST YEAR OPERATIONAL (U)

(Figure ~~SECRET~~)



III. TECHNOLOGY—CURRENT AND PROJECTED (U)

A. (U) Airframe

(U) ~~(S)~~ Soviet missile airframe technology, although not known in great detail, appears adequate for reliable operation at speeds of Mach 3 to Mach 4 and altitudes of about 80,000 feet. The technological base evident in such applications as the supersonic-cruise FOXBAT interceptor and reconnaissance aircraft and in large air-to-air missiles like the AA-6 indicates that the Soviet near-term development of additional cruise missiles will probably not be constrained by the inability to develop suitable structures. Sustained missile operations at speeds higher than Mach 4 at high altitude, however, will require additional materials and structural developments. Intelligence analysts see no evidence of sustained low-altitude speeds greater than Mach 1.5 and believe that additional development of technology will be necessary for missiles operating in this flight regime.

B. (U) Target Acquisition

(U) ~~(S)~~ Current target-acquisition systems include launch-point determination for inertially guided strategic systems, autonomous detection of targets by the launch platform for both air- and sea-launched antiship systems, and intermediate platform-assisted acquisition for longer range sea-launched systems. Some antiship systems also use data links that relay target information as seen by missile terminal radars. The launch platform accomplishes target acquisition for air-launched home-on-radar missiles.

(U) ~~(S)~~ The greatest apparent potential in Soviet target acquisition is the use of space systems to provide target information for longer range antiship missiles. The missiles

(U ~~S~~—Continued) are inherently capable of greater ranges, with the proper selection of flight profile, and the Soviets could exploit that potential more fully by development of highly reliable data links from active-radar reconnaissance satellites.

C. (U) Guidance

(U) ~~(S)~~ Soviet application of precision guidance in high-explosive-warhead antiship missiles is well established. The greatest near-term potential for these systems appears to be in the area of improving resistance to countermeasures by combining two types of guidance in one missile. Promising groupings appear to be: passive home-on radar and active radar, active radar and infrared, and passive home-on radar and infrared.

(U) ~~(S)~~ Other than use of home-on radar, analysts see no evidence of the application of precision guidance for use against land targets. The Soviets will most likely use laser and television guidance on shorter range tactical systems; use on long-range cruise missiles is not expected. Techniques such as radiometry and TERCOM would be suitable, but Soviet application in the near term (within 10 years) is not probable.

D. (U) Propulsion

(U) ~~(S)~~ The size of Soviet cruise missiles has been influenced most by the propulsion technology they use. Earlier systems used relatively primitive turbojet engines with high specific fuel consumption and low thrust-to-weight ratios. Of the newer missiles, only the SS-N-12 uses a turbojet, apparently a now-technology afterburning type, and performance is significantly improved over that of the older systems.

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(~~S~~ U—Continued) if and when they develop low-altitude, air-launched, subsonic-cruise, nuclear-armed missiles. It is more likely, however, that Soviet air-launched cruise missiles will be carried externally and consequently will not be severely size-constrained.

IV. STRENGTHS AND WEAKNESSES (U)

A. (U) Strengths

(U) ~~(S)~~ Soviet cruise-missile history reveals consistent development and application to a variety of roles. This effort has resulted in a sound technology base and a backlog of operational experience. Some noteworthy strengths of the program are:

- The Soviets have pursued development of both autonomous and assisted target acquisition. Their use of data links from some sea-launched antiship missiles to the launch platforms establishes them on the initial steps in development of remotely piloted vehicles.
- Soviets use precision guidance against ship targets and radars. This permits the use of high-explosive warheads and a cruise missile force-in-being with greater adaptability than an all-nuclear force.
- The Soviets are willing to adapt launch platforms to the missile sizes and weights that technological constraints dictate. Adaptability has been primarily in the number carried for both air and sea platforms and in the use of external carriage on aircraft.

B. (U) Weaknesses

(U) ~~(S)~~ Some of the design compromises that permit a consistent and broad cruise-missile development program result in features that generally would be looked upon as weaknesses. However, each of these should be viewed in the context of what is acceptable to the Soviets.

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(S—Continued) Certain limitations that a U.S. designer or operator would consider unacceptable are likely regarded by the Soviets as a necessary compromise to allow a desired capability. From the non-Soviet point of view, some weaknesses are:

- The large size and resulting low number of missiles per platform
- Aircraft performance degradations that result from external carriage of large missiles
- The short range of air-launched strategic systems
- The apparently poor circular-error-probable (CEP) of inertially guided strategic systems.

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This overview takes a chronological look at the roles, characteristics, performance, and applied technology evident in Soviet cruise missiles, thus providing some insight into the orientation of the program. It examines detailed characteristics to reveal those requirements that were of most importance during design tradeoffs. Having established both the orientation and the requirements, the study looks at the nature of the systems placed in service to identify the constraints of technology.