DRSMI-KGS (13 Dec 78)
SUBJECT: Request for Review of JUPITER Monograph

TO DRSMI-AH

FROM DRSMI-C

DATE 14 Dec 78 CMT 2
Mr. Barclay/mpd/6-1811

1. Subject document has been declassified. Authority for declassification is letter, subject: JUPITER Weapon System, dated 4 June 1964, from Brookley AFB, AL. This letter states essentially that all JUPITER information, except for warhead information marked Restricted Data, is placed in the old Group 4 category.

2. Since the document in question contains no Restricted Data, and the classification on Group 4 documents has expired, this, and all similar documents should be declassified, citing the above mentioned letter as the authority.

(Signed) Terris C. Lewis

TERRIS C. LEWIS
LTC, MPC
Chief, Security Office

1 Incl
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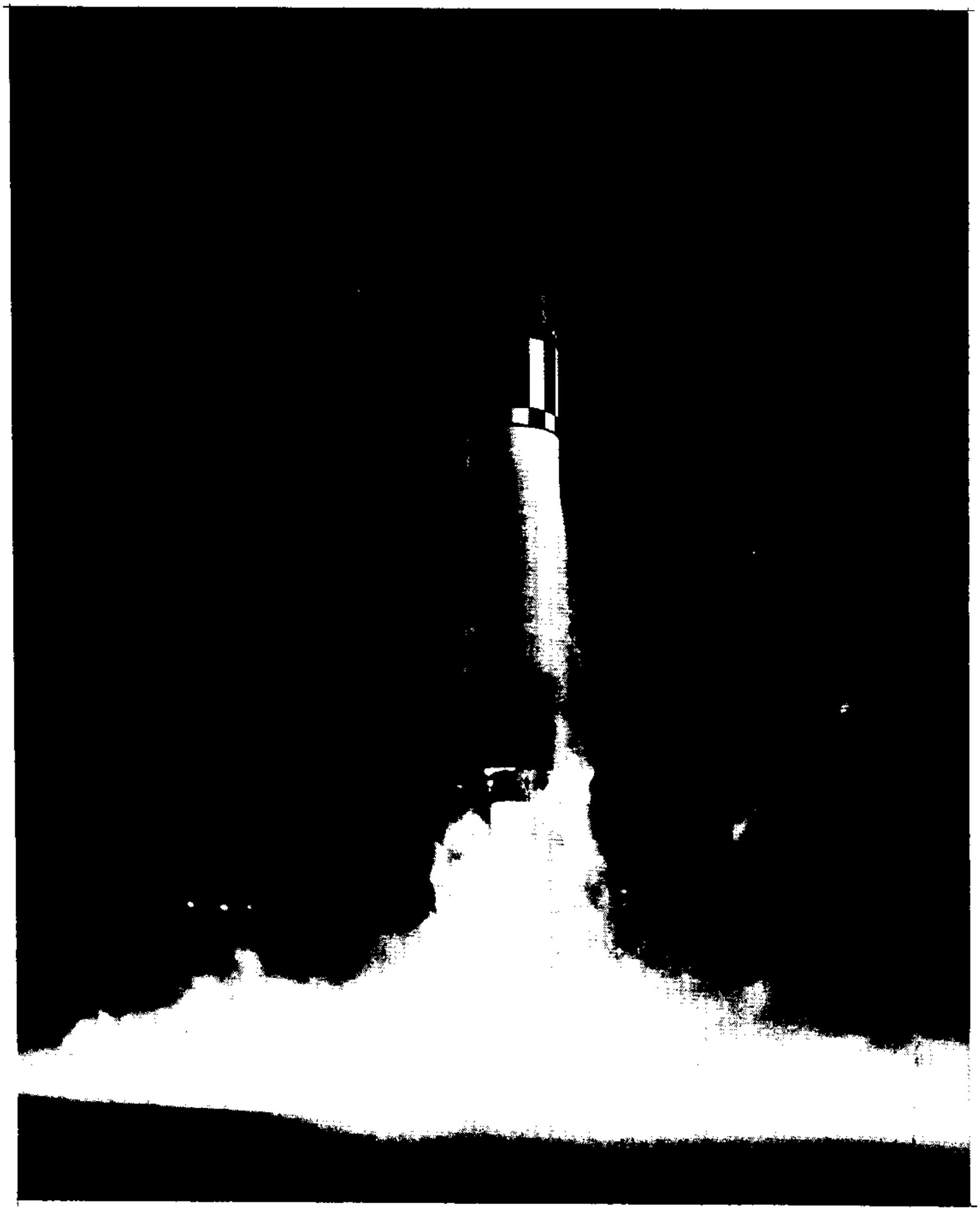
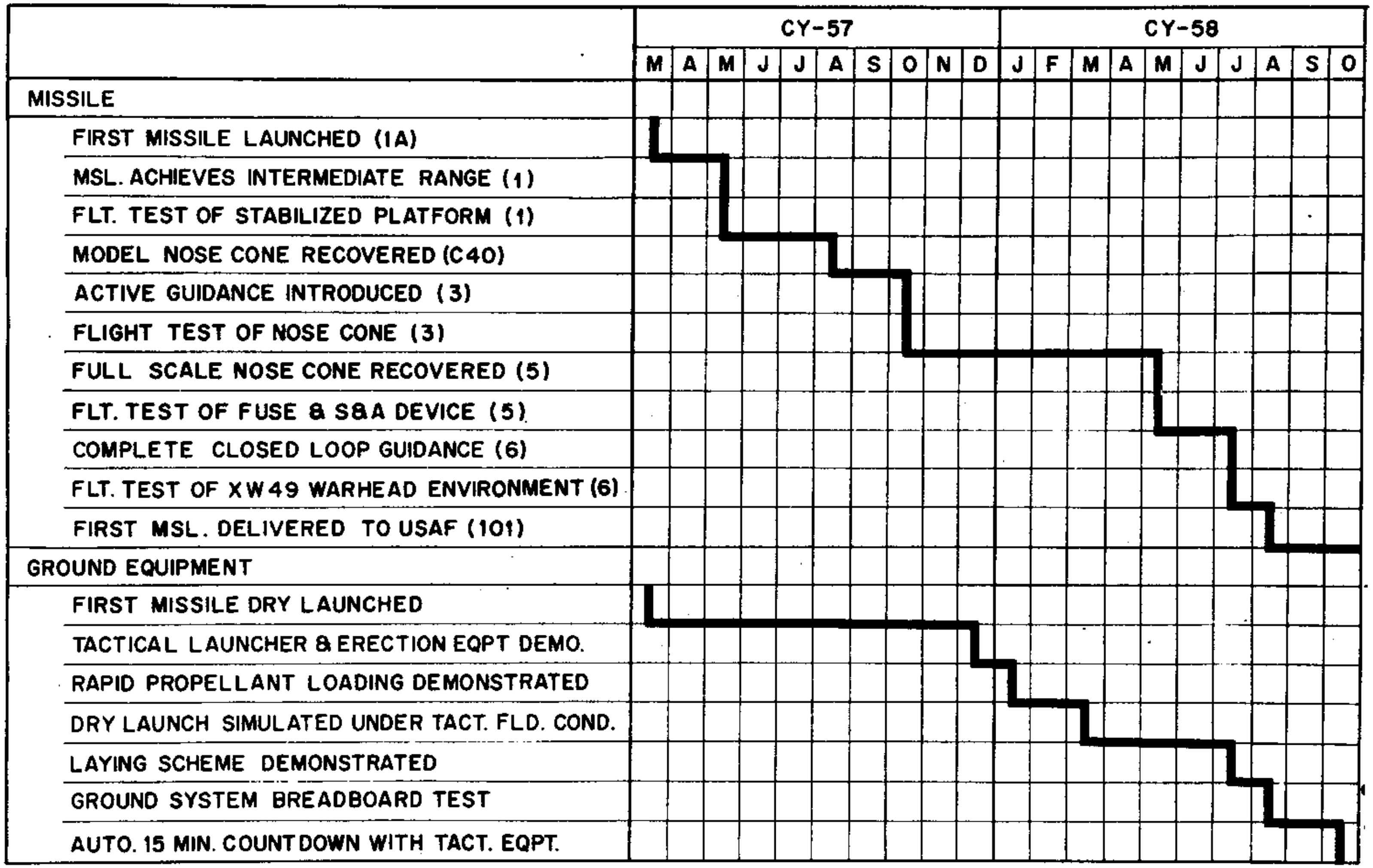
CF:
DRDMI-TB



FIRING OF JUPITER MISSILE 33

4 November 1959

MAJOR JUPITER DEVELOPMENT MILESTONES



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10-20-58

UNCLASSIFIED

HISTORY

OF

THE JUPITER MISSILE SYSTEM

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PREFACE

That this nation passed through extremely trying years in selecting the best approach for the development of the ICBM's and the IRBM's is a generally known fact. During the formative stages of the program, the military services, in a sense, occupied the role of "bidders" seeking developmental responsibilities. Each was sure that it had the best proposal, which fostered a highly competitive spirit. Since both Army and Air Force were eventually assigned IRBM development tasks, controversial issues arose on methods of developing and concepts for deploying the finished weapon. In justifying positions or beliefs, literally thousands of documents were amassed covering every phase of the program. Thus, many parts of the JUPITER program have already been the subject of exhaustive narrative treatment. This monograph was written to provide an overview from concept of the weapon to deployment of the missile.

James M. Grimwood

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[redacted]

I. ([redacted]) EVOLUTION TOWARD JUPITER DEVELOPMENT

(U) In a sense, it is practically impossible to designate a point in time that could be specified as the starting date for JUPITER planning. To have a missile weapon system that could strike targets within the depth of theater operations was a prime goal of battlefield commanders. Based on this criteria, planning for the development of a long-range missile, or at least what would have been considered long-range in the late 'Forties and early 'Fifties, could be said to mark the start. With this in mind, the REDSTONE would be the immediate forerunner of the JUPITER, and logically so, for many JUPITER components were sophistications of REDSTONE components.

([redacted]) At the outset, the REDSTONE program had a range objective of 500 nautical miles. As time drew near to the actual "hardware cutting," however, the Office, Chief of Ordnance (OCO) dictated a payload or warhead weight that reduced the range to less than 200 nautical miles with the power plants then available. This was in late 1950 when development of the REDSTONE was started. Although the Army Field Forces (AFF) were now given promise of a missile weapon system with a thermo-nuclear capability, the range was less than desired, and the REDSTONE became an interim measure to attain at least a short-range capability. A long-range system was still needed, and this thought was constantly in the minds of many planners. For a while, the thinking was directed toward gaining the additional range through component redesign of the REDSTONE. In fact, one such proposal in February 1954 was brought forth by the Department of Army Chief of the Organization and Training Division that

[redacted]

[redacted]

the warhead weight be reduced, with a resulting range increase to 240 miles. But in May of that year, the Department of Army (DA) decided to continue the REDSTONE as a weapons project to gain the early thermonuclear capability. To some extent, this shifted attention momentarily away from the REDSTONE as a possible long-range warhead carrier.[1]

(U) After the DA decision, AFF embarked on a comprehensive study project that covered an optimum family of guided missiles. One of these was a short-range missile—75 miles—to support corps or army operations, and the CORPORAL, an on-the-shelf item, could partially meet this requirement during the interim before replacement by the solid-propellant SERGEANT. For medium-range operations, a new missile having a 150-mile capability was proposed for support of Army and Navy group operations. What was then considered as long-range would be achieved through development of a new 500-mile missile to replace the REDSTONE.[2]

The 1,000-Mile Missile

[redacted] DA did not concur with AFF's 150- and 500-mile range proposals. Instead, they felt that efforts should be concentrated on developing one missile capable of a 1,000-mile powered flight and of being accurately guided the last 200 miles at a speed of Mach 3. Indications were that development of the 1,000-mile missile would start immediately, but, on

1. Tech Rpt, Ord GM and Rkt Pros, REDSTONE, Vol IV, pp. 2-3; Ltr, OCO to RSA, 10 Jul 50, subj: Study Towards a 500-mile Wpn, cited in abv Tech Rpt; Memo, Org & Tng Div to AC/S G-3, 16 Feb 54, subj: Army GM Pro, cited in DA Pam 70-10, p. 35.
2. Memo, OCAFF to AC/S G-3, 25 May 54, subj: Surface-to-Surface GM Rqmts for Spt of Corps & Larger Units, cited in DA Pam 70-10, pp. 35-36.

[redacted]

2 August 1954 the Army Chief of Staff directed further study covering surface-to-surface missile requirements.[3]

(U) During the course of these events, and even prior to the dates indicated above, personnel at Redstone Arsenal, where most of the existing Army know-how for missile development was concentrated, advised OCO that a 15-month study on a long-range missile had been prepared and was being submitted for review. Also, germane to the proposed development plan was the fact that the personnel corps at Redstone had reached a scientific point of achievement where assignment of a challenging new project would be quite welcome. In brief, Redstone suggested that it be directed to initiate the 1,000-mile missile development program.

(U) The Redstone study concluded that the best approach would be the development of a ballistic, two-stage rocket-propelled missile, with the warhead separating from the second stage after burnout. This proposal was based on a probable need for a controllable warhead; but, if this device were unnecessary, feasibility studies should consider the development of a single-stage, rocket-propelled ballistic missile. Propulsive agent proposals involved gasoline and liquid oxygen (LOX), which was consistent with the then state-of-the-art and availability.

(U) While these recommendations were being made, Redstone Arsenal was becoming more and more capable of initiating the long-range missile program, for the REDSTONE missile had, by that time, traversed a number of successful flights and could be used as a carrier in a component development program. A suggestion to this effect was made, especially

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3. DA Pam 70-10, p. 36.

with regard to experimental nose sections, as it was known that the re-entry problem for long-range missiles would be difficult to solve. The initiation seemed logical, too, from another standpoint, for North American Aviation (NAA) was on the verge of developing a power unit capable of 135,000 pounds of thrust, which could be either adapted to the REDSTONE or used in new missile development.[4]

(U) Eventually, many of the recommendations of the Redstone group were adopted, that is, with reference to the technical pursuit, but not in 1954, for DA and DOD felt that further study was necessary. Redstone was persistent, however, for as late as December, proposals for long-range missile development were forwarded to OCO. Reactions were mild.

(U) At the outset of 1955, it appeared that the cycle of study and propose was to continue, when OCO directed Redstone to make a study of a family of missiles for Army use. To some extent, this did remain the pattern, but informal information gleaned by OCO in February eventually brought changes. With regard to the continuing studies, a July proposal for a 1,500-mile missile led to a specific development program. As for the February item, OCO learned that the Air Force intended to invite proposals for the development of a 1,000-mile missile using existing hardware. An announcement had also been made in January by the Air Force confirming the fact that Convair was working on the ATLAS 5,000-mile ICBM.[5]

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4. Ltr, RSA to OCO, 31 Jul 54, subj: Army Long-Range Msl Sys, and annex, subj: A Pro of Feasibility Studies & Spting Res for a Long Range Msl Pro, Hist Off files.
5. ABMA Ref Book: JUP, Part I, Tab A-4, Hist Off files.

(U) These Air Force announcements fostered a wave of activity on the part of the Army, especially with regard to the 1,000-mile missile. To Army, depending on the use of the 120,000-pound thrust NAA engine, its facilities appeared to be the logical site for development. It was felt that the REDSTONE could be upgraded to a two-stage missile having a range of 1,000 miles or better. Besides, the guidance system was being developed, and much of the hardware required for such a weapon had already been proven. Personnel and facilities at Redstone Arsenal could admirably satisfy the requirement, and OCO proposed that these be offered.[6]

The 1,500-Mile Missile

(U) The thinking in terms of range did not stop with the idea of the 1,000-mile missile, for on 14 February 1955 the Technological Capabilities Panel, commonly known as the Killian Committee, recommended an immediate program leading to the development of small artificial satellites and an IRBM of the 1,500-mile range class to parallel ICBM development. Missiles of such range actively affected the concept of waging warfare and, in this respect, the Army Deputy Chief, Research and Development (R&D), queried OCO as to the possibility of a 1,000- to 1,500-mile missile. There were a number of matters to be considered. For example, according to the R&D chief, airlifted assaults over great distances might characterize Army operations, and the transport of such

6. DA Pam 70-10, p. 118; House Rpt Nr 67, 87th Congress, 1st Session, subj: A Chronology of Missile and Astronautic Events, Washington, D.C., 1961; Emme, Eugene M., Aeronautics and Astronautics, NASA, 1961.

weapons as the REDSTONE and SERGEANT to airheads might pose a serious logistic problem. Therefore, the launching of a long-range ballistic missile from a relatively rear area might prove quite effective as well as economical. Before such a concept was adopted, however, there were salient questions to be answered. These involved the degree of accuracy that could be achieved, reliability of guidance systems that might be employed, and whether or not problems in either case could be speedily resolved.[7]

(U) This was but one move in the slightly quickened pace leading toward action, for, on 25 March, the Assistant Chief of Staff, G-3 (Training), recommended the initiation of the 1,000- to 1,500-mile missile development program. Additionally, CONARC began reviewing and updating its 1954 conceptions. Proposals for short range remained the same, with the 75-mile SERGEANT being considered as the best solution to meet this requirement. In the medium-range field, development of a 250-mile missile was proposed to replace the suggested 150-mile weapon. As for long-range missiles, CONARC did not make a specific suggestion. The 250-mile missile, to their thinking, deleted the 500-mile requirement; however, they believed that the Army did require the ability to attack targets with nuclear warheads at extremely long range.[8]

(U) By May 1955, Redstone Arsenal completed the study that had been directed by OCO in January. Basically, this involved three missiles,

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7. House Rpt Nr 67, op. cit., p. 21; Memo, Dep Chf R&D to OCO, 1 Mar 55, subj: Medium Range Ball Msls, cited in DA Pam 70-10, p. 118.
8. DA Pam 70-10, p. 118; Memo, CONARC to OCRD, 2 Apr 55, subj: Surface-to-Surface GM Rqmts for Spt of Corps & Larger Units, cited in DA Pam 70-10, p. 38.

the larger of which was an IRBM. No commitments were immediately forthcoming from this or any of the other preceding proposals, but at this point recommendations from widespread sources were centering on the requirement for a long-range missile of the IRBM class. Redstone Arsenal quite firmly believed that it had the capability to accomplish such development, so, in June, another presentation was made to Washington officials proposing development for a ballistic missile system of 1,000 or more nautical miles range. Throughout this study, it was repeatedly stressed that this development could be effected by redesign of existing components. The REDSTONE had served as an excellent laboratory and could still be used in such a way to test and prove long-range missile components. In fact, 19 REDSTONES had been earmarked for these purposes, especially with regard to resolving the nose cone re-entry problem. A number of alternative methods were included as to the way in which the missile could be employed, which involved ranges above and below the 1,000-mile mark. All of these proposals hinged on the use of NAA's engine, which was now rated at 135,000 pounds of thrust and had undergone some 334 static tests.[9] No active results came from this proposal.

([redacted]) Continuing with the successive monthly proposals, Redstone Arsenal, in July, dropped all recommendations for shorter range and concentrated on the 1,500-mile version. As to characteristics of the weapon being considered, it was to be a single-stage, liquid-fuel

9. RSA OML Study, 13 Jun 55, subj: OML Prop for a Ball GM sys of 1,000 or More NM Range, Hist Off files.

ballistic rocket designed to carry a 2,000-pound payload to the specified range. A swivel-mounted 150,000-pound thrust NAA engine would be used as the power unit (static tests of engines of this capability had already been conducted). The missile would have a diameter of 95 inches and a length of 1,114 inches. Propulsion would be provided by using 45,860 pounds of JP4 as fuel and 103,120 pounds of LOX as the oxidizer to acquire a maximum burning time of 119.3 seconds. Launching weight would be 167,000 pounds. The missile was not fin controlled but, instead, would have attached two hydrogen peroxide vernier thrust nozzles of 1,000 pounds of thrust each. Additionally, six small nozzles would be installed to provide spatial attitude control in pitch, yaw, and roll. The gimballed engines also served to assist in correcting the same problems, and the swivel would be hydraulically activated.[10]

(U) The June and July proposals orally presented by Dr. Wernher von Braun, chief of the Redstone development team, before the Armed Services Policy Council began to interest officials at the high Washington level. Secretary of Defense Charles E. Wilson designated Reuben B. Robertson of DOD to investigate the IRBM field. Then, OCRD requested OCO to compile a list of facts favoring development of the 1,500-mile missile at Redstone. OCO quickly complied, listing many of the reasons that had been included in past studies, that is, facilities, competent personnel, and proven components that could be redesigned. One new feature was added: that the REDSTONE missile had been transferred

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10. RSA OML Study, 1 Jul 55, subj: OML Prop for a Ball GM Sys of 1,500 NM Range, pp. 14-16, Hist Off files.

to a production contractor. This meant that an industrial capability would be available when the 1,500-missile reached that stage, an important point to be considered.[11]

(U) By August 1955, the matter had reached a cost study stage. In this respect, the Army Chief of Staff requested an estimate for developing a 1,500-mile missile at Redstone. OCO placed the cost of a six-year development program at $240 million, but OCRD believed this to be too conservative and estimated that the costs would run between $400 and $500 million. Redstone's plans as of September indicated that the time frame of the development would be somewhat telescoped, giving an Ordnance Readiness Date of 1 November 1960. This plan was based on an assumption that the starting date of the program would be 1 October 1955 with the first flight test of a REDSTONE to support research mission assignments for development of the 1,500-mile missile. Fifteen such vehicles would be used in the first stage of the program. Thereafter, a 50-missile prototype test program was contemplated. For strictly R&D purposes, there would be 40 missiles. The other 10 missiles would serve the dual purpose of R&D and engineer-user testing and would be instrumented to satisfy both requirements. This planning was based on experience in the REDSTONE development program, and was the basis for OCO's $240 million estimate.[12]

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11. ABMA Ref Book, Part I, JUP, Tab A-4.
12. Memo, OCRD to D/CS for Plans and Resh, 1 Aug 55, subj: 1,500-mile Msl Costs, R&D; Pam 70-10, p. 119; RSA OML Study, 7 Sep 55, subj: OML Ball GM Props for Range of 1,500 NM.

Department of Defense Decision

(U) Now that it was generally conceded that a requirement existed for a 1,500-mile range ballistic missile, the matter at hand was the adoption of the specific technical development pursuit from the several existing plans. For example, the development plan proposed by the Air Force in January 1955 was still active, and OCO as late as September was suggesting that the team at Redstone be used to accomplish the work. Air Force officials indicated that they would like to see the team broken up and assigned to its various activities to effect development, but Secretary of the Army Wilbur M. Brucker objected to such fragmentation. At this point, the Secretary of Defense, Charles E. Wilson, decided there would be two IRBM's developed, one of which would cover land- and sea-based requirements.[13]

(U) When this decision was made, DOD, in reality, had five possible systems under consideration for the IRBM role. One was simply to use a by-product of the ATLAS ICBM program and the others included a separate Air Force project, a United States (US)-United Kingdom (UK) cooperative development program, a Navy ship-based ballistic missile, and the Navy TRITON missile. Most of these courses appeared illogical to Army technical experts. With regard to the ATLAS by-product, the high ICBM development priority and the anticipated operational date of the ATLAS—1965—made this possibility seem a poor choice. The UK had little experience and it would be 1965 before a product would result

13. Hist, ABMA, 1 Feb-30 Jun 56, p. 3, Hist Off files; ABMA Ref Book, Part I, JUP, Tab A-4; House Rpt Nr 67, op. cit., p. 23.

from a cooperative venture. TRITON was nonballistic, so it was completely ignored. With regard to Air Force and Navy projects, Army believed that these could be combined and the group at Redstone Arsenal could develop and have the system available by 1960. Also—in September—Dr. von Braun gained an audience with Mr. Wilson and pointed out that the development of the 1,500-nautical mile missile was a logical extension of the REDSTONE program.[14] Some effect on the development course must have resulted from this particular presentation.

(U) The pace accelerated in September and October 1955. An Army staff proposal presented to DOD on 22 September called for a program embracing the recommendations of the Redstone Group, that is, use of facilities and personnel, design assumptions, and cost estimates. On 13 October, the same presentation was made to the Chairman of the Joint Chiefs of Staff (JCS). Then, on the 26th, the Army Chief of Staff announced to his key subordinates a plan to execute the 1,500-mile missile development program, if the Army were assigned program responsibility. This plan outlined the role that the later-to-be-activated Army Ballistic Missile Agency would play. It also gave indications that the commanding general of this organization would be delegated special authority, covering funding, development, and procurement actions, to execute the

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14. Study, 18 Sep 55, subj: Ball GM Sys Props for Range of 1,500 NM (abbreviated); House Rpt Nr 67, op. cit., p. 23; House Rpt 1121, 86th Congress, subj: Org & Mgmt of Msl Pros, p. 58; AOMC Ball Msl Ref Book, subj: Consolidated Chronology of Significant Events in the JUP Pro.

program under a compressed time frame, even to requiring assistance from Army organizations outside his immediate command.[15]

(U) Ways and means for conducting an IRBM development program were available, but one major question remained to be answered. This pertained to the employment of the missile when it had attained an operational capability. Simply stated, who was going to fire the missile—Army or Air Force? For years now the Army commanders had been envisioning a battlefield of considerable depth, which manifested the necessity for a long-range missile. Secretary Brucker defended this need before the National Security Council on 1 November, and pressed for a decision favorable to Army. The next day, the JCS indicated to Secretary Wilson there was an urgent requirement for IRBM development, but they could not agree as to the service to which it should be assigned. On the 8th the DOD decision was rendered, and an Army development program was given the "green light."[16]

(U) Secretary Wilson's decision covered the long-range ballistic missile program, which included two ICBM's and two IRBM's. All were to be afforded the highest national priority, with a qualifying stipulation that the IRBM's were not to interfere with ICBM development. The Army, in cooperation with the Navy, was to develop IRBM Nr 2 to achieve an early land- and sea-based capability. To direct the program from the

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15. Hist, ABMA, 1 Feb-30 Jun 56, pp. 89-90; Hist Monograph Nr 3, subj: Spec Powers Delegated to the CG of the ABMA, 1 Feb 56-31 Mar 58, Feb 61, Hist Off files.
16. ABMA Ref Book, Part I, JUP, Tab A-4; Memo, JCS to S/D, subj: Definition of Mil Rqmts of the Mil Svcs for the IRBM, cited in AOMC Ball Msl Ref Book, JUPITER Chronology; Memo, S/D to S/A & S/N, 8 Nov 55, subj: Mgmt of the IRBM Nr 2 Dev Prog, Hist Off files; House Rpt 1121, <u>op. cit</u>., p. 102.

top level, a Joint Army-Navy Ballistic Missile Committee (JANBMC) was established, with the Secretary of Navy serving as Chairman and the Secretary of Army as vice chairman. They, in turn, reported to the Ballistic Missiles Committee, which the Secretary of Defense established in his own office (OSD/BMC). Secretary Brucker and General Maxwell D. Taylor, Army Chief of Staff, relayed the word to all Army elements that the IRBM Nr 2 program was to carry top priority in the Army.[17]

(U) Once the decision had been made, reaction was quick. In this respect, Maj. Gen. John B. Medaris was made Commanding General designee of the to-be-formed ABMA on 22 November 1955. Exactly one month later, the general orders were published activating ABMA, with an effective date of 1 February 1956, as a Class II activity under the Chief of Ordnance. The fruition of Army proposals had come about, although from a different tack than had been earlier intended. Rather than being a partner with the Air Force for the development of a land-based IRBM, the Army team and now been assigned the responsibility of developing an IRBM that was responsive to land and sea requirements.[18]

17. Memo, S/D to S/A & S/N, 8 Nov 55, subj: Mgmt of IRBM Nr 2 Dev Pro; Memo S/A to C/S, Army, 16 Nov 55, subj: Prosecution of the Intermediate Range Surface-to-Surface Msl Pro; Memo, Army C/S to Army Staff, 18 Nov 55, subj: Prosecution of the Intermediate Range Surface-to-Surface Msl Pro., all in Hist Off files.

18. DA SO 227, Section 8, 22 Nov 55; DA GO 68, 22 Dec 55. Also see Appendix 1 for a chronological listing of significant events in the JUPITER program.

II. ([redacted] BUILDUP FOR JUPITER DEVELOPMENT

(U) The DOD charge to develop IRBM Nr 2 to meet land- and sea-based requirements at the earliest possible date posed, in many ways, a number of problems. To be specific, these were men, materiel, and management. With respect to the personnel facet, the Guided Missile Development Division (GMDD) at Redstone Arsenal, the group that had been consistently recommending the development of a long-range missile, possessed the nucleus to acquit this task, but not within the telescoped time frame indicated in the development directive. This meant that qualified people would have to be recruited and trained. Likewise, facilities at Redstone provided a basic requirement, a factor that had weighed heavily in choosing the installation as the development site, but these had to be augmented with structures and test facilities that were peculiarly suited to a mission of large scope and complexity. Too, the prime production contractor had to be assisted in obtaining suitable space. And finally, with regard to the management aspect, the development of the weapon to full operational capability required the talent and technical "know how" of numerous Army elements, and a management system had to be devised to assure the responsiveness of these organizations. In sum, the Agency leader, although armed with special delegated powers, had many problems to resolve at the outset of the JUPITER development program.

Personnel

(U) As intimated, GMDD provided the basic manpower reservoir for the newly formed ABMA. This group was comprised of about 1,600 personnel, of which some 500 were classified as scientists and engineers. One hundred of these had been scientists and engineers on the German V-2 project during World War II. Although talent and capability were represented by this group, there was a demand for a greater technical work force to accomplish the task at hand. To meet this requirement, the month before ABMA's activation, Redstone sought and received permission from the Fifth Civil Service Region to start a nation-wide publicity and recruiting campaign. ABMA continued this program after it became an independent agency. The initial goal was to fill 2,349 positions, including GMDD incumbents and new hires.[1]

(U) Several pitfalls were met as skilled employees were needed by the new missile development agency; Redstone Arsenal had to maintain its forces; and industry, which was on the threshold of a heavy missile production program, had a requirement to recruit highly technical personnel. Also, the Air Force and its prime contractors were similarly affected. This created a highly competitive atmosphere, and one given to proselyting, since the qualified manpower source was quite scant. So recruiting ground rules, as effective as possible, were drafted. Despite the obstacles, ABMA recruitment was relatively successful, for, by 30 June 1956, against an authorization of 3,301 civilian positions, 2,702 had

1. Hist, ABMA, 1 Feb-30 Jun 56, Chap VIII, Hist Off files.

been filled and a number of others had been committed. Additionally, 513 military personnel were on duty, as compared with 535 authorized.[2]

Facilities

Private Housing

(U) In a sense, during its early years of operation, ABMA had a direct and indirect facilities problem; one related to the task of constructing facilities associated with the development program, the other to private housing for its employees. With respect to housing, Huntsville, Alabama, a comparatively small town of 16,000 in 1950, had trebled its population by 1956, largely through the influx of people associated with the arsenal and the buildup of contractor operations. Housing had not kept pace, and it was June of 1956 before two Congressional bills helped solve this problem, and several years later before supply and demand more nearly coincided. As may be surmised, the housing problem had its effects upon the personnel recruiting program, too.

Contractor Facilities

(U) ABMA was also concerned with housing from another standpoint, and one that still was not involved with the construction of facilities within its own immediate complex. This problem related to effectively

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2. Ibid.; Memo, Dep Cmdr, ABMA to all Staff & Div Chfs, 14 Feb 56, subj: Recruiting & Employment by ABMA; Ltr, RSA to ABMA, 9 Apr 56, subj: Recruitment for Staff and Divs of ABMA; Ltr, ABMA to OCO & DA, 14 Aug 56, subj: Competition with Govt Contractors for Key Professional & Managerial Pers; Ltr, Ramo-Woolridge Corp to Maj Gen B. A. Schriever, with cc to Maj Gen J. B. Medaris, 30 Apr 56, subj: Ramo-Woolridge Procedure When a RSA Employee Applies to Us, all in Hist Off files. See Appendix 2 for semiannual strength totals during peak years of JUPITER development.

siting Chrysler, its prime contractor for REDSTONE and IRBM Nr 2. Difficulty was experienced in satisfying these space requirements. At the time, Chrysler was occupying 200,000 square feet of floor space at the Naval Industrial Reserve Aircraft Plant (NIRAP) in Detroit, Michigan. This space was devoted to REDSTONE production, and a minimum of some 350,000 additional footage was needed for the IRBM production program. There was more space in the NIRAP building, but this was being used for jet-engine production. Prompted by this fact, Rear Admiral W. F. Raborn suggested that the Army seek other sites in the Detroit area. Thereafter, conferences were held and studies were made, and the choice usually turned to the NIRAP installation, at least on a temporary basis.[3]

([redacted]) This temporary element attached to the use of the structure left the way open to continuous suggestion of sites for operation. In fact, recommendations were being made for a period of 20 months. Some of the places considered included the Chrysler San Leandro, California Plant; Michoud Ordnance Plant, New Orleans, Louisiana, where Chrysler had an operation during World War II; and Limestone Cave near Nashville, Tennessee. Finally, on 31 October 1957, NIRAP was selected as the permanent production site, and the installation was renamed the Michigan Ordnance Missile Plant. This gave Chrysler 1.649 million square feet of space that could be devoted to manufacturing and 120,000 square feet of administrative space.[4]

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3. MFR for CG, ABMA, 7 Feb 56, subj: Conf Notes fr Mtg on Jet Engine Plant Facility held on 6 Feb 56; Minutes, JAN/BMC Mtgs, 12 Mar, 12 Apr & 15 Nov 56, all in Hist Off files.
4. Msg, COFORD to ABMA, 31 Oct 57, cited in AOMC Ball Msl Ref Book, subj: JUP Chronology.

Redstone Arsenal Facilities

(U) Construction of missile development facilities at Redstone also caused considerable attention. As earlier mentioned, existing facilities at the arsenal had been a major factor in its selection as the site to develop the IRBM. This situation had not come about overnight, nor were the facilities, as existed in 1956, considered adequate to accomplish the task at hand.

(U) Buildup for missile development programs at Redstone actually started in 1950 when the Chief of Ordnance selected the site because it appeared to lend itself to guided missile research programs. This decision was quite appropriate in that year, but the facilities had been built during war time, with only a five-year life expectancy. Buildings that had aided Redstone's wartime chemical mission had been rehabilitated to house laboratories used in support of REDSTONE missile development. As the program progressed, these structures became inadequate and, in 1953, some new construction was started. This involved three buildings—405, 405A, and 405B—which were used as missile assembly and component hangars to meet a modest fabrication schedule of one missile per month. Other laboratories were still housed in old warehouses.

(U) The next increment in the construction program came about in 1954, as a result of a growing national interest in missile research and development. This building effort included a test stand with ancilliary buildings to permit testing of a complete missile under full thrust, a guidance and control (G&C) laboratory, and an engineering building (488, which was later renumbered 4488 and became the headquarters building of ABMA). When ABMA was activated, it inherited the new construction plus the old chemical warehouses.[5]

(U) The crash nature of the JUPITER program (so named in April 1956) demanded additional structures, and 11 construction projects were considered absolutely necessary by ABMA. These, in part, included an addition to the structural fabrication building, a structures and mechanics laboratory, an extension to the G&C lab, a guided missile test shop, a missile assembly-inspection hangar, and modifications to some of the 1954 construction. A total of $25 million was requested to satisfy these purposes. As it turned out, authority for $23,968,379 was received; and, on a balance sheet of 5 January 1962, the Mobile District of the Corps of Engineers (COE) reported expenditures of $22,087,451.21 against obligations of $22,087,459. Added to this, approximately $1.5 million had been spent on an engineering building at the Jet Propulsion Laboratory (JPL) in support of the JUPITER program. Thus, the construction program stayed well within its authority.[6]

(U) Despite the crash connotation placed on the weapon's development, the construction program did not move with the speed this implied. During December 1956, ABMA sent a message to OCO, the gist of which was largely justification for the facilities to be constructed, modified, or expanded. Moreover, ABMA pointed out that these facilities could be used at a later date, with little, if any, change for other guided and

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5. MFR, Col J. G. Zierdt, Chf, ABMA Cont Off, 28 Apr 56, subj: FY 57 MCA Const in the JUP Prog, in ABMA Ref Book, subj: Facil, MCA, Hist Off files.
6. Ibid.; Ltr, ABMA to COFORD, 29 Jun 56, subj: Revision of FY 57 MCA Prog of JUP, in ABMA Ref Book, subj: Facil, MCA; Msg, 289/05, COE, 5 Jan 62, Mobile Dist to ABMA. See Appdx 3 for listing of projects in the FY 1957 MCA program.

ballistic missile development programs. Only five projects had made any significant progress by 30 November 1956—10 to 30 per cent—and these were still a considerable time away from effective use. On the others, there was no progress or a mere one per cent.[7]

(U) The situation of "make do" with what they had in 1956 was far from satisfactory. A good example, in this respect, although reported much earlier in the year than the December message, was the missile assembly and inspection hangar. As already stated, the original facility was constructed in 1953 to provide for the production of one REDSTONE missile per month. This facility was totally inadequate for the 1956 production work, and an expansion request was placed in the amount of $2.401 million. At that time, the production goal was two missiles per month, but there were other factors involved besides this. For one thing, the diameter of the JUPITER was 105 inches as compared with 70 inches for the REDSTONE, and special rigging was required. Moreover, fabrication was not limited to the JUPITER _per se_, for that missile was still a considerable time away from a frozen configuration. There were other test vehicles such as JUPITER A's and C's. This meant the likelihood of almost simultaneous work on several missiles that were of varying configurations, or even work stopped on one particular missile until component redesign could be effected on deficient parts discovered by the labs. Working space was a vital necessity.[8]

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7. Msg, ORDAB-E-220, CG, ABMA to COFORD, _c_. Dec 56, in ABMA Ref Book, subj: Facil, MCA.
8. MFR, Col J. G. Zierdt, Chf, ABMA Cont Off, 28 Apr 56, subj: FY 57 MCA Constr in the JUP Prog, in ABMA Ref Book, subj: Facil, MCA.

(U) It is relatively simple to identify the source of the facility construction difficulty, as the slow pace was caused by the DOD roles and missions decision of November 1956, which, in part, stated that construction projects in support of anti-aircraft and ballistic missiles within the Army were being deferred without prejudice and returned for rejustification under the new ground rules (limitation of Army employment of missiles of 200-mile range and under). In reality, the FY 1957 MCA program did not feel the complete impact of this decision, for $15 million was already under contract, but the proposed FY 1958 MCA program was dealt a "body blow" with little time for reclama by Ordnance.[9] Eventually, the late 1957 DOD decision to develop both IRBM's brought construction more in line with requirements.

Management

(U) Because of the scope of the development program and the charge to accomplish the task with speed, effective program management was a must. The Agency Commanding General was armed with unusual authority, that is, for a field commander, to carry out the order, but a chain of command still existed to assure that decisions were carried out in the best interest of the program. At the top of program control was DOD's Ballistic Missile Committee (BMC) and, thence, downward to JANBMC. Subsequently, after the pull out by the Navy, the joint group was redesignated the Army Ballistic Missile Committee (ABMC). This management tier provided higher review authority and program control.

9. Msg, no citation, COFORD to ABMA, 28 Nov 58, subj: MCA FY 58 - Review of GM Facil, in ABMA Ref Book, subj: Facil, MCA.

(U) Management at the working level was also an important factor. It was imperative that the organization have "on-the-spot" technical competence for every facet of the development program, and thus the headquarters staff was organized somewhat differently than normal. Extensive coordination usually breeds delay, so the move was made to bring the experts of the various technical services and other organizations to the development installation. In this respect, COE, Transportation Corps, and Signal Corps were represented. Besides this, representatives of the combat arms and pertinent Department of Army staff offices were domiciled at ABMA. These individuals served in dual roles—staff members of ABMA and representatives in the interests of their parent organizations. Direct communications were made possible with all necessary sources, which reduced the reaction time in settling specific technical problems. This cooperation promoted early and valid decisions with regard to program direction.[10]

10. Hist Monograph Nr 3, subj: Spec Powers Delegated to the CG of the ABMA, 1 Feb 56-31 Mar 58, Feb 61, pp. 4-7 & 13-16. Appendix 4 provides the organizational structure under which ABMA functioned during the Army-Navy cooperative period.

III. (C) ARMY-NAVY COOPERATIVE PROGRAM

(U) DOD's decision relative to the joint cooperative effort between Army and Navy to develop IRBM Nr 2 did little to deter the Redstone group's development plans, although in the very recent past they had been studying to satisfy either Army or Air Force requirements. Since the Navy was now in the program, the configuration of the proposed missile would have to change drastically to suit shipboard or possibly submarine operations.

Development Plans

(U) As may be recalled, the Secretary's decision was made on 8 November 1955, and by the 28th of the month General Medaris presented a tentative development plan to OSD-BMD that had been previously approved by JANBMC. The Navy, too, had reacted quickly, for on 17 November a Special Project Office (SPO) was created with Rear Admiral W. F. Raborn appointed director. SPO was established to handle problems associated with the ship-launched version of the JUPITER weapon system.[1]

(U) Prior to the start of actual development operations, the Army and Navy worked out ground rules as to which service would accomplish a specific function or task. According to DOD, both services were to agree upon military characteristics (MC's) and performance for a single land- and sea-based missile. ABMA was responsible for developing the basic missile, and operational objectives for both employment concepts

1. Prop, 23 Nov 55, subj: Army-Navy IRBM Tentative Dev Plan - FY 56-FY 57, in ABMA Ref Book, subj: JUP, Part I, Tab B-3; JUP Dev Plan, FY 58, 29 Sep 56, Hist Off files; House Rpt Nr 67, op. cit., p. 24.

were to be accomplished simultaneously rather than compromise Navy work to gain an early land capability. The Navy was charged with the responsibility of selecting a contractor for developing a system that was capable of accepting and launching the Army missile. This was later designated the ship inertial navigation system (SINS). To promote a cooperative atmosphere at the working level, Navy and Army liaison offices were established and manned with technical personnel at ABMA and the Navy development site, respectively.[2]

(U) Returning to the tentative development plan, the brevity between decision and submission prevented any detailed presentation on MC's or specifications, for they were not then available. Despite the preliminary nature, there were some directed requirements and some known design characteristics to fulfill the goals. In this respect, a maximum range of 1,500 miles was to be attained, and calculations had been made on several versions that could reach this distance. The proposed types were from 50 to 65 feet long, and weighed between 85,000 and 115,000 pounds. Both figures were considerably shorter and lighter than the 1955 proposal for an Army land-based IRBM. ABMA intended to start development on a vehicle involving the greater weight and length and, as engineering and flight experience permitted, move toward the smaller version. The plan went on to discuss the environment the missile would experience from lift-off to impact, and the reactions on the part of the missile to meet the demands of this situation.

2. Terms of Ref for Army-Navy Dev of IRBM Dual Land-Based and Sea-Based Wpn Sys's, 2 Dec 55, in ABMA Ref Book, subj: Important Props, Requests, and Directives, Tab E, Hist Off files.

(U) Over-all, the 1,500-mile missile development program would be dependent on work that had been accomplished in behalf of the REDSTONE, and mention was made of the continued importance of funding this program. This remark was prompted by the fact that JUPITER component development activities would begin with the firing of a REDSTONE in April 1956, and after that 35 more of these missiles would be used in support of JUPITER development. According to ABMA plans, major assemblies and components or subcomponents would be procured from prime contractor production, and would be modified at the arsenal to suit a special mission. As the JUPITER prototype version was approached, the first 10 such missiles would be assembled at Redstone, too. Afterwards, through prototype number 18, the contractor would assemble the odd-numbered vehicles and Redstone the even-numbered, and this would continue at the rate of two per month to the end of a 50-missile program. Contractor-produced missiles would be subjected to final modifications and testing (static and otherwise), and instrumented according to the R&D needs at the Arsenal.

(U) ABMA envisioned that the first production missiles would be ready for field troops by June 1960 or earlier. Funding estimates were $43.14 million for FY 1956 and $96.52 million for FY 1957, with a total program cost estimated at $452.21 million.

(U) The accomplishment of the development goal, according to ABMA's belief, would depend on the resolution of two major problem areas. These were engines and range facilities. Four ballistic missile programs were largely dependent on NAA's 150,000-pound-thrust engine production, and Army negotiators were experiencing difficulty obtaining Western Development Division* approval on delivery dates to meet the Army-Navy IRBM development schedule. The second problem related to range facilities at Patrick Air Force Base, especially the Cape Canaveral complex. It appeared to ABMA that DOD would have to make a thorough study of capabilities and requirements of this installation through 1960.[3]

(U) DOD reacted quickly to the presentation and, on 15 December 1955, the development plan was tentatively approved, that is, subject to some limitations and until better data were available. One of the qualifications pertained to the guidance and control (G&C) development. The Army, in the plan, proposed that a radio-inertial guidance scheme be developed as backup for the all-inertial guidance system, and DOD felt that the system proposed for the Air Force might be considered as the alternate method. Additionally, DOD believed that the solid propellant program, which was scheduled for eventual submarine employment, should be coordinated with the Air Force. In fact, they went on to say there should be a tri-service position on such development. Relative to the engine problem, OSD-BMC had learned that the missile developers of the three services were studying the problem, and they had requested a report on this matter from the Air Force by mid-January

* Later renamed Air Force Ballistic Missile Division (AFBMD) and divided in 1961 into Space Systems Division (SSD) and Ballistic Systems Division (BSD).

3. Prop, subj: Army-Navy IRBM Tentative Dev Plan, op. cit.

1956. On Patrick facilities, a master plan and test schedule for all programs was requested to be ready for submission in April 1956. Funds in the amount of $50.8 million for FY 1956 and $111.1 million for FY 1957 were approved and, in addition, funds for the tactical REDSTONE program could be used to expedite IRBM development. And lastly, OSD-BMC desired that a monthly progress report be submitted covering component development, rocket engine supply, flight test, and other items of importance.[4]

(U) Major problem areas covered in the tentative November plans began to be resolved, in part, by January 1956. During that month General Medaris met with General Schriever of WDD and came to an agreement on the allocation of NAA motors to ABMA. Also within the month, emergency construction was started at the Cape in support of the missile flight testing programs.[5]

[redacted] Although progress had been made by concluding the engine agreement, ABMA was not satisfied with the situation as it applied then or would apply in the succeeding years. WDD had allocation control from the NAA source, and ABMA felt that it needed direct contractual relationship in order for an engine to be produced that would meet the needs of the JUPITER system. General Medaris expressed these feelings to General Schriever, and the latter replied that he did not foresee any difficulty in the procurement of engines for the JUPITER program through a military interdepartmental procurement request (MIPR) to WDD. General Schriever

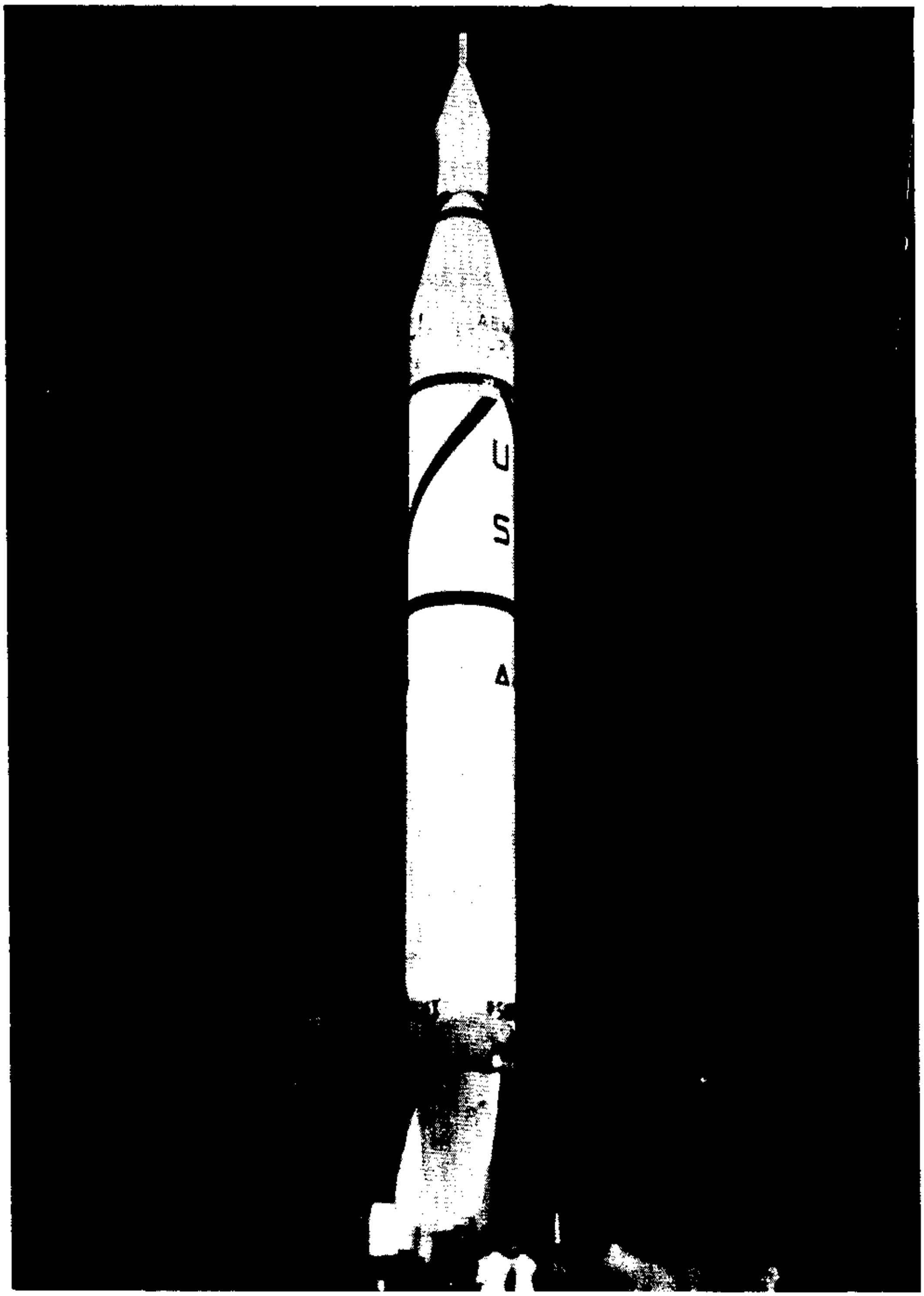
4. Memo, Dep S/D to Chairman, JANBMC, 20 Dec 55, subj: IRBM #2 Pro, in ABMA Ref Book, subj: Important Props, Requests, & Directives, Tab F.
5. JUP Dev Plan, FY 1958, 29 Sep 56.

went on to say that he would extend every consideration possible, "short of those which might engender delays in the ICBM and IRBM programs ... ." The qualifying phrase bothered ABMA, for it appeared to say that JUPITER had a second rather than equal priority to the other IRBM. This was not the only item that ABMA was unsatisfied with, as the only contractors (NAA and Aerojet General) for powerful thrust engines had their capabilities saturated with requirements to fill orders for the four major ballistic missile programs. In other words, the opportunity for research was small, and ABMA felt that NAA's engine was only marginal for the JUPITER program.[6] Be that as it may, this was the situation ABMA faced in 1956.

In getting the Army-Navy program under way, operational priority goals were established. The first was to comply with the DOD directive to design a basic missile that was responsive to land and sea requirements. A second represented the desires of DOD and the State Department, and that was the demonstration of the capability to fire a ballistic missile to a range greater than 1,000 nautical miles. From first appearances, it seemed that parallel development was the obvious course to follow, but the Army and Navy soon realized that there were not enough technically qualified personnel available to pursue this dual program. In fact, they aligned their program to the basic design, an early operational capability, and, then, the long-range shot. As a note of interest, on 20 September 1956, a JUPITER C attained an altitude of

6. Present, undated, subj: /Need for a Fair Competitive Position Bet IRBM #1 & IRBM #2/, Hist Off files; Ltr, WDD to ABMA, undated, subj: North American Engines for Delivery During CY 1957, in ABMA Ref Book, subj: JUP, Part I, Tab D.

[redacted]



THE COMPOSITE RE-ENTRY TEST MISSILE
20 SEPTEMBER 1956

682 St miles and a range of 3,335 St miles, shattering all existing records at that time in both categories. This flight admirably satisfied DOD and State Department requirements.[7]

(U) One of the first orders of business, after the February 1956 activation, was to update the development. Several substantial changes were made. For example, in November 1955, it had been planned to start with a 65-foot missile and, then, gradually reduce the length, but the Navy requested that the missile be as short as possible. So the previous plan was abandoned, and the development program was to aim for a 55-foot missile with a 105-inch diameter (10 inches greater than had been planned). At the outset the Army believed the range capability for such a system would be about 1,300 nautical miles with a growth potential to 1,400. Subsequently, the length was specified for 58 feet to assure the 1,500-mile range.

[redacted] Plans were also becoming firm on developing other components of the missile. In the G&C section, the all-inertial system appeared to offer the best approach, but there were some problems to be considered. To achieve an accuracy of a 1,500-meter miss distance circular probable error (CPE) at full range, fuel cutoff had to be effected within close limits. However, there were a number of these that could be resolved and proven through testing. For the Navy, investigations were in progress to determine if the SINS could be connected to the inertial guidance system. In any event, ABMA felt that a parallel program to develop radio-inertial guidance was a must to assure that there was an

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7. JUP Dev Plan, FY 1958, 29 Sep 56.

adequate system when the missile was operational. This could be accomplished through the coded doppler radar command (CODORAC) system, in which considerable development progress had already been recorded.

(U) The re-entry problem was being studied, too, and plans were made as to the methods of conducting tests. ABMA was developing a three-stage vehicle with a detachable head that would approximate conditions of the JUPITER upon re-entry. Twelve vehicles designated as composite re-entry test missiles (CRTM) were allocated to this phase of the program. The REDSTONE and a cluster of scaled-down SERGEANT motors served as the booster element.

(U) According to the plan, ABMA was still dissatisfied with the engine arrangements. It was pointed out that all work was proceeding on known and proven designs, whereas they felt that some engineering efforts should be devoted to development of higher-thrust engines. ABMA also mentioned that it planned to investigate different fuels, oxidizers, and additives that might afford greater efficiency and reduce logistic problems. Basically, it was requested that an additional contractor be phased into the engine program.[8]

(U) OSD-BMC reviewed the plan, and took several actions. For example, they disapproved the introduction of a new engine contractor; however, it was noted there were modifications that could be made to the NAA and Aerojet engines to improve performance. Moreover, the idea of forward research was not shelved, as DOD had directed its R&D element to make a study on future requirements for higher-thrust engines, and

8. ABMA Plan for IRBM 2 Msl Dev FY 56-57, 23 Feb 56, Hist Off files.

ABMA was told to proceed with its liquid propellant research studies. On another important matter--the radio inertial guidance system backup program--OSD-BMC noted that such development was contingent on construction of an engineering facility at JPL. Funds were approved for buying contractor equipment and training equipment, but FY 1957 MCA construction fund approval was deferred pending a complete review. In all cases, ABMA was cautioned to maintain close coordination with the Air Force so as to assure joint development of items common to the IRBM's.[9]

Navy Requirements in the Development Program

(U) When the Army and Navy actually began the development program, there were a number of problems to overcome. These stemmed mainly from the reconciliation of requirements for the two services into a single missile. Each had to provide for certain operational peculiarities. In this respect, whereas the Army could handle a rather lengthy weapon, the Navy required a weapon as short as possible. The original Army proposal was for a missile that was better than 90 feet high, and the Navy aimed for a 50-foot missile. This called for a compromise, and a 58-foot weapon was decided upon. By going to the shorter length, a greater diameter had to be invoked--105 inches--which caused some Army concern for logistics and transportation reasons. Compromise between the two to gain respective goals became the key to the development mode.

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9. Memo, OSD-BMC to JANBMC, 25 May 56, subj: JUP Fiscal & Dev Plans for FY 1956 & FY 1957, in ABMA Ref Book, subj: JUP, Part I, Tab C.

(U) In reality, Navy requirements played a rather heavy role in the system's design characteristics in view of the peculiarities of launching a missile at sea: safety and adequate engineering for ship conversion. It was necessary to design a complete set of launching and handling equipment for sea use as well as a set for the land version of the missile. In all of these cases, technical coordination was required and the decisions influenced configuration, so really ABMA was engrossed in satisfying all requirements. General Medaris, in November 1956, estimated that the decision on the length and diameter caused a design time loss of two months, and another two-month loss to define several other Navy requirements. Yet, it was known that the sea-based missile would be more complex than the land-based, for many of the latter's requirements had been resolved and proven.[10]

(U) Although the Army people realized that the integration of Navy requirements would incur some delay, nevertheless they knew that if these complex sea-based problems were not resolved, an unacceptable delay of shipboard application would occur. So, to gain Army goals in the long run, Navy problems were tackled, and by 1 September 1956 the over-all program was well adjusted and had a promise of being able to fire the first JUPITER-configured missile in January or February 1957. This was three months in advance of the original schedule. It was a strange turn of events, that during the first nine months of 1956 Army personnel were working on problems in navigation, ship motion, missile

10. JUP Dev Plan, FY 1958, 29 Sep 56; Present by Maj Gen J. B. Medaris to the NSC, Dec 56; Draft, JUP Brochure forwarded to Chf, R&D, DA, c. Jan 57, Hist Off files.

guidance, launching and handling, submarine application, and fuzing requirements. The Navy contributed its part, as well, especially in the nose cone recovery program. In this respect, they furnished a dummy missile under naval contract, and loaned a considerable amount of equipment to the program.[11]

Withdrawal From Army Program

(U) The Navy was never particularly satisfied with a liquid-propelled IRBM because of the storage, handling, and launching problems involved. Inherently, liquid-propelled missiles, after ignition, rise from the launch ring much slower than solid propellant counterparts whose lift-off is nearly simultaneous with the firing command. Knowing these facts, the Navy sought very early to get a solid propellant version of the IRBM approved. On 20 March 1956, OSD-BMC began to consider the proposal, and early the next month the decision was forthcoming. The Navy was allowed to do a systems study to include component development. This could involve propulsion flight testing as an aid toward determining weapon system feasibility. When the studies were completed and if the development work showed promise, OSD-BMC wanted a full-scale review before a missile development program was initiated.[12]

(U) As the Navy progressed in its solid propellant study, they became more and more removed from adapting the JUPITER to shipboard application, for a shorter missile was their desire. This meant a

11. Ibid.; ABMA Final Rpt on Joint Army-Navy Aspects of JUP Dev Pro, c. Dec 56, Hist Off files.
12. Memo, DOD to JANBMC, 4 Apr 56, subj: OSD-BMC Action with Respect to the Navy Solid Propel Pro, Hist Off files.

separate weapon system development, so in cooperation with the Lockheed Missile Division, a study was started toward such aims. One of the critical factors to be considered in making the decision, from the standpoint of DOD and the President, was whether or not a 1 1/2 year delay for the operational date could be accepted.[13]

(U) Secretary Wilson's decision on the course of Navy IRBM development was made on 8 December 1956. At that time the Navy was authorized to delete from its program the liquid-propelled JUPITER, and to proceed with the development of the POLARIS IRBM with submarine application as first priority. This action, of course, prompted the dissolution of the JANBMC and the formation of the Army Ballistic Missile Committee (ABMC) with the Secretary of Army serving as chairman.[14]

(U) Withdrawal by the Navy from the Army program was not simultaneous, for there were many areas where the two services had common interests. In fact, the Navy mentioned several, especially in the nose cone recovery efforts. Moreover, Navy Special Project Office asked its office at ABMA to determine the extent that the Army could participate in the POLARIS program, particularly nose cone and G&C. For these reasons, a Navy Liaison Office was maintained at the Army agency, but for all practical purposes the Navy was severed from the Army program.[15]

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13. Memo, BuOrd, Dept of Navy, 4 Dec 56, subj: Mins of Staff Mtg-27 Nov 56, Hist Off files.
14. JUP Chronology; Memo, DOD to JANBMC, 18 Dec 56, subj: Dissolution of JANBMC; Msg, COFORD to ABMA, 20 Dec 56, subj: Org of ABMC, Hist Off files.
15. DF, Chf, Navy Off, ABMA to CG, ABMA, 11 Dec 56, subj: Reorganization of Navy Off at ABMA, Hist Off files.

(U) Departure of the Navy placed the Army IRBM program in a precarious position, for, coupled with the Secretary's decision in this respect, his roles and mission statement of November presented a situation wherein the Army was developing a missile that it could not employ. Douglas Aircraft Company was already in the process of developing the SM-75 THOR for the Air Force, and in December 1956 there was uncertainty as to whether or not the Air Force wanted another IRBM. The Army's in-house development prospects in early 1957 did not appear "bright."

[redacted]

IV. ([redacted] OPERATIONAL CONTROL TO THE AIR FORCE

(U) When Mr. Wilson's roles and missions decision was made in November 1956 and the JUPITER was placed under Air Force operational control, there were no unusual or particular problems that would have impaired the effectiveness of the ABMA missile development team. This group had already been engaged in solving the highly complex problems of naval missilery, and the Air Force employment requirements would be very similar, with some exception, to those the Army had conceived.

<u>Air Force-Army Employment Concept Differences</u>

[redacted] The Army recognized that a large degree of the planned mobility for the system would be lost, for the Air Force method was, by and large, to operate from fixed installations. In this respect, the Air Force planned to gain an initial operational capability (IOC) with the IRBM's against enemy airfields and thereby enhance the penetration ability of manned bombers to win the airpower battle. As the battle progressed, the IRBM's would be launched against secondary targets within range, accuracy, and warhead yield limitations. In other words, the missiles would serve as adjuncts to Strategic Air Command (SAC) bases, and the launching sites would be satellited around these installations. As might be suspected, swift reaction within a 15-minute period was a must because these static-type launching sites would certainly be located by enemy reconnaissance. This meant that servicing, orientation, and checkout of the missile prior to launching would have to be accomplished rapidly. The element of success depended on hitting the enemy sites first.

[redacted]

[redacted] To the Army, this thinking was a calculated risk. World War II V-1 and V-2 lessons had shown that vulnerable static positions were ineffective as missile launching sites but that the mobile mode had been effective. Besides, there were political implications to be considered. NATO countries were already hosts to numerous static installations and the addition of fixed missile launching sites would contribute to the threat of atomic devastation. On the other hand, highly mobile units would be practically impossible to locate and would serve as an able deterrent to an enemy strike.[1] Be that as it might, the Army development team remained responsive to Air Force requirements[redacted]

Administration and Coordination Bog

(U) Although the Army stood ready to react to Air Force direction with respect to JUPITER development, none was forthcoming. And, when the Army took the initiative in seeking Air Force requirements, it was met with rebuffs.

(U) In December 1956, ABMA's representative at WDD placed several requests for documents concerning operational requirements, concepts, and military characteristics. These were refused by Brig. General Osmond J. Ritland, Deputy Commander, WDD, based on the contention that there were no implementing instructions in the Wilson memo. With regard to another request of the same sort and in the same month, a February 1957 answer from General Ritland indicated that such requests should be made only interdepartmentally at the headquarters level. It had already

1. Draft, JUP Brochure forwarded to Chf, R&D, DA, c. Jan 57, Hist Off files.

become apparent to ABMA in December 1956 that cooperation was going to be difficult, so they had requested the Army Chief of R&D to seek USAF operational requirements and military characteristics, and in January 1957, DCSOPS informed ABMA that such action had been taken. The next month, General Thomas D. White, Vice Chief of Staff, USAF, replied and suggested that the technical liaison units be used to interchange such information.

(U) This action should have settled the issue, but it did not, for later in the month, General Ritland stated he had not received the correspondence. Although he was shown the message, the general said he did not feel that he had the authority to release the requested information. However, he did say that ABMA should prepare a formal request to WDD; and, when the message from USAF was received, up-to-date general operational requirements (GOR) would be drawn up and submitted to Air Research and Development Command and USAF headquarters for release. ABMA complied.

(U) While waiting on the agreement to transpire, General Medaris, in a March visit to WDD, sought to resolve the problem more speedily. He pointed out to Maj. Gen. Bernard A. Schriever, WDD's commander, that ABMA needed information on over-all system design requirements. General Schriever agreed, but stipulated that authority to furnish such information would have to come from USAF. Also, he promised to discuss the problem with USAF during a forthcoming Washington visit.

(U) In late March, word came from General Ritland that the GOR had been forwarded through Washington channels; and, on 12 April, after a four-month lapse from the original request, ABMA received the documents.

The material, however, was unsatisfactory as it was devoted to THOR development and could not be construed as a GOR. ABMA was still without guidance to proceed with the JUPITER design. Thus, the Army had to revert to the channel routine once again.

(U) By May 1957, there appeared some promise that the development program could proceed. At that time WDD had sent messages to all potential users concerning the possible use of the JUPITER by the Air Force. ABMA reacted quickly and suggested that a briefing be given at the end of the month. Additionally, ABMA provided a list of assumptions as to JUPITER requirements to satisfy USAF operational needs. This was not what WDD had in mind. They desired to be briefed on the JUPITER program as it had been conceived, so a redirection could be made, if necessary. ABMA was amenable to this task also, and the briefing was given. Guidance was still not forthcoming.

(U) When it appeared that no action would be taken as a result of the June conference, ABMA, on 10 August, forwarded a document to WDD containing what was felt to be Air Force requirements for operations, GSE, logistic support, and training. WDD was asked to modify the documents as necessary, and confirm the plan as Air Force requirements. No results came from this action, for at the end of the month, WDD (now called AFBMD) suspended all activity pertaining to the JUPITER program pending a decision by DOD on the over-all IRBM program. The JUPITER program appeared to be in a very tenuous position; however, ABMA staff-level planning was to continue in such areas as operations, training, maintenance, and GSE.[2]

Termination Threat

(U) As of April 1957, there were already indications that one of the IRBM programs might be dropped. The Army had previously placed its request to fund the program between July and November, and OSD-BMC approved the estimated costs in the amount of $35 million. The committee pointed out that this action was consistent with Mr. Wilson's decision to continue both IRBM programs as far into 1957 as needed "in order to get a feeling of confidence that one of the two land-based IRBM programs will be successful" before dropping either of the programs.[3]

(U) By August, decision time was nearing, so the Secretary of Defense set up an _ad hoc_ committee, comprised of Mr. W. M. Holaday from his office, General Medaris, and General Schriever, to work out a single land-based IRBM program. All aspects of both systems were to be studied, with particular attention being given to basic missile design, over-all program status, and manufacturing and test facilities contributing to the development program. After careful deliberation, the committee was to make a recommendation to the Secretary by 15 September.

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2. Ref Book, Holifield Committee Hearings, Tab I, subj: ABMA Attempts to Obtain Guidance on AF Opnl Rqmts & MC's for the IRBM, Hist Off files.
3. Memo, OSD to ABMC, 2 Apr 57, subj: FY 58 Fund Rqmts for the JUP Prog Through 30 Nov 57, Hist Off files.

(U) While this study was in progress, explicit guidelines were given for program operations in being. ABMA was told not to commit funds for missiles or missile components beyond those needed to meet a production rate of one missile per month. In turn, leadtime commitments for procurement would be limited to 12 months. Anything beyond that time frame, whether it was procurement of development activity, should be suspended or canceled. ABMA and contractor personnel were also limited to an overtime rate of three per cent, with the exception of personnel directly connected with static and flight testing.[4]

(U) To ABMA's thinking, the Secretary's decision had an adverse impact upon the effectiveness of the Agency's operations. For example, General Medaris felt that the three per cent limitation reduced his work force at a rate equal to 1,000 people. This meant that the Agency would be operating at a relative strength of 65 per cent, which, in turn, threatened a number of programs. For example, it was likely that ABMA participation in the Atomic Energy Commission's (AEC) Project HARDTACK would be canceled if the Agency were unable to meet missile delivery and firing schedules imposed by the Commission. Moreover, both the REDSTONE and JUPITER programs would face stretch-outs. So the limitation, which would occasion a momentary savings, would, in the long run, prove to be quite costly. Intangibles such as lowered personnel morale and the possible loss of scientific momentum were other considerations to be coped with.[5]

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4. Memo, S/D to S/A, 13 Aug 57, subj: IRBM Pro, Hist Off files.
5. Msg, ORDAB-CR-34-8, ABMA to Chf, R&D, DA, 27 Aug 57, Hist Off files.

(U) Subsequent to the Secretary's 13 August directive, literally thousands of pages were generated comparing the THOR and the JUPITER from every angle conceivable. Competition and feeling between the two development elements ran high, as, quite naturally, each felt that it had the better missile. The deadline of 15 September came and passed, and, in fact, the *ad hoc* committee was still deliberating when SPUTNIK I orbited the earth. This demonstration was the overriding factor in choosing two IRBM's instead of one. On 10 October, the President approved the Secretary's recommendation for the rapid development for both missiles. And, in short order, the Secretary of Defense directed that AFBMD cooperate with ABMA in the full development of the JUPITER system.[6] The administration and coordination bog had been dredged: the termination threat had subsided in a beep.

Army-Air Force Cooperative Program

(U) Although SPUTNIK was a tilting weight on the scales, the extensive deliberating period by the *ad hoc* committee was largely due to the fact that on one hand an IRBM had been proven by flight tests and on the other a program of only promise existed. Based on this fact, it would have been unwise to have eliminated the JUPITER. Hence, the decision was made to develop both. The Air Force was now directed to assist in the development of the JUPITER to meet national operational requirements.[7]

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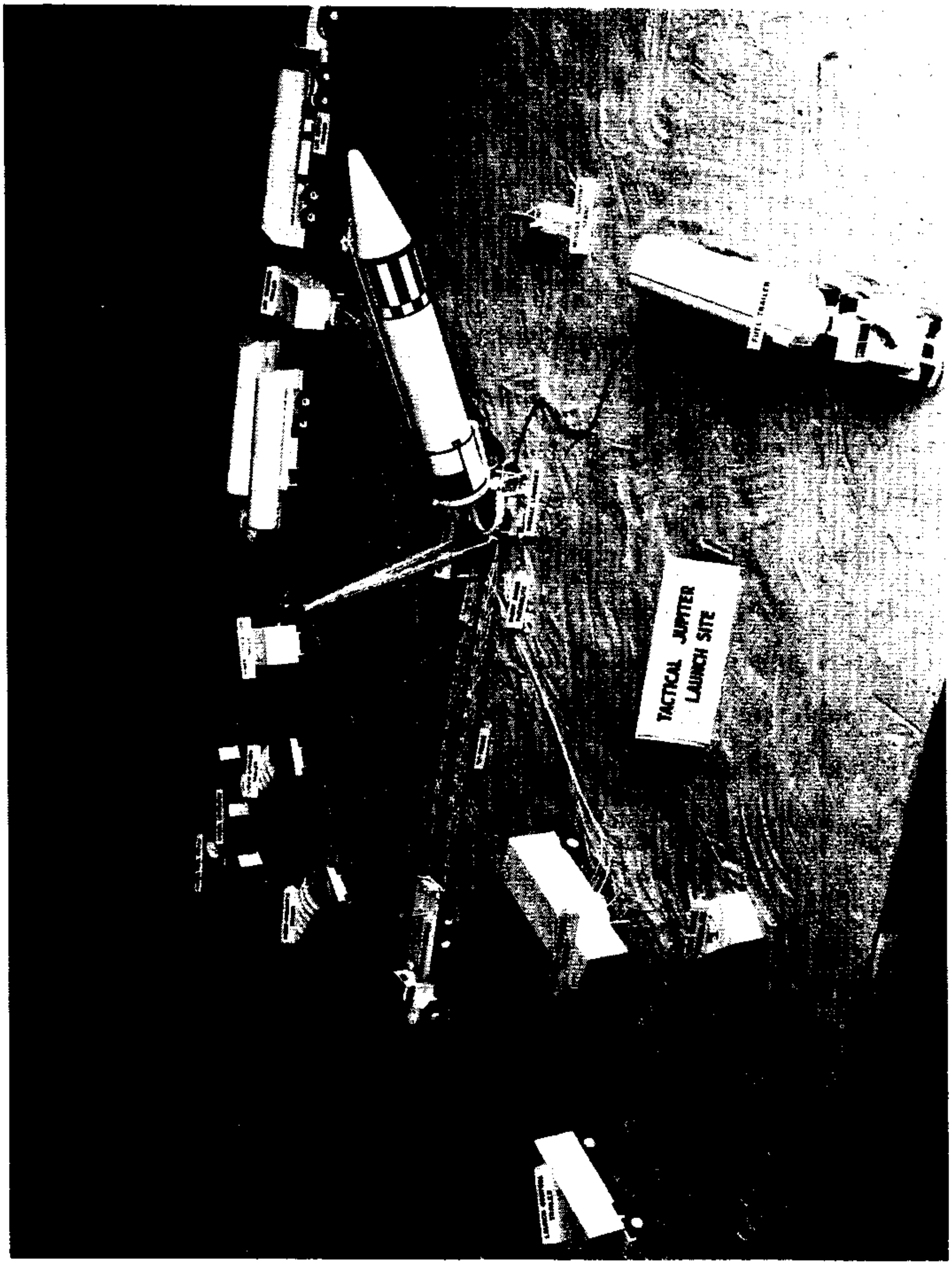
6. JUP-THOR *ad hoc* files; Hist of ABMA, Jul-Dec 57, pp. 6-8; JUP Chronology; all in Hist Off files.
7. JUP Story, prepared by Gen Medaris for S/A, 14 Dec 59, Hist Off files.

(U) Suffice it to say, the closing months of 1957 were marked by numerous meetings and coordination of specifications between the two development organizations. Two major problem areas that ABMA faced were GSE and a valid training plan. This condition existed because, since program approval for development on 8 November 1955, no authority had been given for GSE development or operational training other than that associated with the R&D effort. AFBMD representatives, on 18 September 1957, visited ABMA to review conceptual operational GSE plans to assure that the JUPITER could be integrated into the existing THOR GSE development program. As a note of interest, this was several days past the Secretary's decision deadline. And during the next month, ABMA GSE engineers visited AFBMD and the Douglas Aircraft Company (DAC) to study the application of THOR GSE to the JUPITER program. Shortly thereafter AFBMD forwarded to ABMA some 66 requests for alterations to GSE that had been conceived by the Agency. Then, in November, the first training conference was held at AFBMD.[8] After this, it appeared that the JUPITER program for the first time in its history was on the road toward employment as a tactical weapon system.

(U) When the go-ahead was given for JUPITER development, ABMA was actually involved in three high priority projects, so careful planning to accomplish these tasks was a must. As to the sequence of importance, AEC's HARDTACK project was given first priority, and, then, in succeeding order, maintenance of the JUPITER firing schedule and preliminary actions leading to a possible satellite program. With regard to the

8. Ibid.; JUP Chronology.

[redacted]



JUPITER portion, the President's decision had outlined the specific goals. The overriding objective was the successful achievement of an IRBM with a 1,500-mile range reasonable accuracy. Related problems such as ground support, contradictory service employment concepts, and increased range were not to delay the basic goal. This was an order to go to work with one aim in mind, and General Medaris warned his personnel not to take any actions outside these areas.[9]

[redacted] In view of the urgency indicated in the go-ahead directive, by November 1957 General Medaris had made a number of recommendations to Secretary Brucker as to the manner in which an early operational capability could be attained. He suggested that the JUPITER be released for production with mobile equipment. If this were done, the first firing unit with two launchers and four missiles could be ready for deployment by July 1958. To achieve that goal, REDSTONE ground equipment would be converted and oncoming REDSTONE personnel scheduled for unit training would be trained and used to initially employ the JUPITER. Training would start immediately for Air Force personnel, and they could take over the firing unit about January 1959. The balance of the first firing group, consisting of either six or 15 launchers, could be manned with Air Force personnel or a mix with Army personnel by the end of the first quarter of 1959. From there, squadrons or mobile groups could follow at the rate of one per quarter, beginning with the second quarter of 1959.[10]

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9. DF, Cont Off, ABMA to Comdr, ABMA, et. al., 17 Oct 57, subj: Priorities Within ABMA, Hist Off files.
10. DF, Cont Off to Dev Opns Div, et. al., 25 Nov 57, subj: Early Opnl Capability, Hist Off files.

([redacted]) For a time, it appeared that the program might go along the lines suggested by the General, even to the point that a Holaday paper was circulating in Washington to the effect that Army personnel could man the first employed missiles. The Air Force immediately complained of this matter to the Secretary of the Air Force, who, in turn, went to Secretary of Defense Neil McElroy and the Holaday paper was recalled. At that time, the situation was rather fluid, as the Air Force was in the process of a reorganization. Previously, AFBMD was to have exercised operational control over the IOC missiles, but, in early December, this responsibility was about to pass to the Strategic Air Command (SAC). Thus, a deployment manner was almost impossible to determine. One item, however, appeared a certainty, as the Air Force, in general, did not favor the Army's mobility concept based on the alleged fact that the countries in which the missile would be deployed would have little room for maneuvering. The Air Force was pinning all of its plans on attaining a 15-minute readiness capability for all weapons. ABMA did see some future in the turn of events occasioned by the Air Force's reorganization in that it would now be a contractor for an operational user and would not have to extensively coordinate with a lateral development agency to reach the user. In this respect, thought was given to the possibility of certifying a liaison office to the SAC element in charge of the IRBM missile program.[11]

([redacted]) By mid-December, the picture as to the eventual use of the JUPITER became a little clearer through an Air Force briefing presented

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11. Msg, ABMA/AFBMD 6171, ABMA FLDO at AFBMD to ABMA, 6 Dec 57, subj: Info on THOR/JUP Plans & SAC Plans, Hist Off files.

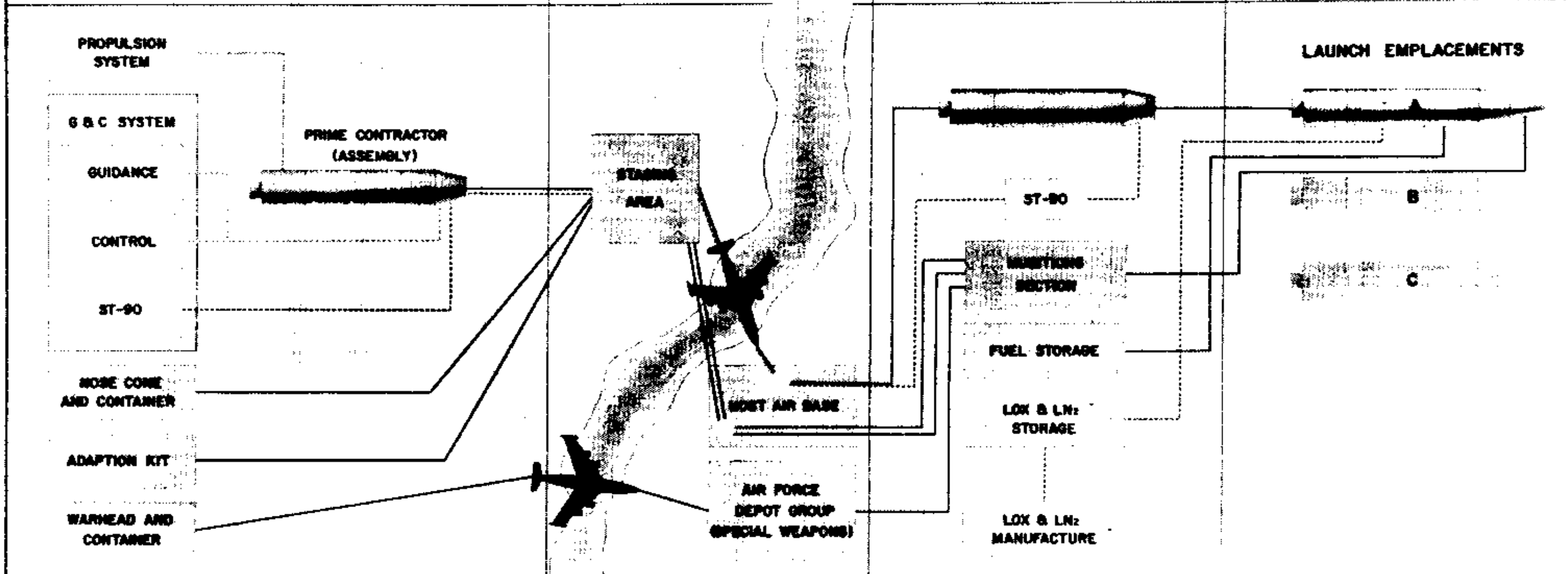
in Washington. Deployment plans called for four squadrons, with the first squadron being equipped with six launchers and 15 missiles. Six missiles would be fired in 30 minutes, and the remainder within 2½ hours. Thereafter, the succeeding squadrons would have 15 launchers and 15 missiles, all capable of firing within 15 minutes. Other stipulations included Air Force manning, capability to deploy to strategic locations (some notice of mobility), capability of continuous operation, minimum vulnerability, and fast reaction time (15-minute salvo). The Army was still dubious about the lack of mobility and being able to deploy by December 1958, unless Army personnel were used to man the system.[12]

(U) Subsequent to the briefing, Secretary Brucker forwarded a memo to the Secretary of the Air Force outlining Army plans to meet Air Force requirements. Again, the question was raised as to the ability to deploy in December without using Army personnel that were in REDSTONE training. At any rate, the Army would furnish temporary technical assistance and train Air Force specialists. With regard to the training facet, the Secretary mentioned that it was his understanding that Army responsibilities covered only individual training, and that unit and readiness training was an Air Force responsibility. Mr. Brucker also pointed out the importance of an early decision on GSE and training equipment, and that the Army was ready to furnish the mobile type. He also indicated that major changes to equipment would result in a loss

12. Msg, Col T. T. Paul to Gen Medaris, 17 Dec 57, subj: AF Planning for Use of JUP, Hist Off files.

FACTORY TO LAUNCH SEQUENCE (JUPITER)

ZONE OF INTERIOR		OVERSEAS AREA	
FACTORY AREA	TRANSIT AREA	RIM AREA	LAUNCH POSITIONS



FACTORY AREA

1 MANUFACTURE OF COMPONENTS.
2 ASSEMBLY OF MISSILE LESS ST-90, NOSE CONE, EXPLOSIVE COMPONENTS, AND WARHEAD.
3 PRE-INSTALLATION & POST-INSTALLATION ACCEPTANCE AND PERFORMANCE CHECKS OF COMPONENTS.
4 ACCEPTANCE CHECKOUT OF ASSEMBLED MISSILE.
5 ST-90 SHIPPED TO STAGING AREA.
6 NOSE CONE & ADAPTION KIT SHIPPED TO STAGING AREA.
7 MISSILE SHIPPED TO STAGING AREA.

TRANSIT AREA

1 MISSILE & COMPONENTS, EXCEPT WARHEAD, SHIPPED OVERSEAS THROUGH ZI STAGING AREA.
2 AT OVERSEAS HOST AIR BASE CONTAINERS OF COMPLETE MISSILE SHIPPED TO RIM AREA.
3 NO TESTING PERFORMED.
4 WARHEAD SHIPPED DIRECTLY TO AIR FORCE DEPOT GROUP, THEN ISSUED TO JUPITER SQUADRON.

RIM AREA

1 INSPECTION, ASSY. AND PERFORMANCE TESTS OF MISSILE AND ST-90.
2 NECESSARY REPAIRS AND ADJUSTMENTS ARE MADE.
3 PERFORM SIMULATED FLIGHT TEST.
4 NOSE CONE, ADAPTION KIT, & WARHEAD ASSEMBLED INTO NOSE CONE PACKAGE.
5 ASSEMBLED MISSILES ARE TRANSPORTED TO LAUNCH EMPLACEMENTS.
6 ASSEMBLED NOSECONES ARE TRANSPORTED TO LAUNCH EMPLACEMENTS.
7 REPAIR OF DEFECTIVE MISSILES RETURNED FROM LAUNCH EMPLACEMENTS.
8 MANUFACTURE, STORAGE AND ISSUE OF PROPELLANTS.

LAUNCH POSITIONS

1 MISSILES WILL BE MAINTAINED IN AN T – 15 MINUTES READINESS.
2 PREPARE LAUNCH SITE.
3 MATE ASSEMBLED NOSE CONE TO MISSILE.
4 CHECK OPERATIONAL READINESS OF ALL ITEMS.
5 PERFORM SIMULATED FLIGHT TEST.
6 INSERT TARGET PRESETTINGS.
7 CONNECT EXPLOSIVE DEVICES.
8 ERECT MISSILE.
9 LAY MISSILE.
10 LAUNCH MISSILE.

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of time and money. Financial reimbursement was to be made to the Army for all costs occasioned by the JUPITER program.[13]

(U) In early 1958, the momentum in the JUPITER program was considerably accelerated. For example, on 8-10 January, an operational planning conference was held at ABMA and, from this meeting, the SAC JUPITER Operational Plan 1-58 resulted. Prior to adoption of the plan, however, a number of other meetings had to be held to work out the details on specific functions and responsibilities. One of these pertained to program management. The Air Materiel Command (AMC) had been designated as the executive agent for the JUPITER, and its Ballistic Missile Office (BMO) had been assigned the role of executing the program. AMC then took action to establish two project offices: one at AMC/BMO; and the other at ABMA, designated as the Air Force JUPITER Liaison Office. The latter was comprised of representatives from ARDC, AMC, Air Training Command (ATC), and SAC. This gave a close coordination at the working technical level similar to that prevailing in days of the Navy Office.[14]

(U) A second problem area was to be resolved through a logistics planning conference. The object here was to effect a smooth transfer of logistic responsibility from the Army to the Air Force. Mobile Air Materiel Area (MOAMA) had been made responsible for the logistic support program. To effect the transition, ABMA established the JUPITER Support Management Office (JSMO), which was staffed by contractor personnel.

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13. Memo, S/A to S/AF, 31 Dec 57, subj: THOR-JUP Msl Sys's, Hist Off files.
14. DF, Cont Off, ABMA, to Dev Opns Div, _et_. _al_., 3 Feb 58, subj: JUP Planning Conf, Hist Off files.

This group was involved in provisioning plans, maintenance analyses, equipment deployment plans, and determining contractor support requirements. By June 1958, they had already published a considerable amount of material on technical aspects of the missile and its GSE.[15]

(U) Perhaps one of the more difficult areas to resolve was the interservice agreement between the Army and the Air Force. The principal problem involved the method by which the Air Force would reimburse ABMA. An agreement was reached in October 1958, after an eight-month discussion on the matter, that the Army would provide facilities and instructor personnel to conduct training, accomplish the research and development program. As originally stated, the document was to terminate on 30 June 1960, but agreement difficulties with host nations that eventually employed the weapon caused a stretch-out to 1 June 1961; then, 31 December; and, finally, some 2½ man-years of work to close out the program, that is, the Army part, by 30 June 1962.[16]

([redacted] Other matters of immediate concern involved the size of the program and the employment concept. Before these were resolved, a considerable expense was incurred because of the frequency requirements to effect over-all program revisions. At the outset, it appeared that the JUPITER would be a four-squadron program, and that each squadron would be mobile and capable of periodic movement to alternate sites to complicate the enemy attack problem. In August 1958, however, it was learned

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15. Ibid.; Hist, ABMA, Jan-Jun 58, pp. 48-50.
16. Ibid.; DF, Cont Off, ABMA, to R&D Liaison Off, ABMA, et. al., 28 Feb 58, subj: Proposed Inter-Service Agreement-JUP Msl Prog Mgmt US Army-US AF, Hist Off files; JUP Chronology; SAC SM-78 (JUP Opnl Plan, as revised, 4 Mar 62; Case History, Hist of the JUP Tng Prog, pp. 20-21, Hist Off files.

that the Secretary of the Air Force had designated $225 million for FY 1959 in the JUPITER portion of the IRBM program rather than $299 million that had been programmed by ABMA. This meant that only a three-squadron program was planned, as opposed to the four; although it was October before this fact was known. Almost paralleling this action was a USAF notification on 12 November 1958 to the effect that tactical mobility was no longer considered a part of the program. A clue to this situation had been received some two months before when SAC changed the deployment plans for the first squadron to two launch positions of three emplacements each. All through the time frame covered in these changes, ABMA had been forced to program and reprogram because of the piecemeal way the information came to the Agency. With regard to the mobility part, termination costs for contracts already in force were rather high. Thus, in reality, two years had elapsed before ABMA could determine the exact direction that the JUPITER program would pursue. After that, the requirement still existed to conclude the government-to-government and technical agreements. This had a serious effect on ABMA training plans and facilities.[17]

(U) Although there was considerable lost motion, that is, from a planning standpoint, hardware work and training progressed rapidly during 1958. SAC activated its 864th Strategic Missile Squadron (SMS), later redesignated as Technical Training Squadron (TTS), on 15 January at ABMA. This unit began its training program in March. This was followed by activations of the 865th on 2 June and the 866th on 1

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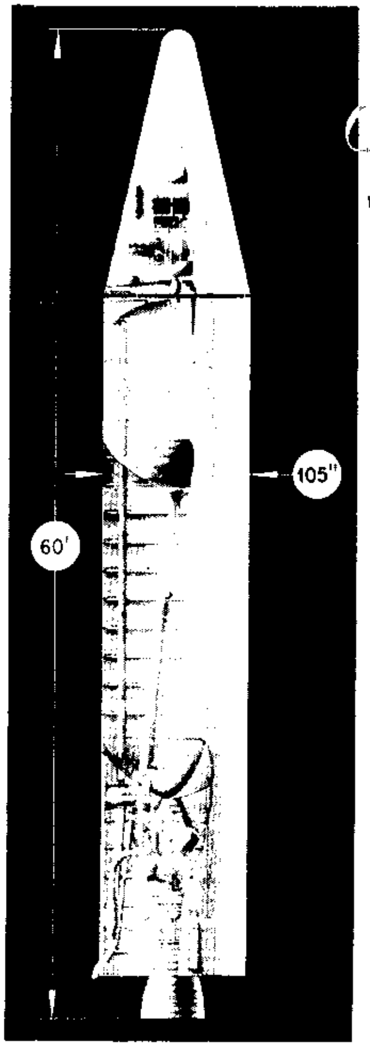
17. Hist, ABMA, Jul-Dec 58, pp. 8-11; Major Decisions Affecting the /JUP/ Pro: .

September. As to the hardware, the first IOC weapon, Missile 101, was delivered to the Air Force on 28 August, a week before the scheduled date, and deliveries of Missiles 102, 103, and 104 were made in September. Moreover, on 18 May, the Navy recovered a tactical JUPITER nose cone, proving that ABMA had been correct in its ablation theory. Yet, although men were trained and missiles were ready at the end of December, there was no place to go, as agreements with host nations had not been signed.[18]

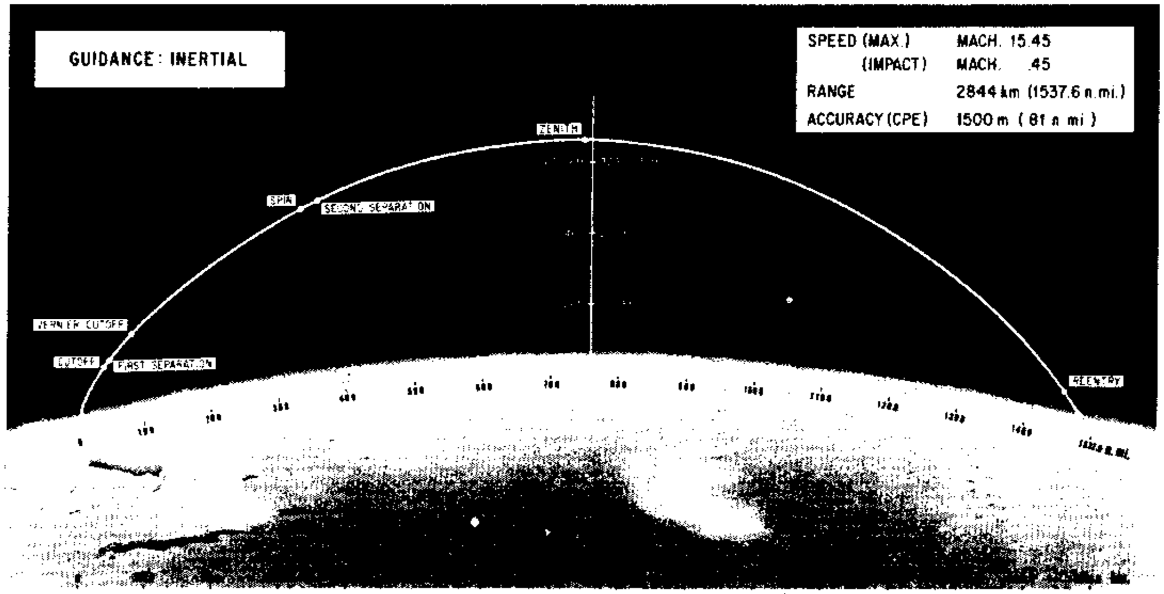
18. Hist, ABMA, Jan-Jun 58, pp. 49-50, 74-76; Hist, ABMA, Jul-Dec 58, pp. 10-12.

MISSILE AND TRAJECTORY

MAIN CHARACTERISTICS



WEIGHT (APPROX.)		MAIN ENGINE CUTOFF	VERNIER CUTOFF (AVERAGE)	ZENITH	RE-ENTRY	IMPACT
TOTAL MSL. DRY	10,715 lbs.					
NOSE CONE	2,617 "	V 4,563.5 m/s	V 4,521.2 m/s	V 3,454.4 m/s	V 4,660.3 m/s	V 165.86 m/s
FUEL : LOX	67,645 "	Y 123 km.(66.4 n.mi.)	Y 163.9 km.(88.5 n.mi.)	Y 660 km.(356.9 n.mi)	Y 100 km.(53.99 n.mi.)	Y 0
RP-1	30,209 "	X 134.5 km.(72.58 n.mi.)	X 193.6 km.(104.6 n.mi.)	X 1,414.5 km.(764.1 n.mi.)	X 2,733 km.(1473.7 n.mi.)	X 2844 km.(1537.6 n.mi.)
AT IGNITION	108,804 "	t 157.8 sec.	t 173.8 sec.	t 550 sec.	t 950.5 sec.	t 1,016.9 sec.



J-691
13 MAR 60

DOWNGRADED AT 3 YEAR INTERVALS
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

[redacted]

V. ([redacted]) THE MISSILE

Description

(U) With its travels from service to service, the configuration of the Army's long-range or IRBM missile changed significantly. As first conceived, when it would have been used exclusively by the Army, its suggested length was better than 92 feet. The entrance of the Navy into the program forced a drastic change in order to make the missile more compatible with Naval operations. In fact, the Navy's goal was a missile as near to 50 feet in length as possible, but the final figure was 58 feet and a diameter of 105 inches, or 10 inches greater than the Army-planned missile.

([redacted]) Following the departure of the Navy, and the awarding of JUPITER control to the Air Force, the possibility of a configuration change arose, since the system would now be land-based exclusively. However, development progress had reached a technical point where changes of great scope were unnecessary. So the length of the missile was increased by only two feet to an over-all length of 60 feet. The diameter remained the same, as did the range. Some changes were made, such as the elimination of the inertial fuze in the warhead section, leaving the proximity and impact fuzes; and the elimination of the radio-inertial guidance scheme from the program, leaving only the all-inertial system.[1]

([redacted]) As to other missile vital statistics, the JUPITER was a single-stage, liquid-propelled, rocket-powered ballistic missile, designed to

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1. For complete statistics, see Appendix 5, subj: JUP Msl Fact Sheet - 1959.

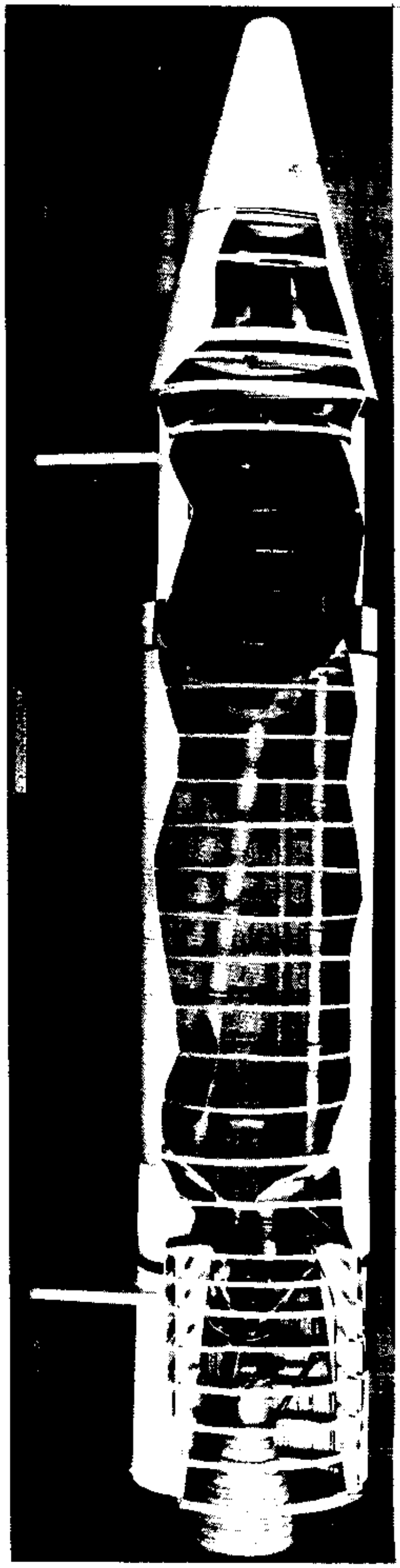
[redacted]

carry a 1,600-pound payload to a maximum range of 1,500 nautical miles, with a 1,500-meter circular probable error (CPE). It was composed of three major assemblies: the nose cone, the aft unit with instrument group, and the thrust unit. Structural loads were divided between the missile skin and a number of Z-ring stiffeners. The ablative heat-protected nose cone contained the warhead, fuzing and arming device, and related power equipment. G&C was housed in the aft unit, with the exception of such components as the swiveling actuators for the main rocket engine. Vernier engine spin rockets and jet nozzles for spatial attitude control were also located in the aft unit. When the nose cone and aft unit were joined, it became the missile body. The thrust unit was made up of a center unit containing the propellant tanks and feed lines, the rocket engine, and the tail section. The tail section also contained cabling and propulsion system accessories.[2]

(U) Propulsion of the JUPITER was accomplished by an NAA rocket engine (NAA-150-200-S-3D) rated at 150,000 pounds of thrust. Fuels used were liquid oxygen (LOX) as the oxidizer and kerosene or RP-1 as the propellant. The engine was mounted on gimbals which allowed a pitch or yaw movement up to plus or minus seven degrees. This action was produced by an electro-hydraulic actuator system which received its signals from the G&C system. Propellants were fed to the main engine by two turbine-operated pumps, which operated on a gas produced in a LOX-RP-1 gas generator. The generator was fueled from the main propellant tanks.

2. Standard Msl Characteristics, SM-78B JUPITER, released by auth Secy AF, 16 May 60; SACOP 1-58, 4 Mar 58, Hist Off files.

[redacted]



CUTAWAY OF THE JUPITER MISSILE SYSTEM

[redacted] Besides serving as the thrust agent for the missile, propellants were also important in missile control. For example, the thrust unit effected roll control by deflecting the exhaust gases from the turbine and swiveling the turbine exhaust nozzle. A second unit was the vernier thrust system that was mounted on the aft section of the body to provide fine control of cutoff velocity of the body immediately after separation from the thrust unit. This was accomplished by a solid propellant unit rated at 500 pounds of thrust and capable of operating for 20 seconds. While the missile was out of the sensible atmosphere and had already separated from its thrust unit, eight jet nozzles equally spaced on the missile body provided pitch, yaw, and roll. These jets were off-on types, and were powered by nitrogen from storage bottles housed in the body. This formed the spatial attitude control system.

[redacted] To depict the operation of the propulsion system during a typical flight, the missile was launched vertically and then was tilted gradually by a guidance program device into a ballistic trajectory. Trajectory was divided into four major phases: main power, vernier, spatial attitude control, and re-entry. While in the main power phase, the missile was controlled in pitch and yaw by hydraulically activated swiveling of the rocket engine, and in roll by the thrust unit roll control system. Separation of the body and thrust unit then occurred when the main rocket engine cut off, and then the missile was in its vernier phase. The vernier engine now operated to control missile velocity along the trajectory until the slant range computer in the G&C was satisfied. All during this time, the spatial attitude nozzles were helping maintain control, and were especially preparing for the re-entry phase. When the correct attitude was achieved, two spin rockets [redacted]t the base of the body were activated to impart a 60-rpm rotation to the body, and, upon attaining this rate, nose cone separation occurred. No controls were exercised on the nose cone after separation because of the high Mach re-entry speed.

([redacted]) G&C was accomplished by an all-inertial system that was based on the principle of constraining the missile as closely as possible along a precalculated standard trajectory. This work was done by a null-seeking system that continuously compared actual experience data with that which had been precalculated. Then, attempts were made to eliminate the errors by gimballing the engine and signaling the main and vernier cutoffs at the appropriate times.

([redacted]) Total flight time for the JUPITER for a maximum range firing was 1,016.9 seconds. At the end of 70 seconds from lift-off, the missile experienced its maximum dynamic pressure (13.69 G's) during the rise, and main engine cutoff occurred at the end of 157.8 seconds at a speed of Mach 13.04. Separation of the thrust unit and the vernier start happened at 161.8 seconds, and vernier cutoff was at 173.8 seconds. Nose cone separation occurred at 339.3 seconds, and the nose cone reached its zenith at 552 seconds. Re-entry began at 950 seconds (Mach 15.45) at about 100 km's in height, and maximum dynamic pressure (44 G's) during the descent was exerted at 980 seconds. Then, impact occurred at the previously cited 1,016.9 seconds when the aerodynamic drag had reduced the speed to Mach .49.[3]

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3. Ibid.; See Appendix 5.

[redacted] After the mobility operational concept was deleted, the mode of employment was from static sites. A continuous capability to salvo all 15 missiles allocated to a squadron within 15 minutes after receipt of the execution order was to be maintained. This meant that the missile had to be in a 15-minute readiness condition at all times. Squadrons would deploy around a single support base on five outlying launching positions. Each launch position would contain three emplacements, comprised of three missiles, three launchers, and one triple launch control trailer (LCT). This became known as the three-by-five configuration. No alternate positions were provided, and no tactical movement of launch positions was planned.[4]

Development Program

Nose Cone

(U) As earlier mentioned, nose cone re-entry into the sensible atmosphere was recognized by ABMA at the beginning of its operations as a difficult technical problem to resolve, so this task was undertaken immediately. From German rocket history, ABMA scientists knew that, from a height of 107 miles, re-entry thermal heat was such that melting would occur. After the war, high altitude probes at WSMR met with these conditions. When the JUPITER was approved, the developers knew that missile ranges in excess of 250 miles would meet with this re-entry factor. Since the JUPITER was to be a 1,500-mile weapon system, the problem was compounded because of the higher Mach rate needed to

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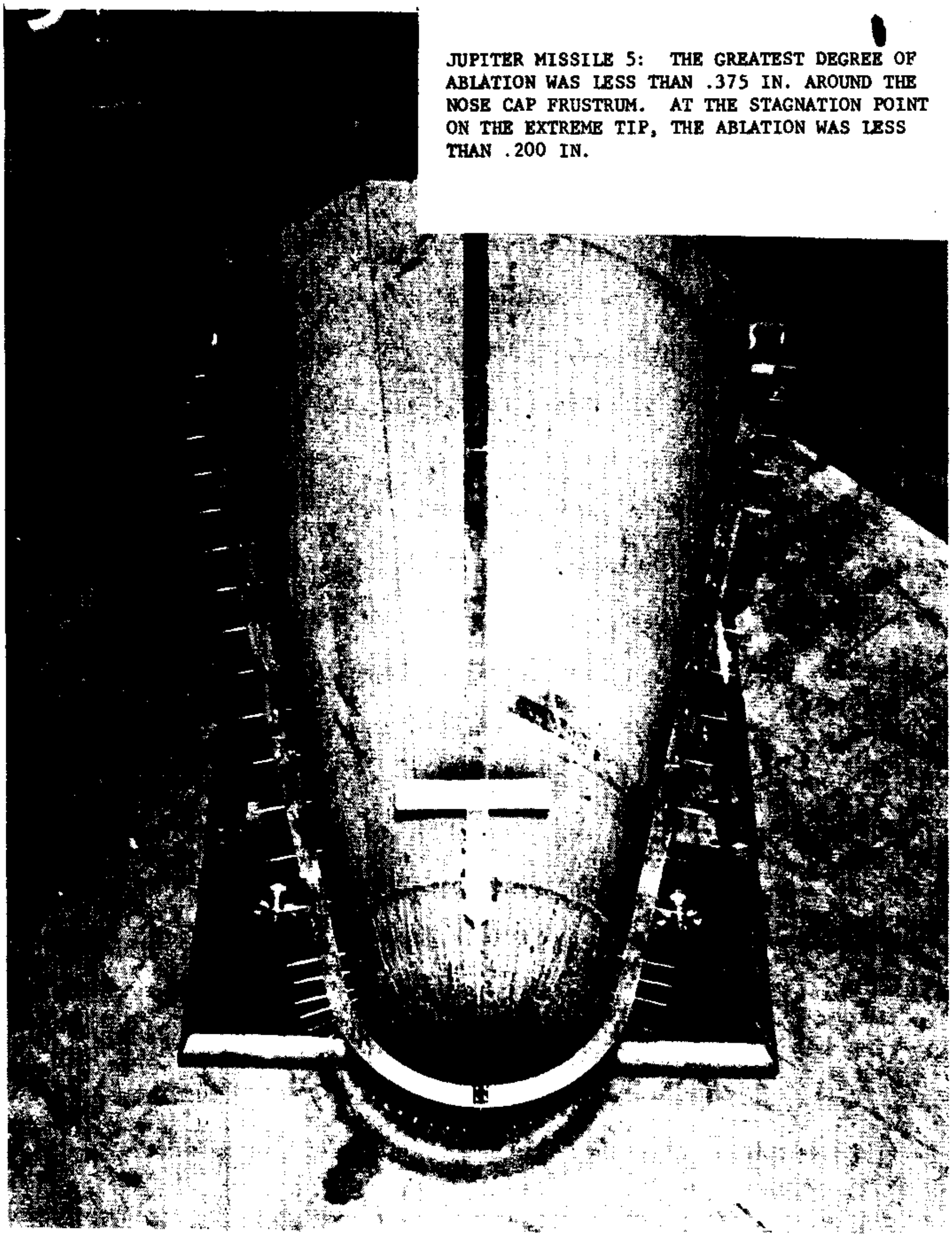
4. USAFE Op Plan, 1960.

[redacted]



JUPITER MISSILE 5: THE GREATEST DEGREE OF ABLATION WAS LESS THAN .375 IN. AROUND THE NOSE CAP FRUSTRUM. AT THE STAGNATION POINT ON THE EXTREME TIP, THE ABLATION WAS LESS THAN .200 IN.

[redacted]

reach the increased distance. At that range, steel would have been easily melted in the thermal barrier.

([redacted]) ABMA initially began work by screening potential materials and methods, and testing these materials with jet burners. From this, they chose what seemed the best. Four protective methods were explored: ablation, heat sink, radiation, and transpiration. Ablation proved promising, so an investigation of plastics, fibers, and ceramics was started. To flight test the findings, three scaled-down models were constructed, and the first was flown on the IRBM demonstration flight in September 1956. No recovery attempts were made, but, according to telemetry data, the model functioned well. Recovery efforts were scheduled for the Missile Number 34 shot in May 1957; however, the mission was not fulfilled because the REDSTONE booster failed. Missile Number 40, fired in August, was completely successful, and the nose cone was recovered close to the predicted impact range of 1,100 nm. Other shots were unnecessary, and the scaled-model tests were concluded. The ablation principle had been proven.[5]

(U) ABMA now began to work toward the full-scale nose cone re-entry. Missile AM-5 launched on 18 May 1958 registered a re-entry success. Recovery of the full-scale nose cone in good condition by the Navy marked a significant step forward in the state-of-the-art of this nation's long-range missile development programs. Also interesting was the fact that re-entry was visible to on-site observers. This was followed by a July firing—Missile AM-6—and recovery. The most famous of the re-entry

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5. Rpt, Re-Entry Studies, 25 Nov 58, Vol I.

[redacted]

tests, however, was JUPITER Missile AM-18 fired on 18 May 1959. Contained within the nose cone were two primates, designated Able and Baker, that survived their flight in excellent condition. Thus, not only was ABMA's ablative theory ably demonstrated, but life could pass through outer space and be safely brought back to the earth.[6]

[redacted]. Re-entry could have posed a problem from another standpoint—aerodynamic stability—but fortunately no difficulties appeared. Configuration was responsible for this successful development. As to the vital details, the nose cone had a 12.5-inch radius spherical tip joined to a cone frustrum of 65-inch base diameter, with an over-all length of nine feet. The nose cone also had a rear cover shaped in the form of a shallow-dished (convex outward) bulkhead, and this was the key part to providing aerodynamic stability for any attitude to re-entry. Tests of this configuration were first made in wind tunnels; then, on the scale re-entry models; and, finally, on the full-scale JUPITER. Thus, from re-entry to impact, the nose cone was a stable component.[7]

Guidance and Control

(U) At the outset of the JUPITER development program, two G&C schemes were under consideration: the all-inertial guidance system and the radio-inertial guidance system, with the latter being considered as the alternate or back-up means. Subsequently, in 1958, the radio-inertial part of the program was canceled, for development efforts in

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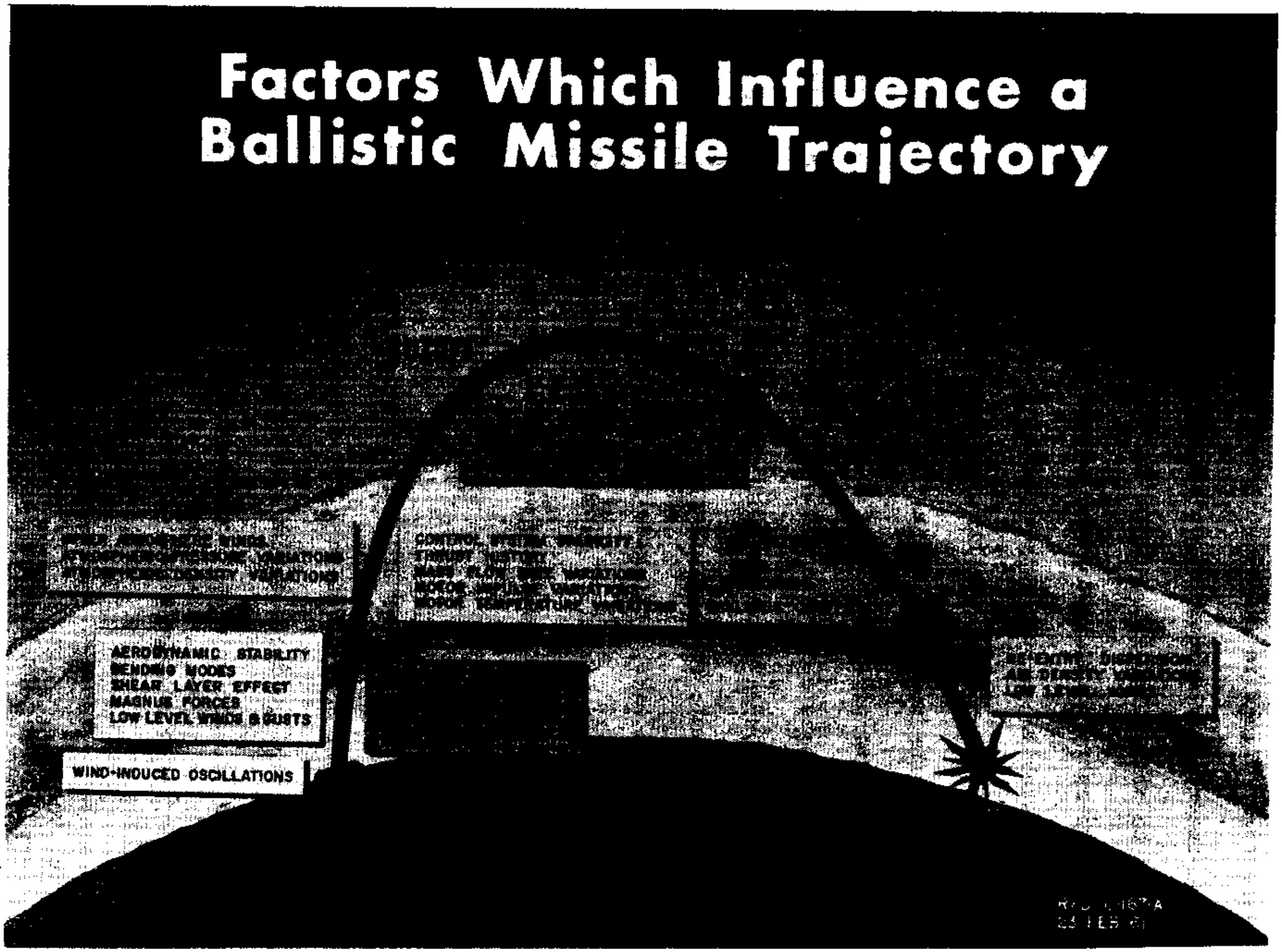
6. Ibid, Vol II.
7. Ibid.; JUP Prog Rpt for Aug 56, 5 Sep 56; Present, Aeroballistic Aspects of the Re-Entry Phase, Present for Scientific Advisory Committee for DOD, 14 Jan 57, Hist Off files.

[redacted]


Factors Which Influence a Ballistic Missile Trajectory
AERODYNAMIC STABILITY
BENDING MODES
SHEAR LAYER EFFECT
MAGNUS FORCES
LOW LEVEL WINDS & GUSTS
WIND-INDUCED OSCILLATIONS

the all-inertial area had progressed systematically and successfully. Thus, although ABMA and JPL did laboratory work on the radio-inertial system from September 1957 until its cancellation, principal attention will be devoted to all-inertial development.[8]

[redacted]) The JUPITER all-inertial guidance system development program was based heavily on the success of the tried and proven REDSTONE G&C system. From the beginning, this move appeared to be logical as the best means to meet such multiple requirements as simplicity, reliability, mobility, jamming resistance, and availability of components. Work assigned to this system involved constraining the system along a ballistic trajectory from liftoff to impact, and the principal component that performed this function was the gyro-stabilized platform (ST-90). Important to and located on the ST-90 were three air-bearing supported accelerometers that measured acceleration on the missile in three directions. Primarily, these were needed to detect and act on external forces that might influence the trajectory. To some extent, certain forces such as standard thrust of the propulsion system, aerodynamic drag, and separation forces could be determined before firing, and, if the missile had only these to contend with, the trajectory would be standard and the G&C problem simple. But non-standard forces, which were quite unpredictable from either points in time or space, did exist and some means had to be available to start a proper reaction. Examples of the non-standard type include wind gusts and deviations in thrust. Thus, the problem at hand, when occasioned by these external forces, was

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8. DF, RIG Off, G&C Lab to IO, et. al., 24 Mar 58, subj: Cancellation of RIG Program, Hist Off files.

to bring the missile from its actual trajectory to that desired in order to assure a CPE of not greater than 1,500 meters. Since guidance was not feasible during the re-entry phase, these problems had to be solved before nose cone separation.[9]

([redacted]) There wére also several other major components that mad[redacted] up a part of the G&C system. One of these was the guidance computer, which was packaged outside the ST-90 because of weight. This unit received its input from a gyro accelerometer, and was concerned with distance and speed information. A programming device was responsible for tilting the missile in pitch and compensating for environmental conditions experienced during the trajectory. All information was then fed into the control computer—attitude information from the ST-90, angle-of-attack signals from the angle-of-attack meter, and guidance signals from the guidance computer—which assimilated the information and signaled the hydraulic actuators for such actions as swiveling the main and vernier engines or operation of the jet nozzles.[10]

(U) The target date to accomplish firm G&C plans was November 1956, and this was met. Specifications were furnished to the Ford Instrument Company for the delivery of the ST-90 in January 1957. A testing program was then under way until October 1957, when JUPITER Missile 3 was used to flight test the ST-90 and related components. It worked.[11]

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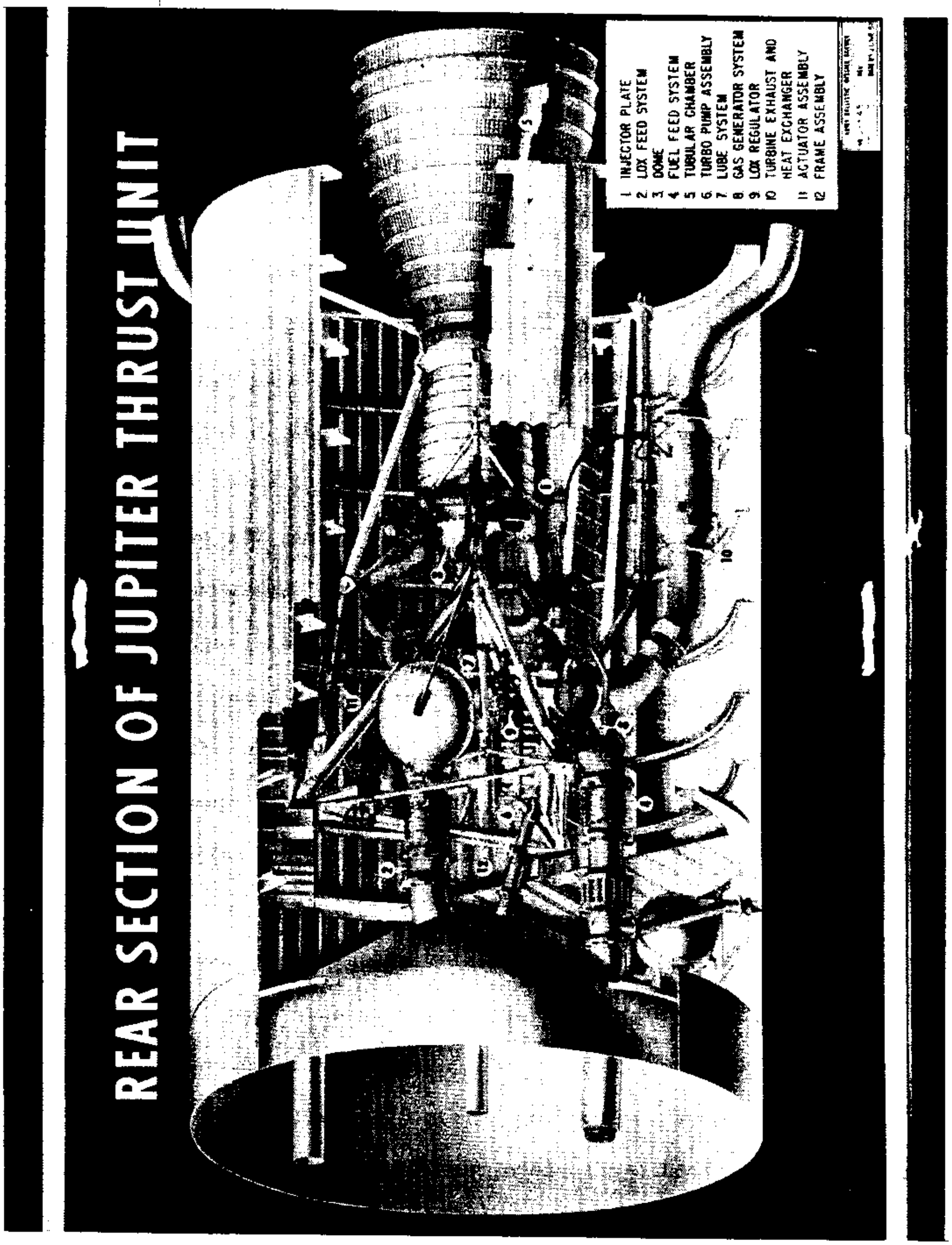
9. Haeussermann, Dr. Walter, the JUP All-Inertial G&C Scheme, 5 Dec 56, Hist Off files.
10. Ibid.; JUP Dev Plan, FY 58, 29 Sep 56, Hist Off files.
11. JUP Prog Rpt for Nov 56, 8 Dec 58; JUP Prog Rpt for Oct 57, 8 Nov 57, Hist Off files.

Propulsion System

(U) Perhaps one of the most difficult of the development problems to resolve was in the propulsion area, an item over which ABMA had the least control. The heart of the system was the main engine, a component commercially produced by NAA. As earlier mentioned, the supply source was saturated in satisfying the demands of four long-range missile systems. Since the Air Force was in charge of the development of three, ABMA's requirements had considerable difficulty in being met. Also, ABMA thought that the NAA engine was only marginal in satisfying JUPITER needs, yet there was little opportunity for NAA to enter into a large-scale research program. To ABMA's way of thinking, the over-all engine program should involve one in production, one in development, and one in advanced design and component developments.[12] Although DOD people were studying long-range needs for new and higher thrust rated engines, this did not solve ABMA's problem of the moment. This meant that ABMA had to "make do" with the then present NAA engine and suggest modifications to suit the JUPITER missile. Modifications included such items as thrust governing and throttling.

(U) As to the method of propulsion system operation, the main 150,000-pound-thrust engine used LOX and kerosene. The thrust chamber was of tubular wall-type construction, with a self-impinging fuel injector and a regenerative cooling system. Gimballing the engine, which was coupled to hydraulic actuators, permitted missile control in pitch and yaw. There were several engine sybsystems. One of these was the

12. Study, Liquid Rkt Engine Dev Prog, 19 Jul 56, Hist Off files.


REAR SECTION OF JUPITER THRUST UNIT
1 INJECTOR PLATE
2 LOX FEED SYSTEM
3 DOME
4 FUEL FEED SYSTEM
5 TUBULAR CHAMBER
6 TURBO PUMP ASSEMBLY
7 LUBE SYSTEM
8 GAS GENERATOR SYSTEM
9 LOX REGULATOR
10 TURBINE EXHAUST AND HEAT EXCHANGER
11 ACTUATOR ASSEMBLY
12 FRAME ASSEMBLY

propellant feed system that delivered the propellant from the tanks to the thrust unit by means of valves and a turbopump. Also, the propulsion contained a lub oil system to lubricate the moving parts. A pneumatic pressure system was used to operate the valves, and a hydraulic system operated the gimballing unit.[13]

(U) In the first stages of development, the vernier engine of the propulsion system was fueled mainly with hydrogen peroxide—90 per cent—and a 10 per cent catalyst; but, starting with the firing of JUPITER AM-7 on 27 August 1958, a solid propellant engine was adopted. The vernier unit consisted of an engine case that housed the propellant and served as the combustion chamber, a pyrogen unit for engine ignition, a nozzle, and a thrust termination device. Unlike the main engine, all components formed one unit. In operation, the vernier engine ignited two seconds after separation from the main thrust unit. The vernier unit then propelled the missile body until the desired velocity was attained, and when this requirement was satisfied, cutoff occurred. Squibs were used for the thrust termination device, and the engine nozzle was blown away.[14]

(U) Although the two foregoing units were the major portion of the propulsion system, other devices, already discussed in part, were equally important in solving the target range problem. These included a missile roll control system, and a spatial attitude control system.

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13. JUP Dev Plan, FY 58, 29 Sep 56.
14. ABMA Rpt DSD-TR-4-60, Vernier Engine Operation, 21 Jan 60, Hist Off files.

(U) NAA delivered its first nonflyable main engine to ABMA in July 1956, and the Agency began a static test program in September. At first, the tests progressed smoothly with a number of static firings lasting for several seconds; but, by November, four thrust chambers had burned out, causing delay while ABMA and NAA were investigating the problem. Strengthening modifications to the thrust chamber eliminated the difficulty, and in January 1957 the static testing program was progressing satisfactorily.[15]

(U) ABMA received its first flyable engine in September 1956; and, during inspection, a number of design deficiencies were noted. Within a short time—November—the second engine was delivered. Both of the engines were down rated by ABMA from 150,000 pounds to 135,000 pounds because the turbopump was not satisfactory. NAA was already in the process of modifying this unit, and two pumps were subjected to prolonged tests with satisfactory results. However, because of the critical supply of these engines, the first JUPITER missiles had to fly with the lower thrust units. In fact, while procuring the first four flyable units, the situation was far from being satisfactory to ABMA. For one thing, procurement had to be effected through WDD, which caused an undue administrative workload. Then, the uncovering of the technical design deficiencies created a severe problem in assuring the timely delivery of spare parts and modification kits. One problem had, in turn, created another. NAA was supposed to have been able to ship the missiles completely modified to ABMA in January 1957, but it was several

15. JUP Dev Plan, FY 58, 29 Sep 56; JUP Prog Rpt for Nov 56, 8 Dec 56; JUP Prog Rpt for Jan 57, 8 Feb 57, Hist Off files.

months after that. Engine modifications of late 1956 and 1957, however, appeared to be quite successful. This was aptly demonstrated in one instance during a static test at NAA, when a unintended overrun to 195,000 pounds of thrust happened. The turbopump and the thrust chamber did not show any damage.[16] From time to time, however, technical problems, including the turbopump, did crop up.

[redacted] Another major propulsion system problem concerned propellant sloshing. This condition was uncovered during the firing of JUPITER 1B, the second JUPITER missile fired. After a normal liftoff and up to 70 seconds, the flight program was normal, but then oscillations in pitch and yaw began to build up and the missile disintegrated at 93 seconds. Heavy instrumentation immediately located the difficulty, and data showed that propellant sloshing was caused by the tilting program to such a degree that the missile became dynamically unstable.[17]

[redacted] A rather ingenious testing device was rigged by ABMA in the attempt to cope with the sloshing problem. A JUPITER center section was placed on a railroad flat car, with proper attachments that would simulate flight environment forces on the propellant tanks, and several types of baffles were placed inside the tanks as a means to reduce the sloshing. Success was attained by installing a turncated-cone type in the fuel tank and an accordion type in the LOX tank. The full-scale IRBM flight of JUPITER 1 in May 1957 aptly demonstrated two major points: (1) quick reaction of an in-house R&D team and the resulting brevity in

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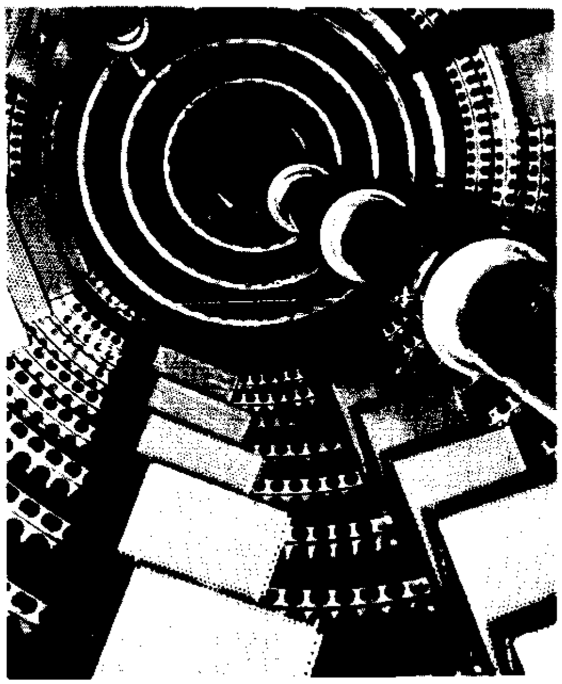
16. Ibid.; JUP Prog Rept for Apr 57, undated; JUP Prog Rpt for Aug 57, 6 Sep 57, Hist Off files.
17. Hist, ABMA, Jan-Jun 57, pp. 42-46; JUP Prog Rpt for May 57, 6 Jun 57; JUP Prog Rpt for Oct 57, 8 Nov 57, Hist Off files.

A. The truncated-cone baffle design installed in the JUPITER fuel tank.

B. The accordion baffle design installed in the JUPITER LOX tank.



time between problem isolation and component fix, and (2) the validity of heavily instrumented R&D flights.

(U) The above represented the major problem areas in the propulsion system development program. This is not to say that problems of the moment were not experienced with other components. For example, during the early flights of the solid propellant vernier engine, some failures did occur, but quite often it was hard to tell whether or not the difficulty had been caused by main engine failures. In any event, development progress was not deterred by the other propulsion components, which never became major problem areas.

Ground Support Equipment

(U) Difficulty in the GSE development of JUPITER came to pass for reasons that were other than technical. At the outset of the program, the DOD dictum was strictly confined to developing the IRBM and nothing was said about GSE. (This was quite a contrast to the THOR program, in which missile and related GSE development progressed almost simultaneously.) This situation existed all through 1956 and until October 1957, when DOD directed weapon system development. A target date for deployment to an overseas site was set for December 1958. Although the Agency was pleased that the JUPITER was finally headed toward weaponization, the impact in view of the time phase was critical on GSE and training. This meant that within a minimum of 12 months, GSE would have to be designed, fabricated, and tested, and personnel trained in its use.

Just before the DOD decision was released, the ABMA technical group estimated that JUPITER GSE was about one year behind Air Force efforts.[18]

(U) This was not the end of the complications, either. For one thing, the employment concept changed. To attain the early operational capability, the Air Force went along with the Army idea of mobility, as opposed to the fixed site operation they supported. ABMA immediately went to work on mobile GSE, which was not too difficult because they had REDSTONE equipment to serve as a pattern. The main problem in the mobility phase was expediting contractor delivery, for, more often than not, reports constantly cited that such-and-such a component was late in delivery. This caused concern as the deployment date was rapidly approaching. Added to this, the mobility concept was deleted in November 1958.[19] Some of the tension was relaxed, however, for by that time it was realized that the necessary agreements would not be signed in time for the December employment. This afforded an opportunity for equipment refinement and matching and mating work. On the other hand, this stretch-out indicated that measures would have to be taken to adequately store missiles and equipment until the agreement was consummated.

(U) Mention has been made of the fact that ABMA technical experts considered JUPITER GSE to be one year behind. In some respects, the problem was not as adverse as this connotes. For example, from the

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18. Hist, ABMA, Jan-Jun 58, pp. 48-49; Fact Book, /Compilation of Documents on/ Opnl Acceptability and GSE, Aug & Sep 57, Hist Off files.
19. JUP Mo Prog Rpts throughout 1958 constantly list late deliveries by the contractors. See Appendix 6 for the contractor break-out structure for fabrication in the development of the JUPITER missile system.

outset of the program, ABMA made a concerted effort to fabricate its R&D GSE in a design that would be suitable for tactical employment. This pattern held true with the launcher, transport equipment, and other JUPITER peculiar GSE components. With the in-house design and fabrication, necessary changes manifested during the R&D firing program could be integrated with ease, and each change moved the equipment nearer to the tactical configuration. During this systematic hardware buildup, it was also possible to design suitable checkout gear. Perhaps one of the most important assets during the GSE buildup phase was the on-hand experience in other large ballistic missile programs. Drawing on this experience, equipment was simplified. In this way, complex and expensive hydraulic erection was rejected for the better lightweight mode; a ring-type launcher was used rather than the more complicated fall-away leg type; and an inexpensive one-time use cryogenic cooler was selected over an expensive electric cooler for use in the countdown phase.[20]

(U) By April 1958, the first tactical type launcher had been completed and successfully tested with the lightweight erection equipment (primarily a long boom and cables). Shortly after that came R&D prototype items such as the launcher auxiliary rings, hydro-pneumatic trailer, azimuth laying equipment, intra-squadron communication equipment, supervisory control system, missile transporter, launcher transporter, LOX transfer trailer, propulsion components tester, and other related items of equipment involving both the physical handling and testing of the

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20. Spec Rpt on JUP GSE for Holaday Ad Hoc Committee, 3 Oct 57, Hist Off files.

missile. At the Design Engineering Inspection held on 7-10 October 1958, the GSE performed well and demonstrated that the JUPITER system could meet the 15-minute countdown-to-liftoff sequence.[21]

(U) Progress in the GSE field was far from systematic, though. Basically, the problem was delivery of the tactical item by the manufacturer after the prototype had been submitted by ABMA for fabrication. Also, the Air Force had submitted more than 70 alteration requests, which, in part, may have caused some of the manufacturing difficulties. Then, in November 1958, the mobility factor was deleted from the JUPITER program. This meant there would be a triple launch control trailer (LCT), as opposed to the single LCT that was necessary in a mobile weapon system. Additionally, this action eliminated the cable and launcher transporters.[22] Together, all of these actions could have delayed the deployment of the system until reorientation plans could have been completed, but the lack of agreement with the host country, in the long run, provided ample time.

Production and Delivery

(U) As may be surmised, production plans for the JUPITER program were as changeable as all other facets of operation. In the beginning, a 50-missile test program was planned involving a composite of JUPITER C's for re-entry vehicle tests, JUPITER A's for component testing, and the JUPITER configured missile. During this time, ABMA was involved in a production schedule of about two missiles per month. The roles and

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21. JUP Prog Rpt for Apr 58, 8 May 58; JUP Prog Rpt for May 58, 8 Jun 58; JUP Prog Rpt for Oct 58, 8 Nov 58, Hist Off files.
22. JUP Prog Rpt for Nov 58, 8 Dec 58, Hist Off files.

missions statement of November 1956 posed the initial threat to the program, and the withdrawal of the Navy in January 1957 further placed the program in a precarious position. However, it was August 1957 before the Secretary of Defense directed that the production schedule be limited to one missile per month, pending a decision as to the IRBM that would be selected for weaponization.[23]

[redacted] The Secretary's decision was in effect for only a short time, for in October 1957 weaponization of the THOR and the JUPITER was directed. In turn, this released the production schedule to the two missiles per month immediately, and, on 27 November, notice was received that production was to be held to a maximum of five JUPITER missiles per month.[24] Briefly, the total program, that is, R&D and IOC, was set at 125 missiles. After that, for one reason or another, adjustments were made upwards and downwards.

[redacted] During most of FY 1958, that is, after the program was refined subsequent to the October 1957 decision, the approved program called for 36 R&D missiles, 62 IOC missiles, ground equipment for three squadrons, and prototype and training equipment. Here, the program had been influenced by the budgetary cut first evidenced in August 1958 and the reduction from four JUPITER squadrons to three the following October. This was not the end, for budgetary cuts in December 1958 again reduced the program when five of the R&D missiles were deleted. At that time, the allocation line-up included 11 R&D, 20 reliability and product

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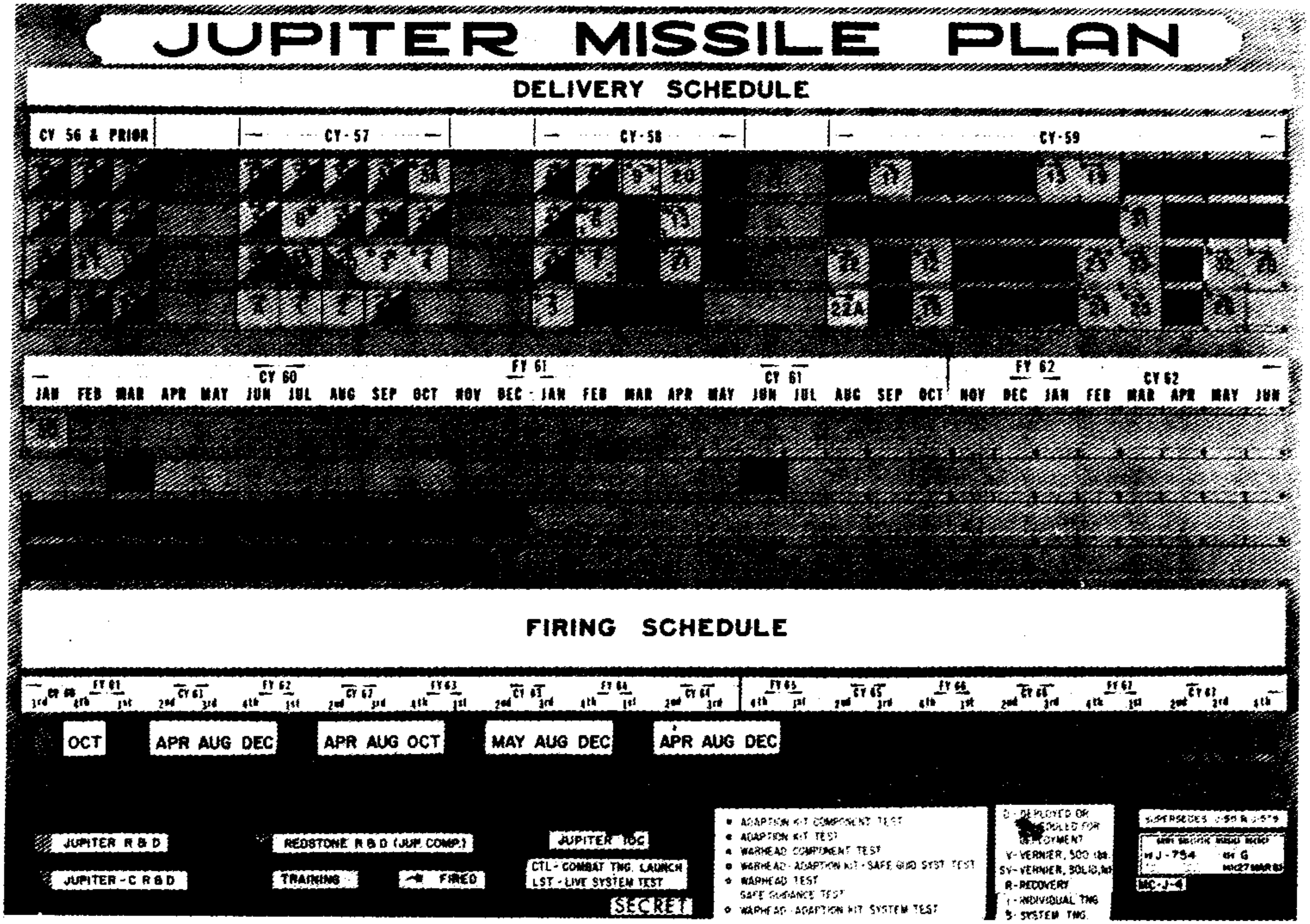
23. Plan, ABMA Plan for IRBM-2 Msl Dev, FY 56-57, 23 Feb 56; Memo, S/D to S/A, 13 Aug 57, subj: IRBM Prog, Hist Off files.
24. Msg, DA to ABMA, 27 Nov 57, Hist Off files.


JUPITER MISSILE PLAN
DELIVERY SCHEDULE
CY 56 & PRIOR
CY-57
CY-58
CY-59
CY 60
FY 61
CY 61
FY 62
CY 62
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN
FIRING SCHEDULE
OCT
APR AUG DEC
APR AUG OCT
MAY AUG DEC
APR AUG DEC
JUPITER R & D
JUPITER-C R & D
REDSTONE R & D (JUP. COMP.)
TRAINING
FIRED
JUPITER IOC
CTL - COMBAT TNG. LAUNCH
LST - LIVE SYSTEM TEST
SECRET
ADAPTION KIT COMPONENT TEST
ADAPTION KIT TEST
WARHEAD COMPONENT TEST
WARHEAD - ADAPTION KIT - SAFE GUID SYST TEST
WARHEAD TEST
SAFE GUIDANCE TEST
WARHEAD - ADAPTION KIT SYSTEM TEST
V - VERNIER, 500 lb.
SV - VERNIER, SOLID
R - RECOVERY
I - INDIVIDUAL TNG
S - SYSTEM TNG.
M J - 754
MC-J-4

[redacted]

improvement, and 62 IOC. During the latter half of 1959, another missile was removed, which left the total program figure at 92. From there, the figure went to 93, and finally 94. Fifty-nine GSE sets made up the total program in that respect.[25]

(U) Deliveries of the IOC missiles to the Air Force began on 28 August 1958, and, at that time, 31 other JUPITER missiles were in various stages of fabrication at the Michigan Ordnance Missile Plant and ABMA. From August until November 1958, ABMA continuously reported that sufficient IOC missiles would be ready to meet the December deployment date of the first squadron. However, the lack of a firm agreement with the host country caused DOD to direct a delivery stretch-out. In this case, money could be saved, as the necessity for contractor overtime was considerably reduced. Also, the opportunity was presented to iron out technical difficulties that had arisen in the NAA propulsion system. When the agreements with NATO I were concluded in August 1959 with an operational readiness date of 1 May 1960, there was ample time to deliver required missiles by the cheaper surface shipment rather than the expensive air shipment that had been planned for the December 1958 deployment. By the time the agreements with NATO II had been concluded, the total production program was ready for delivery.[26]

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25. Hist, ABMA, Jul-Dec 58, p. 8; DF, Ind Planning Off to Procurement Div, 4 Dec 58, subj: Adjustments to JUP Msl Pro., Hist Off files.
26. <u>Ibid</u>.; JUP Prog Rpt for Nov 58, 8 Dec 58; Hist, ABMA, Jan-Jun 60, pp. 69-70; Hist, ABMA, Jul-Dec 60, p. 56, Hist Off files.

[redacted]

Missile Testing Program

(U) One of the more amazing factors in the JUPITER development program was the small amount of time that elapsed between program approval and the actual flight testing of a missile that resembled the final tactical configuration—November 1955 until March 1957. By comparison, the time frame was even more compressed than the REDSTONE program—July 1950 to August 1953—but this system was the key to the JUPITER success story. In many respects, JUPITER components were product improvements of REDSTONE counterparts.

(U) During the previously-mentioned missile study years of 1954 and 1955, the Redstone Arsenal group had made wind tunnel tests of model missiles of every conceivable shape and form. Added to this, they had the flight analysis of the REDSTONES. So when the JUPITER requirement came along, they knew what configurations would fly. Even the forced reduction in length had no ill effects on the flight behavior pattern. Components within the shell followed the same "building block" formula. For example, the angle-of-attack indicator program dated back to 1952, and experience in this work was important in view of the lack of control of the re-entry body. Speaking of the nose cone, even this configuration was solved within six months of program inception, and the protective means by way of ablation was solved in nine months. Practically every part of the missile had undergone an exhaustive testing program; and, thus, the JUPITER development phase was a refinement to meet the IRBM requirements.[27] As a result, the JUPITER could have been fired in anger

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27. Fact Book, subj: JUP Test Results, Tab A, 22 Sep 57, Hist Off files.

in 1958, and possibly in 1957—two years, more or less, after program approval.

(U) The actual flight testing in support of JUPITER development was divided into three phases. Two of these used the REDSTONE as the flight test vehicle to prove out JUPITER components. Designated as JUPITER A's, 25 missiles were fired between September 1955 and June 1958.* Objectives of these tests were to obtain design criteria, apply the angle-of-attack meter to the IRBM, evolve separation procedures, prove guidance system accuracy, and design and prove propulsion system thrust control. To solve the re-entry problem, three missiles designated as JUPITER C's were flown. As to the tally, 20 of the 25 JUPITER A's were rated as mission achieved, two registered partial successes, and three were considered to be unsuccessful. All three of the JUPITER C's performed well. On the second firing, an attempt was made to recover the nose cone, and this failed. However, on the third and last re-entry test, the nose cone was recovered. Success was such that it was no longer necessary to continue this phase of the program, as one of the tests had ably proven the theory of long-range missile flight and the other had demonstrated that the re-entry body could be brought from space into the sensible atmosphere without disintegrating.[28]

[redacted] At the outset of the JUPITER program, it was planned to fire the first JUPITER-configured missile in May of 1957, but the success

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* See Appendix 7 for a chronological listing of JUPITER A firing test results.

28. Ibid.; Hist, ABMA, Jan-Jun 58, pp. 87-90; Chart, JUP Msl Plan Nr J-754, 27 Mar 61, Hist Off files. JUPITER C firing test results may be found in Appendix 8.

registered by the JUPITER A's and C's formed the belief that two assurance missiles could be fired before the scheduled date. As it turned out, it was well this decision was made, for JUPITER 1A had a tail-heating problem and 1B had a propellant sloshing problem. These were solved and the May firing of JUPITER 1 gave the Western World its first demonstrated IRBM. Two successive firings registered in the success box, but Missile 3A met with the previously-mentioned turbopump problem. This difficulty continued with Missile 4; however, the system was back on the success trail with the firing of Missile 5. This event marked the recovery of the first full-scale re-entry body. All-in-all, the JUPITER R&D firing program was quite successful. Twenty-two were rated successful, five were partially successful, and only two were failures, for a total of 29 missiles. Also of significant note, 19 of the 29 were tactical prototypes and 16 of this group impacted within a CPE of 0.81 nautical miles.[29]

[redacted] After the close-out of the R&D firing program in February 1960, five JUPITER missiles were fired. One of these was termed a live systems test in which the missile was successfully fired under conditions approaching the tactical situation. The other four firings were designated as combat training launches (CTL) to promote proficiency and confidence of the NATO troops. Three of these firings were successful

29. Fact Book, Ball Msl Info & Firing Histories - JUP-JUNO, Vol I; Hist, ABMA, Jan-Jun 61, p. 54, Hist Off files. Firing test results of the JUPITER configured R&D missiles are listed in Appendix 9.

and one was partially successful. Eight other CTL firings were still scheduled as of 30 June 1962.[30]

Funding

[redacted] As might be suspected, the status of funds for the JUPITER program varied with the fortunes existing at a particular point in time. This covered the range from acceleration to the threat of program cancellation. At the outset, $10.720 million was allocated for R&D and $23 million for procurement and production (P&P) in support of the development program. Prior to the beginning of FY 1957, plans called for $25 million R&D, $11.534 million P&P, and a $25 million MCA program.[31] These funds were approved in September 1956, but at the same time, a statutory fiscal limitation was placed against the JUPITER program retroactive to 1 July. Compliance with this directive was almost an impossibility, as 20,000 documents had already been processed with installations throughout the country. ABMA immediately interposed a reclama to this directive, but it was January 1957 before the restriction was lifted.[32]

(U) Two events discussed earlier in the study—Navy pull-out and the DOD decision on roles and missions—caused further adverse action in JUPITER funding. The Air Force had no particular interest in being involved in the development of a second IRBM, and by mid-1957 the

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30. Hist, ABMA, Jul-Dec 60, pp. 56-57; Hist, ABMA, Jan-Jun 61, pp. 51-52; Hist, ABMA, Jul-Dec 61, pp. 39-41, Hist Off files; Info supplied by REDSTONE-CORPORAL Project Off, AOMC, 26 Jun 62; Chart, JUP Msl Plan Nr J-754, 27 Mar 61. Appendix 10 contains both the LST and CTL firing test results.
31. Hist, ABMA, Feb-Jun 56, p. 67.
32. Hist, ABMA, Jul-Dec 56, pp. 47 & 52; JUP Prog Rpt for Sep 56, 8 Oct 56; JUP Prog Rpt for Jan 57, undated, Hist Off files.

JUPITER — FUNDS, PROCUREMENT & DELIVERY (U)

FY	PROGRAM FUND REQIREMENTS (IN MILLIONS OF DOLLARS)					PROCUREMENTS & DELIVERYS							
	DEVELOPMENT		PROD.	OTHER	TOTAL	MISSILES						GROUND EQUIP	
						R & D		RELIABILITY & PROD IMP		PRODUCTION		PROC	DEL
	R & D	PEMA	PEMA			PROC	DEL	PROC	DEL	PROC	DEL		
56	10.7	29.0			39.7	3							
57	25.0	115.9			140.9	8	3						
58	48.8	80.0	202.7		331.5		6	19		54		(1-P)(1-T) 2	
59	26.0	19.6	188.3		233.9		2		9	8	25	(1-T) 1	(1-P)(1-T) 2
60		4.8	94.7		99.5				10	1	26		(1-T) 1
61			7.0	2.9**	9.9						12		
62			5.7		5.7								
63			3.3*		3.3								
TOT	110.5	249.3	501.7	2.9	864.4	11	11	19	19	63	63	(1-P)(2-T) 3	(1-P)(2-T) 3

P—PROTOTYPE T—TRAINING

* APPROVED BUDGET ESTIMATE

** AIF

ARMY BALLISTIC MISSILE AGENCY
No 5-567 REV AB
DATE 31MAR61

Secretary of Defense was becoming more and more of the opinion that only one IRBM was needed. This turn of events had an immediate impact on the ABMA program. Allocations for certain portions of the FY 1957 MCA program were withheld, and the FY 1958 development program was pegged at \$35 million to run through November 1957. October world events and recommendations by the ad hoc committee that both IRBM's be developed brought changes. The approved figure in January 1958 for FY 1958 funds stood at \$360.35 million. Of this amount, \$230.97 million was to cover IOC procurement and production, but OSD-BMC withdrew the amount the next month pending an agreement by the Army and Air Force on reimbursement. Subsequently, the FY 1958 IOC P&P was placed at \$202.70 million. As for the FY 1957 MCA, construction was resumed in January 1958. Some portions of this program, such as construction of a nose cone assembly and check-out facility, had been static since May 1957.[33]

[redacted] FY 1959 funds experienced roughly the same pattern as the two preceding fiscal years. The Army planned program reflected a figure of almost \$300 million; but, in July 1958, the Air Force made a move to scale the program down to three squadrons and remove all mobility requirements. This did not become a cold fact until October and, thus, funds were committed that were not recoverable. The Air Force figures were placed at \$225 million, but the final amount was about \$229 million.[34]

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33. Hist, ABMA, Jul-Dec 57, p. 5; Memo, S/D to S/A, 13 Aug 57; JUP Prog Rpt for Jul 57, 8 Aug 58; JUP Prog Rpt for Jan 58, 8 Feb 58, Hist Off files. Also see Appendix 11 for Air Force reimbursements.
34. Hist, ABMA, Jul-Dec 58, pp. 9-10; JUP Prog Rpt for Mar 59, 8 Apr 59, Hist Off files.

Besides the impact on the over-all program, this action represented but another example of the difficulty that ABMA fiscal planners experienced. The scaling down of funds also continued during Fiscal Years 1960 and 1961.[35]

35. Hist, ABMA, Jul-Dec 59, p. 5.

VI. [redacted] TRAINING

(U) JUPITER training followed the circuitous path of the development program, and considering its late start the accomplishment was probably more difficult. This was borne out by the fact that when the program was first approved there was no clear delineation as to which service would employ the land-based version. Quite naturally in the first months after system authorization, the Army expended considerable effort to secure approval to employ the system. OSD-BMC appeared to accept the concepts, but the Assistant Secretary of Defense withheld $6.8 million proposed for FY 1957 GSE funds, and contended that ABMA had no mission to develop GSE. This decision left the Agency with permission to develop just enough GSE to support the development program and train a small cadre of Army and Navy personnel. Thus, other than a research and development mission, operational employment and training plans were at an impasse.[1]

(U) Notwithstanding this apparent block, ABMA acted in November 1956 to establish a separate division for training with a specific responsibility for heavy ballistic missile troop training. Ironically, the Training Division began to function on 26 November, the date of the Wilson roles and missions memo. Not only did the Agency have to struggle to get a training plan formulated, but they had to fight for the very life of the JUPITER program. In keeping with the classic "one-two" pattern, the Navy dropped out of the JUPITER development program shortly

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1. JUP Story, prepared by Gen Medaris for S/A, 14 Dec 59, Hist Off files.

after the Secretary's decision, and it began to appear unlikely that a training program would ever get under way.

(U) Despite the bleak outlook, the new Training Division moved along as efficiently as the situation would allow. For example, they investigated requirements for Ordnance officer training and prepared a tentative training outline, identified specific skills that were necessary to attain missile specialty ratings, arranged for instructor factory training, and provided OJT instruction in the ABMA laboratories. With these efforts a nucleus of personnel from activities associated with the program were trained. In this respect, men from the Maintenance Operating Procedures Shop (MOPSHOP) were given three months training at the Ordnance Guided Missile School (OGMS) in the Ordnance Individual Specialist Course, and two months OJT at Chrysler in Detroit. Additionally, approximately 44 students per month were receiving the OGMS one-week Ballistic Missile Orientation Course.[2]

(U) After operational control of the JUPITER had been given to the Air Force, the Training Division sought information from AFBMD in order that an efficient training program could be planned. At the briefing for General Schriever in June 1957, they presented a complete plan to meet the JUPITER portion of the Air Force IRBM IOC requirement. This proposal was built around the Air Force's static site employment concept. Also, maximum utilization of Air Force specialists would be made. On another point, it was stated that personnel and facilities for

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2. Hist of the JUP Tng Pro, pp. 16-17, Hist Off files.

assembling and servicing special weapons warheads would be furnished by an Aviation Depot Squadron. The plan went on to cover each facet of the training program from factory training of instructors until the troops were ready to man the missile in the field.[3]

(U) Army and Air Force representatives made a comparison of JUPITER and THOR training plans in early July. As for the special weapon warheads, the Army adjusted its plan to the Air Force method of placing this function directly with the Strategic Missile Squadron (SMS - later called Technical Training Squadron - TTS). AFBMD also provided other material such as the training cycle, and firing unit and specialists training. ABMA adjusted its proposed training program and submitted it to the Air Force in August, but at that time it appeared that one of the two IRBM's, and quite probably the JUPITER, would be dropped. Thus, the Air Force expressed no interest in the Army presentation. This situation remained until 17 October when the Air Force was told by the Secretary of Defense to cooperate in the development and deployment of the JUPITER. From that time on, studies on the ways and means of attaining a JUPITER personnel force became serious.[4]

(U) To meet a deployment date of December 1958, General Medaris proposed that REDSTONE training equipment be used and Army personnel scheduled into this training be used to man the JUPITER in the initial

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3. Present, Briefing for Cmdr & Staff, AFBMD, 18-19 Jun 57, Hist Off files.
4. Hist of the JUP Tng Pro, p. 17; Fact Book, subj: JUP Project Rqmts, Tab IIc, 14 Oct 57, Hist Off files.

phases of the program. Later these personnel would be replaced by those from the Air Force. This idea was rejected.[5]

(U) In early January 1958, the training program became more defined. During a general conference on the over-all weapon system, it was decided to start entering Air Force personnel into ABMA courses in February 1958. This plan involved 20 airmen for 16 weeks in propulsion and structure training, 20 for the same length of time in G&C, 20 to Ft. Belvoir for LOX maintenance and operation, and the entrance of the 864th SMS commander and 20 other officers into general training beginning with a one-week REDSTONE orientation course. On the 13th of January, these plans were further refined, and the actual training of USAF personnel did not begin until March.[6]

(U) According to the Army-Air Force agreement, ABMA would provide individual training to the degree that a man became proficient in performing a particular task associated with the handling and operation of the JUPITER. The Strategic Air Command (SAC) was responsible for conducting crew or integrated weapon system training (IWST) at Cooke* Air Force Base, California. The Army's portion comprised 20 courses: 16 being conducted at OGMS; three at the Army Engineer School, Ft. Belvoir, Virginia; and a special weapons course at Lowry AFB, Colorado.[7]

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* Later renamed Vandenberg.

5. DF, Cont Off to ORDAB-D, et al., 25 Nov 57, subj: Early Opnl Capability, Hist Off files.
6. MFR, 9 Jan 58, subj: Opnl Planning Conf for Utilization of the JUP Msl Wpn Sys; SACOP 1-58, 4 Mar 58, subj: SM-78 (JUP) Opnl Plan, Hist Off files. Appendix 12 contains a resumé of JUPITER individual training courses.
7. SACOP 1-58, 4 Mar 58, subj: SM-78 (JUP) Opnl Plan; Hist of the JUP Tng Pro, p. 28

(U) In July 1958, the Air Force scrapped its plans to conduct IWST at Cooke. Instead, this training was conducted at Redstone. This action pressed the installation to prepare the site and secure the necessary training equipment. A strike by construction workers further complicated the problem. It was September before a settlement was effected, and November before the IWST area was available. The December deployment date was close at hand, but agreements had not been signed with the host country. So it was realized that the training portion would not be too pressed.[8]

[redacted] From the outset, the training program was hampered by a lack of equipment. Thus, at the beginning the REDSTONE program had to furnish the nucleus, but many courses were unsatisfactory "paper and pencil" affairs. Eventually, excellent synthetic trainers were fabricated, but even this phase was delayed by the late delivery of the manufacturers. This, and other problems having a bearing, caused frequent rescheduling of the training. To make up for some of the unsatisfactory conditions, ABMA development laboratories were used to the extent possible. [redacted] Still this was not sufficient to acquaint students with checkout and maintenance procedures.[9]

[redacted] Because of the lack of an agreement with the NATO countries, toward the end of 1958, it was necessary to make major changes to the training plans. It was realized that NATO troops could be used to man the second and third squadrons. Thus, this left ABMA with one USAF-manned

8. JUP Prog Rpt for Jul 58, 8 Aug 58; JUP Prog Rpt for Sep 58, 8 Oct 58, Hist Off files.
9. Hist of the JUP Tng Pro, pp. 36-37.

and two NATO squadrons to plan for. In fact, planning was the only thing that could be accomplished because of the lack of an agreement. However, before the entry of foreign students into the course, the opportunity was afforded to remove Restricted Data information from the texts and training program.[10] In many ways, at the end of 1958 the JUPITER program was at an impasse, a situation it had experienced many times before.

(U) For all practical purposes, little in the way of training was accomplished during the first half of 1959, although several false starts were made. For one thing a government-to-government agreement was concluded with Italy on 27 March, and it was thought that deployment could commence. However, there were still problems to be resolved with the host nation such as siting and fabrication of some components, and, thus, a technical or service-to-service agreement had to be concluded. It was several months before this was accomplished, and, in the meantime, training plans had to be revised a number of times.[11]

([redacted]) One of the first major revisions came in February 1959, when the Secretary of Defense issued a schedule disclosing that the first squadron would be USAF-manned and the second squadron would be manned by the Italian Air Force (IAF). Right away, SAC proposed that entry into training for second squadron purposes be stopped. Shortly thereafter, the 865th and 866th TTS's were deactivated. This left only one USAF squadron--the 864th--and this unit had completed its IWST on 24

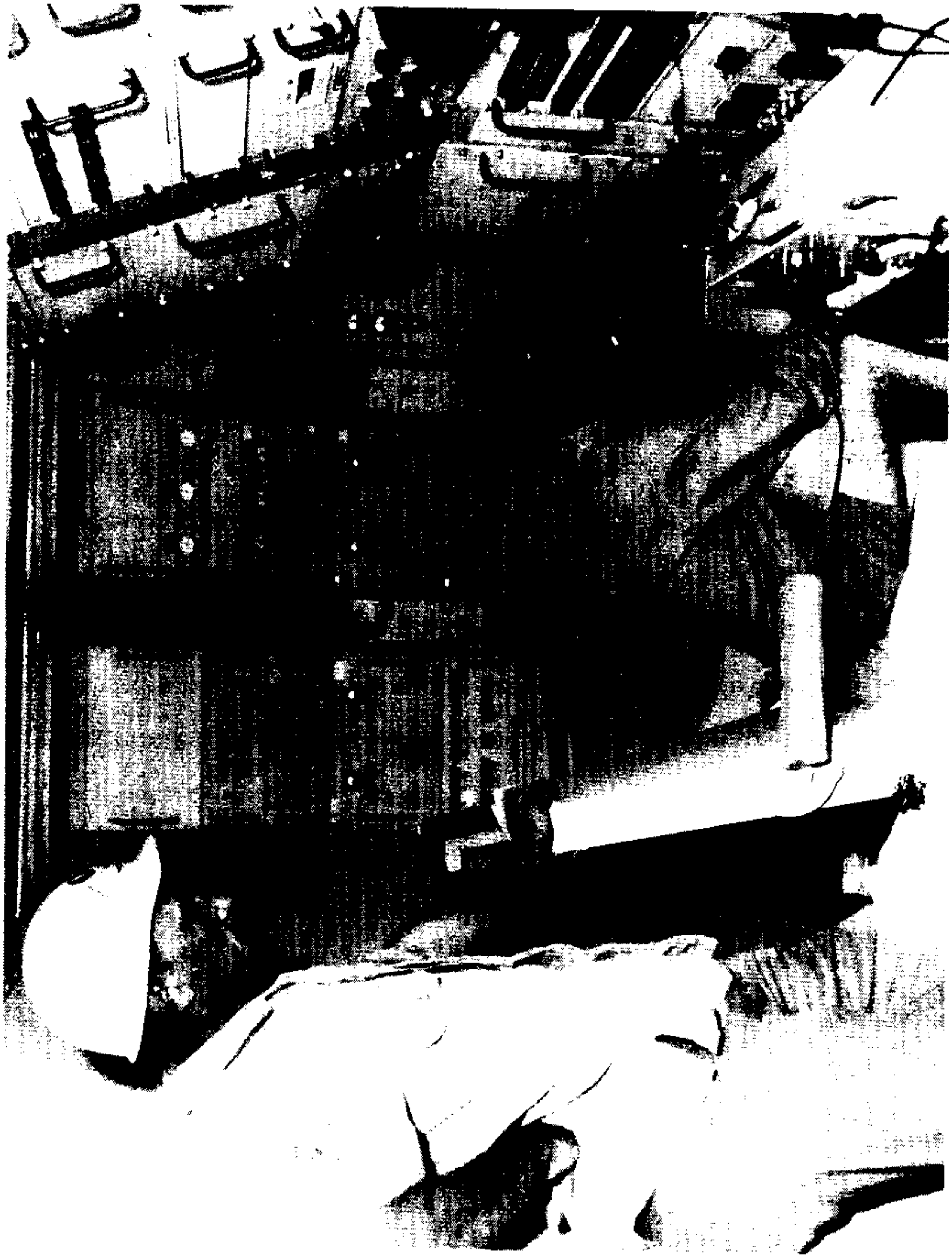
10. Hist, ABMA, Jul-Dec 58, pp. 19-20, Hist Off files.
11. Hist of JUP Tng Pro, pp. 45-46.

February 1959, but had no site to deploy to. So these personnel were entered into refresher courses, especially in areas where a lack of training equipment had been the general condition the first time around.[12]

(U) A change in the maintenance concept forced another major revision in early 1959. Originally, it had been planned to have a receipt, inspection, and maintenance (RIM) area somewhat to the rear of the emplacements, and roving mobile maintenance teams would perform cyclic and emergency maintenance. As time went by, this did not appear to be a wise plan, for in the event of an emergency the maintenance and repair capability needed to be on-site. Based on this, the "fire-house" concept was devised. In a sense, the personnel now had to be both operators and maintenance technicians. This change brought a reduction in manpower requirements, which carried over to the training workload.[13]

[redacted] Thereafter, an organizational change, prompted at the insistence of NATO I, further reduced the manpower requirements. USAF had envisioned that the two squadrons in Italy would operate as separate entities, each having its own headquarters function. It was also believed that four crews at the emplacements would be necessary for around-the-clock operations. To the Italians' way of thinking, a single headquarters and a pool of supporting activities were sufficient. This was called the "2 in 1" concept and was adopted. Moreover, only

12. Ibid., pp. 46-47.
13. Ibid., p. 48.



IAF TRAINING

after lengthy discussion did the Italians agree that even three crews were necessary per site. Here, again, the training requirements were reduced.[14]

[redacted] Although the technical agreement was not signed, resolution of the structure of the organization paved the way for the entry of the Italians into JUPITER training. In June 1959, the first increment of students reported to Lackland AFB, Texas, to begin their language training, and in September they entered the individual training courses at Redstone. The English comprehension level (ECL) of the first group was relatively good, but oncoming personnel did not register so high in ECL. To compensate for this, the courses were lengthened and a little more night work was accomplished. In the meantime, August 1959 marked the signing of the technical agreement with Italy, and the way was at last clear for the deployment of the JUPITER missile. Thanks to the lengthy period of negotiation, it was now possible to man both squadrons in Italy with IAF personnel, and the 864th TTS, on a reduced basis, became a floating training team.[15]

(U) Two months after they had entered into individual training courses, the first group of Italians began IWST on 9 November 1959 and completed the course on 19 January 1960. By October 1960, the Italian phase of training in the United States had been completed.[16] Judging by the records, that is, based on the CTL firings of 1961 and 1962, the quality of the JUPITER training program was quite satisfactory.

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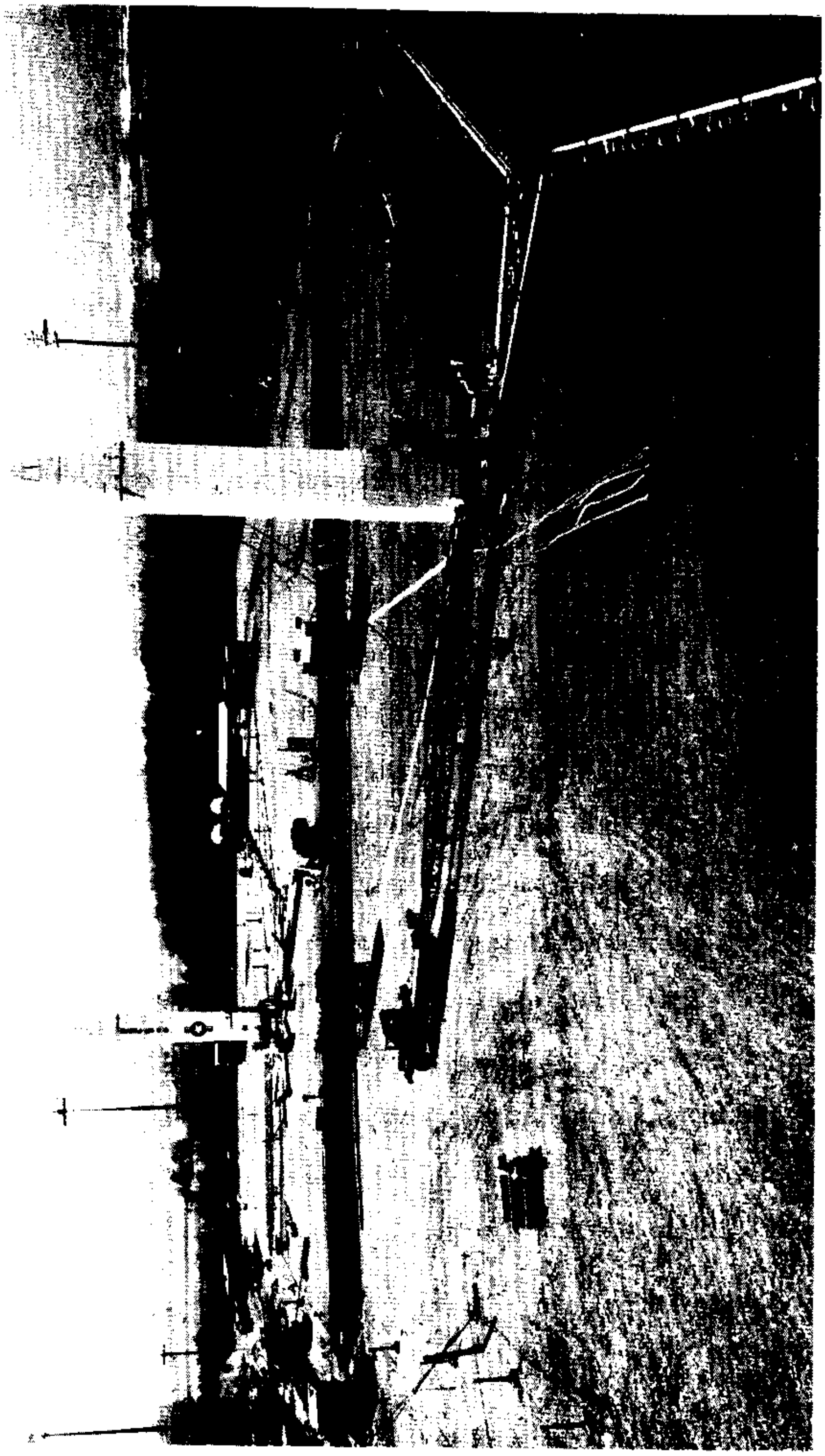
14. Hist, ABMA, Jan-Jun 59, pp. 6-8, Hist Off files.
15. Ibid.; Hist of JUP Tng Pro, pp. 49-51.
16. Hist of the JUP Tng Pro, p. 57.



JUPITER IWST SITE AT OGMS

([redacted]) With the location of the first two squadrons settled, attention was focused on siting the third squadron. On 28 October 1959, [redacted] government-to-government agreement was concluded with Turkey for deployment of the remaining squadron. Tentatively, the US programmed a USAF-manned squadron in the third quarter of FY 1961. Some months later--May 1960--the two countries concluded the technical agreement. This document specified that Turkish personnel would be trained to man the missile at the earliest possible date, but that the JUPITER would be manned by USAF personnel.[17]

(U) Thus, the training school at Redstone that had experi[redacted]ced a slight lull at the end of the IAF program had to prepare for the influx of Turkish Air Force (TAF) students. Because the educational level of the TAF personnel was somewhat lower than IAF, language, individual, and IWST courses were lengthened. For example, USAF furnished six months of language training in Turkey before the students departed for Lackland where they received an additional six months of instruction. By the same token, the technical courses were lengthened.[18]

(U) Training of USAF personnel for NATO II deployment began on 30 November 1961. The Turkish portion of the individual technical training program started on 28 June 1961. This phase and the IWST part were to be completed in December 1963.[19]

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17. Ibid., pp. 55-56.
18. Ibid., pp. 57-58.
19. JUP Qtrly Rpt for 2d Qtr CY 61, 14 Jul 61, Hist Off files.

VII. (C) DEPLOYMENT

([redacted]) When the Army and Navy first started the JUPITER development program, the tentative plan called for deployment of the weapon system on or before June 1960. The location of the deployed missile was undefined, and this was the status for better than two years. From time to time the Army attempted to obtain a deployment plan, but was unable to do so. As earlier mentioned, even the GSE development program was held up, and, without this equipment, deployment was impossible.

([redacted]) The orbiting of SPUTNIK and the decision by OSD to develop both IRBM's brought the deployment aspects of the JUPITER closer to definition, although a specific site was not indicated. The directive simply stated that deployment was to be effected by December 1958. SAC's operational plan of March 1958 mentioned that the emplacements would be located on "the periphery of the Sino-Soviet Bloc," but stated there would be much effort involved in effecting the bilateral agreement with host countries.[1] In June of 1958, Air Force representatives were discussing possible deployment with French NATO personnel,[2] but France did not become a participant in the JUPITER program.

(U) By July 1958, the successful deployment of the missile during the year appeared rather unlikely. ABMA had estimated that an initial site selection had to be made by 25 July in order to gain a partial deployment of the first squadron. This date was based on the fact that

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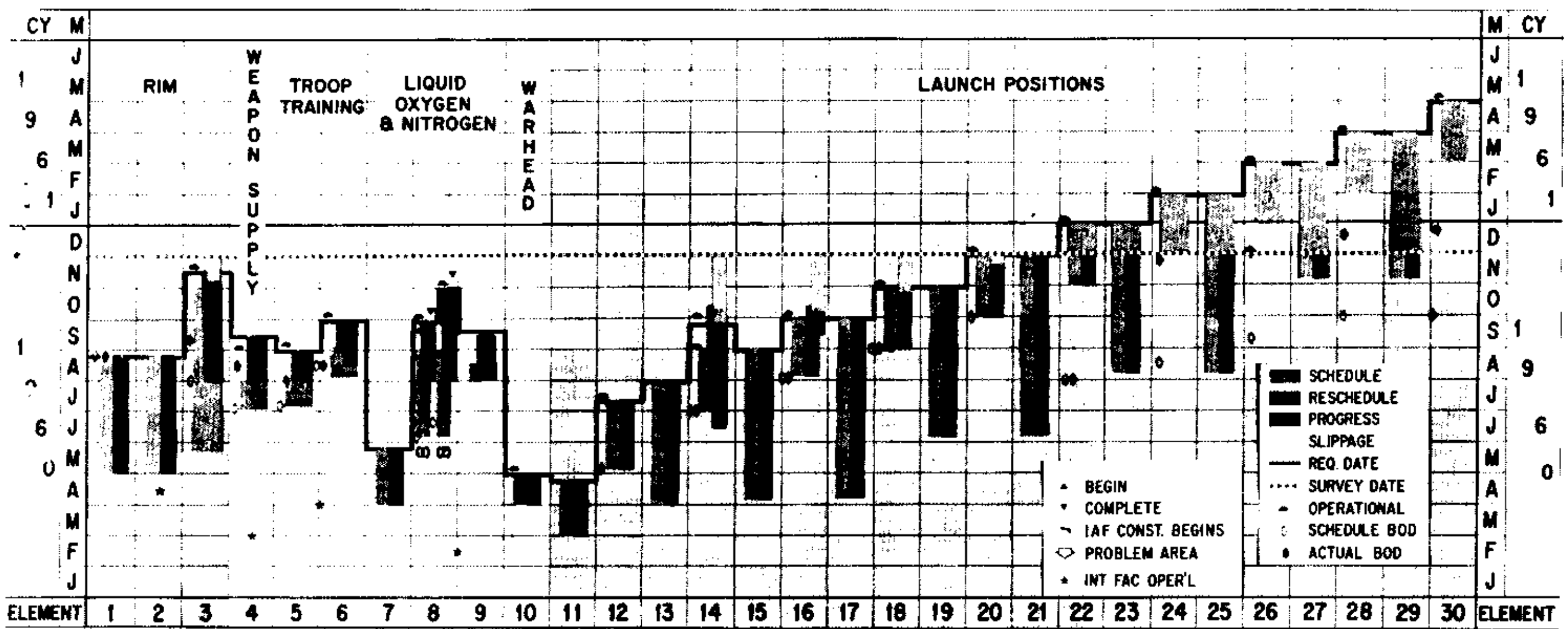
1. SACOP 1-58, 4 Mar 58, subj: SM-78 (JUP) Opnl Plan, Hist Off files.
2. Hist, ABMA, Jan-Jun 58, p. 79, Hist Off files.

JUPITER DEPLOYMENT PLAN



1 CONSTRUCT FACILITIES
2 STAGE EQUIPMENT
3 INSTALL & CHECKOUT
4 BINS, PARTS, TRANSCEIVER EQUIP. INSTALLED
5 INSTALL 1ST SET OF EQUIPMENT
6 INSTALL 2ND SET OF EQUIPMENT
7 STAGE 25 T/D PLANT
8 INSTALL PLANTS
9 INSTALL GSE
10 INSTALL EQUIPMENT
11 STAGE LP-1 EQUIPMENT (1)
12 INSTALL & CHECKOUT LP-1 EQUIP.
13 STAGE LP-2 EQUIPMENT (2)
14 INSTALL & CHECKOUT LP-2 EQUIP.
15 STAGE LP-3 EQUIPMENT (5)
16 INSTALL & CHECKOUT LP-3 EQUIP.
17 STAGE LP-4 EQUIPMENT (4)
18 INSTALL & CHECKOUT LP-4 EQUIP.
19 STAGE LP-5 EQUIPMENT (3)
20 INSTALL & CHECKOUT LP-5 EQUIP.
21 STAGE LP-6 EQUIPMENT (7)
22 INSTALL & CHECKOUT LP-6 EQUIP.
23 STAGE LP-7 EQUIPMENT (8)
24 INSTALL & CHECKOUT LP-7 EQUIP.
25 STAGE LP-8 EQUIPMENT (9)
26 INSTALL & CHECKOUT LP-8 EQUIP.
27 STAGE LP-9 (6)
28 INSTALL & CHECKOUT LP-9 EQUIP.
29 STAGE LP-10 EQUIPMENT (10)
30 INSTALL & CHECKOUT LP-10 EQUIP.

the contractor needed 215 days to set up the LOX, RIM, munition, and six emplacement areas. Each day beyond the decision cutoff resulted in a corresponding day of slippage.[3] As it turned out, slippage became the rule rather than the exception, for it was long past 25 July 1958 before the necessary agreements were signed.

(U) In view of the protracted delays, a question of manning the squadrons arose in September. Conferences with the proposed host country--Italy--revealed a desire that eventually manning would be completely from the allied nation. Thus, tentative plans indicated USAF manning for the first squadron and NATO manning for the second and subsequent squadron.[4] Later, in November, USAF questioned the advisability of the manning plan unless the agreements were signed by 10 December. To gain the early operational capability, they believed that the second squadron would have to be manned by USAF personnel, as well.[5]

[redacted] Deployment plans were based on a "floating M date" during the latter part of 1958. In other words, from the time the agreement was signed, two missiles and supporting GSE would be deployed to be in place 60 days later, and at T-15 readiness at the end of 75 days. The remaining four missiles would be in place at M plus 120 days, and in a combat readiness state at 135 days. This particular plan was of short duration, for in early 1959, changes were made to the effect that the total squadron of 15 missiles would deploy. Schedules used a 150-day

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3. JUP Prog Rpt for Jul 58, 8 Aug 58, Hist Off files.
4. JUP Prog Rpt for Sep 58, 8 Oct 58, Hist Off files.
5. JUP Prog Rpt for Nov 58, 8 Dec 58, Hist Off files.

[redacted]

factor between the signing of a technical agreement and shipment of the first equipment, with first 1 March 1959 and then 1 April designated as M-Day. The signing of the government-to-government (GTG) agreement on 26-27 March confirmed the 1 April date for planning purposes.[6]

[redacted] With the signing of the document, it appeared that the program was under way, but this was not the case. Italy insisted that the GTG agreement lacked sufficient detail and a technical agreement would have to be signed between the IAF and USAF. Points of contention involved funding matters, site construction by Italian contractors, and some component fabrication by Italian industry. Discussions on these matters began to stretch out, and by June it was realized that the 1 April M-Day was no longer compatible with a realistic program. DOD rescinded the date on 1 July and indicated that the new M-Day would coincide with the signing of the technical agreement. At the same time, it was realized that IAF personnel could man both squadrons.[7]

[redacted]) The signing of the technical agreement on 10 August removed the last major roadblock in the NATO I program. Although from time to time there were instances that threatened delays, the course was relatively smooth when compared with past history. Shortly after the signing, United States Air Forces, Europe (USAFE), notified ABMA that the beneficial occupancy date (BOD) for the first position was 1 April 1960. This meant that deployment planning was no longer based on the 190-day factor, but was based on specific BOD's furnished by the IAF.[8]

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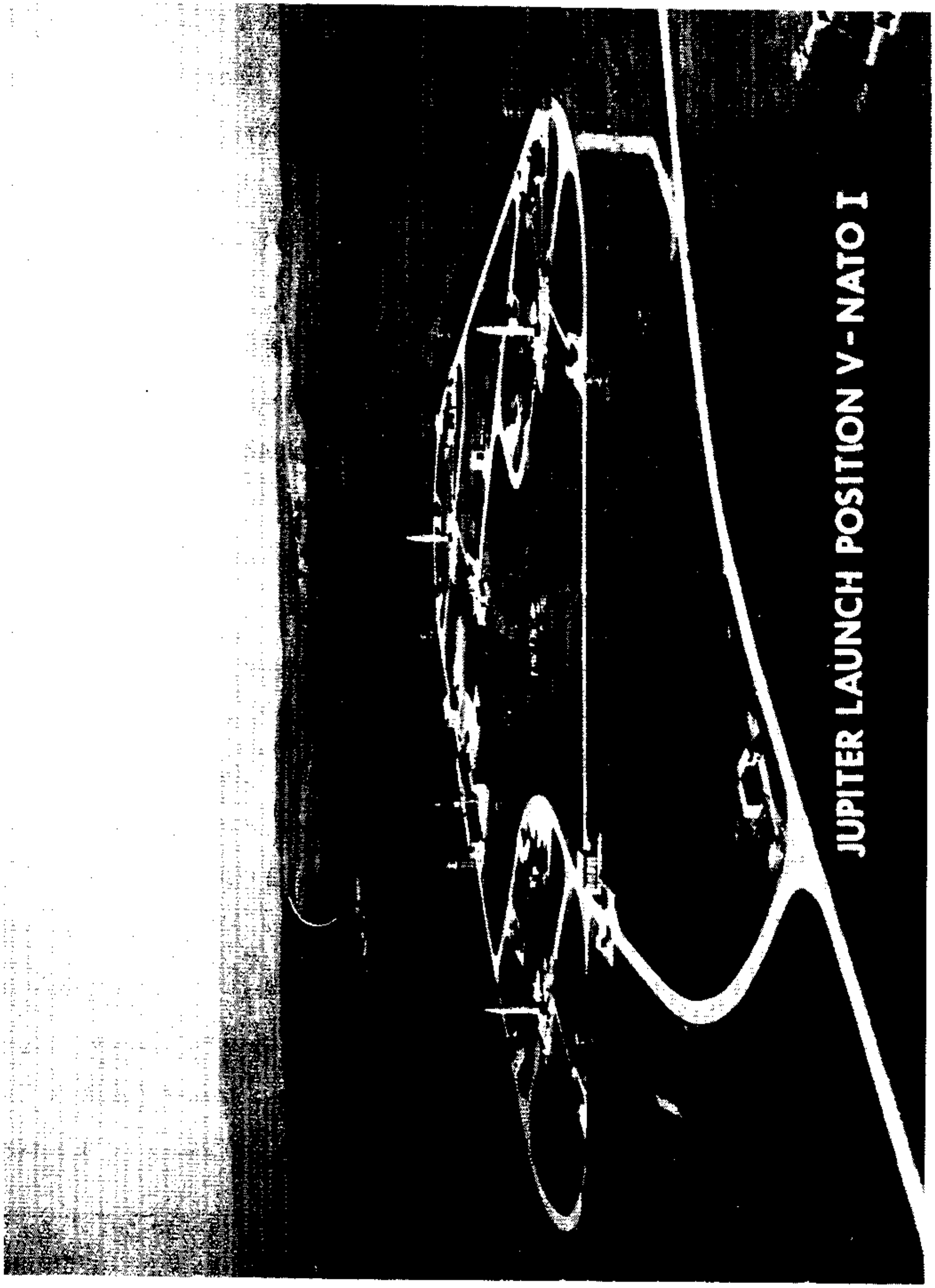
6. Hist, ABMA, Jan-Jun 59, pp. 4-5; JUP Prog Rpt for Dec 58, 8 Jan 59, Hist Off files.
7. JUP Prog Rpt for Apr 59, 8 May 59; JUP Prog Rpt for Jun 59, 8 Jul 59, Hist Off files.
8. JUP Prog Rpt for Aug 59, 8 Sep 59, Hist Off files.

[redacted]

[redacted]



[redacted]

[redacted] Once the program was settled, events occurred rather systematically, for on 20 June 1961 the tenth and last launch position was turned over to the IAF ten days before the scheduled date. Each position consisted of three missile emplacements, and the turn-over dates were as follows:[9]

Position	Date Turned Over to IAF
1	11 July 1960
2	26 April 1961
3	14 April 1961
4	24 March 1961
5	13 February 1961
6	7 June 1961
7	3 March 1961
8	13 June 1961
9	29 April 1961
10	20 June 1961

[redacted] On 28 October 1959, the location of the third and final JUPITER squadron was settled when the GTG agreement was signed with Turkey. Thereafter, the two countries engaged in conferences to complete technical arrangements, plan the facilities, and select the emplacement sites. Tentatively, 1 June 1961 was set as the BOD for the first launch position. To attain this capability in NATO II, initial manning by USAF personnel was required. This arrangement was

9. JUP Qtrly Prog Rpt for 2d Qtr CY 61, 14 Jul 61, Hist Off files.

agreed to by the Turkish government in the technical agreement, which was signed on 1 June 1960. By April 1962, all positions were to be ready and manned, and this objective was attained.[10]

(U) In many ways deployment posed quite a problem to ABMA, although the Agency was not directly involved in consummating the agreements with the host countries. Basically, the trouble with NATO I was site selection and who was going to man the squadrons once they were in place. All during 1958, it was quite a strain to have a deployment capability by December 1958. Then, the switch to NATO I manning placed a further tax on ABMA training facilities. In summation, when viewing the development and deployment "ups and downs," it was indeed fortunate that time did not become critical and that all the emplacement positions were readied and manned.

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10. Hist, ABMA, Jul-Dec 59, p. 15, Hist Off files; Interview, Mr. Prince Danley, REDSTONE-CORPORAL-JUPITER Project Off, AOMC, 11 Jul 62.

VIII. [redacted] PROGRAM DIVIDENDS - SATELLITES

(U) Usually, any given program having a specific objective can be adapted and used for another closely related project. There was no departure from this fact in the IRBM development program. The idea to develop long-range missiles and satellite vehicles and the approval of such action was almost simultaneous. And without the missile, the satellite concept was impossible. Hence, the two programs remained almost inseparable throughout the ICBM and IRBM R&D stage. Also equally parallel to the missile portion, the Army met with the same maddening rebuffs in that the initially selected satellite program was based on the theoretical possibilities of a completely new program as opposed to one that could be based on proven hardware.

(U) All during 1954 and 1955, when proposals for the long-range missile were being made, Dr. von Braun was offering suggestions for the orbit of a satellite. By December 1954, the Army and Navy met in a conference to consider the advisability of establishing a satellite program. Attending representatives concluded that an inert slug approximately two feet in diameter and weighing five pounds could be injected into orbit by existing hardware. REDSTONE was to be used as the basic booster, with clusters of LOKI rockets forming the second and third stages. The fourth and top stage would be a single LOKI. This proposed project became known by the names of Project ORBITER and Project SLUG.

(U) Interest in such an undertaking was prompted by several factors. For one thing, intelligence had revealed that the Russians were definitely working toward satellites, so the project had a politico-technological value to this nation. Besides that, there was a high-altitude aircraft development project--the X-15--that was slated to attain heights of from 100 to 150 miles, and little data was available as to the environment the pilot or the aircraft would face. Thus, a minimum satellite (uninstrumented) could be launched to perfect launching techniques, study orbital behavior, and devise tracking methods. Once this was accomplished, more sophisticated satellites could be placed in orbit that had the capability to gather data on conditions outside the sensible atmosphere. The artificial satellites could also be a part of the International Geophysical Year (IGY).[1]

(U) Just prior to the time that a decision was made as to the course the program would follow, the Air Force and Navy presented DOD with a new instrumented concept based on the VIKING missile. This became known as the VANGUARD program. DOD appointed an ad hoc committee to weigh all the proposals, and the committee chose the VANGUARD approach, based on the contention that the cost would be less and that the Army plan was marginal in assuring success. Their main complaint was against the 75,000-pound thrust REDSTONE power plant.[2] Ironically, when EXPLORER I was boosted into orbit, a slightly more efficient fuel was used to boost the thrust to 83,000 pounds.[3]

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1. Memo to Rear Adm F. R. Furth & Maj Gen L. E. Simon, 14 Dec 54, subj: Conf on Project Orbiter, and attachments, Hist Off files.
2. Rpt of the Ad Hoc Advisory Group on Spec Capabilities, OASD (R&D), Aug 55, Hist Off files.
3. Hist, ABMA, Jan-Jun 58, p. 102, Hist Off files.

(U) Reclama to the committee findings was made by the Ordnance Corps to show that the REDSTONE was more than just an adequate booster but offered growth potential as well. Besides, the Jet Propulsion Laboratory (JPL) had been successful in scaling down SERGEANT motors that would provide greater specific impulses to the upper stages than the LOKI.[4] No deviation was made by the committee from the decision.

(U) Next, the Ordnance Corps asked that its hardware be considered for Phase II of the satellite program when the heavier vehicles would be placed in orbit. Army R&D replied that it was not wise for the Army to apply for such work in view of the priority programs that had been placed on Redstone Arsenal, for at that time DOD had made the decision to develop the JUPITER.[5]

(U) While the Army and Navy had been engaged in ORBITER planning, some engineering had been accomplished on REDSTONE test vehicle[redacted]so that these missiles were suitable to test re-entry nose cones and launch a satellite. The death of ORBITER caused these missiles to be momentarily set aside, but the almost immediate decision to develop JUPITER brought these vehicles to the fore again for the re-entry test program. In fact, 12 missiles were so modified, but by the firing of the third JUPITER C re-entry test vehicle, the nose cone problem was solved and ABMA was ready to test a full-scale JUPITER re-entry body. All during 1956 and 1957, the Army made known to authorities that the JUPITER C was able to orbit a satellite to serve as a backup for VANGUARD.

4. Memo, OCO to ASD (R&D), 15 Aug 55, subj: Scientific Sat Project, Hist Off files.
5. DF, COFORD to DA R&D, 8 Nov 55, subj: Scientific Sat & Cmt, DA R&D to COFORD, 8 Dec 55, same subj, Hist Off files.

Presentations were made to the Ad Hoc Study Group on Special Capabilities on 23 April 1956, but, in May, the group stated that the VANGUARD program was not meeting with any serious difficulty, and backup was not contemplated at that time. The Army was to make no plans using either the JUPITER or REDSTONE for scientific satellites.[6]

(U) From time to time, however, during 1957, information was requested on Redstone satellite capabilities from such individuals as Dr. C. C. Furnas of the ad hoc group. Additionally, Dr. Ernst Stuhlinger presented a paper to the Army Science Symposium on 28 June on the ABMA potential in an earth satellite project. In a conversation between Maj. Gen. Andrew P. O'Meara of Army R&D and General Medaris, General O'Meara stated that DOD had questioned how ABMA had gotten satellite money. General Medaris replied that the JUPITER C's were re-entry vehicles.[7]

[redacted] When the Russians launched SPUTNIK I, to the shock of the United States, Secretary Brucker three days later once again offered Army capabilities to hoist a satellite. He pointed out there were eight JUPITER C's that could be used that had proved to be excess to the re-entry program subsequent to the August 1957 recovery of the scaled-down nose cone. In fact, the re-entry tests had proven three stages of the four-stage rocket that was considered necessary to launch a satellite. DOD then asked the Army in what way they could support the launching of the 21-pound VANGUARD sphere. The Army's reply:

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6. Ltr, ABMA to COFORD, 9 Jul 57, subj: Potential Sat Capability of ABMA; Present by Col /J. C./ Nickerson to Ad Hoc Study Group on Spec Capabilities, 23 Apr 56; Memo, OASD to Army R&D, 15 May 56, subj: Army Capabilities for Scientific Sats, Hist Off files.
7. Msg, ORDAB-C-46-1, ABMA to Army R&D, 31 Jan 57; Present, Potential Contribution to Earth Sat Project by ABMA & JPL, 3 Jul 57; MFR by Maj Gen A. P. O'Meara, 22 Jun 57, subj: Conversation with Gen Medaris at RSA, Hist Off files.

[redacted]

by June 1958, using a vehicle such as the JUPITER. However, before that time, launching was possible by repackaging the instrumentation into a cylindrical container and using the JUPITER C's. Proposals were made to launch two vehicles of this type; one in February 1958 and one in April. In fact, during the month of October 1957, the Secretary of the Army outlined a multi-phase satellite program. The first would consist of the launchings just mentioned. The second would involve launching five JUPITER C satellites carrying television equipment, in view of the fact that the Russians rejected President Eisenhower's "Open Skies" proposal. And the third phase would be a 300-pound surveillance satellite, using the JUPITER as a booster.[8]

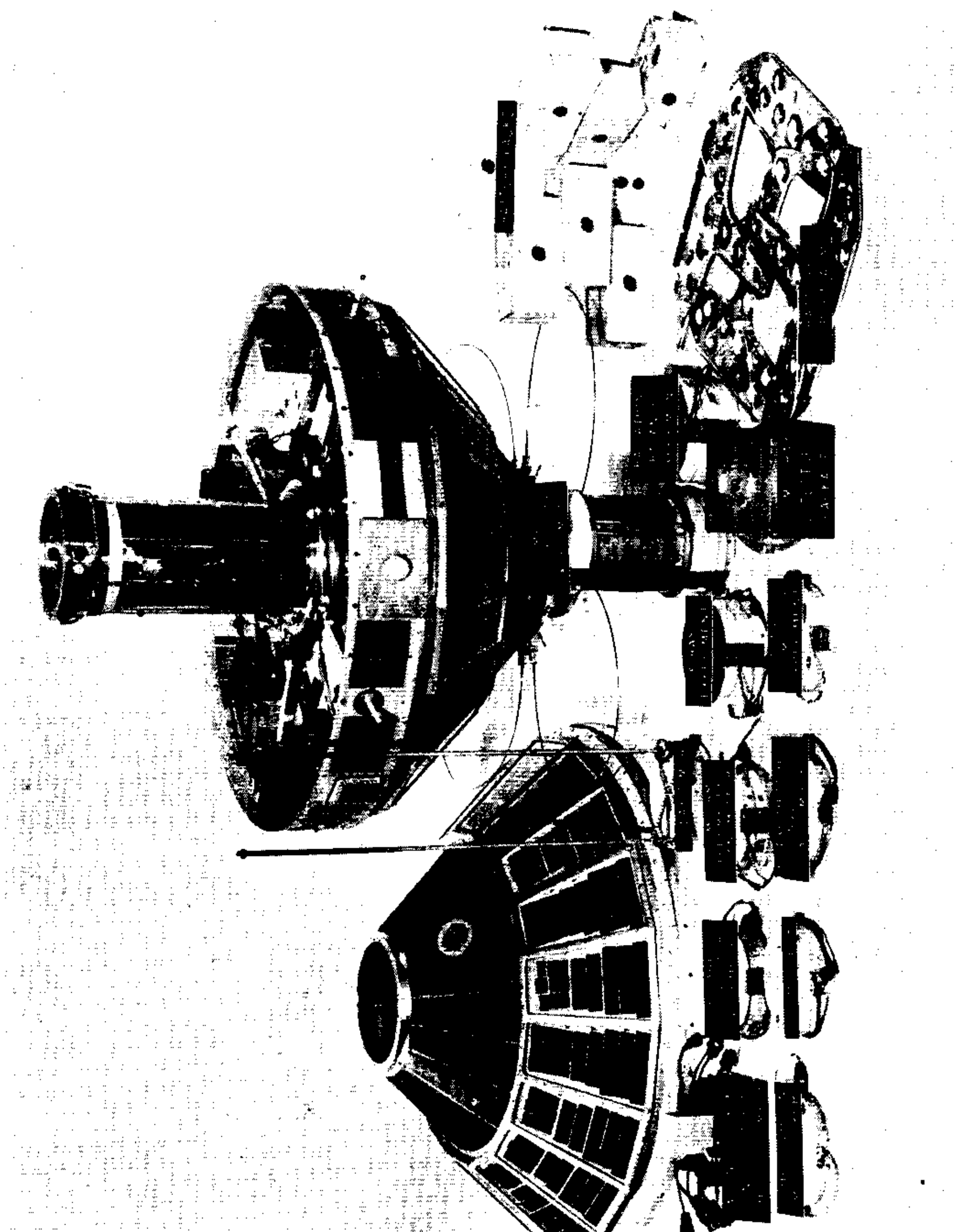
(U) On 8 November 1957, the Secretary of Defense gave his permission for the Army to plan for the launching of two JUPITER C's by March 1958, and $3.5 million was made available. By 20 November 1957, the Secretary of the Army was able to provide launching dates of 30 January and 6 March 1958.[9]

(U) As communication media of all types have recorded, EXPLORER I, the Free World's first artificial satellite, was placed in orbit on 31 January 1958. The hardware used was essentially the same that had been available during 1956, but the United States had missed the opportunity of a "first."

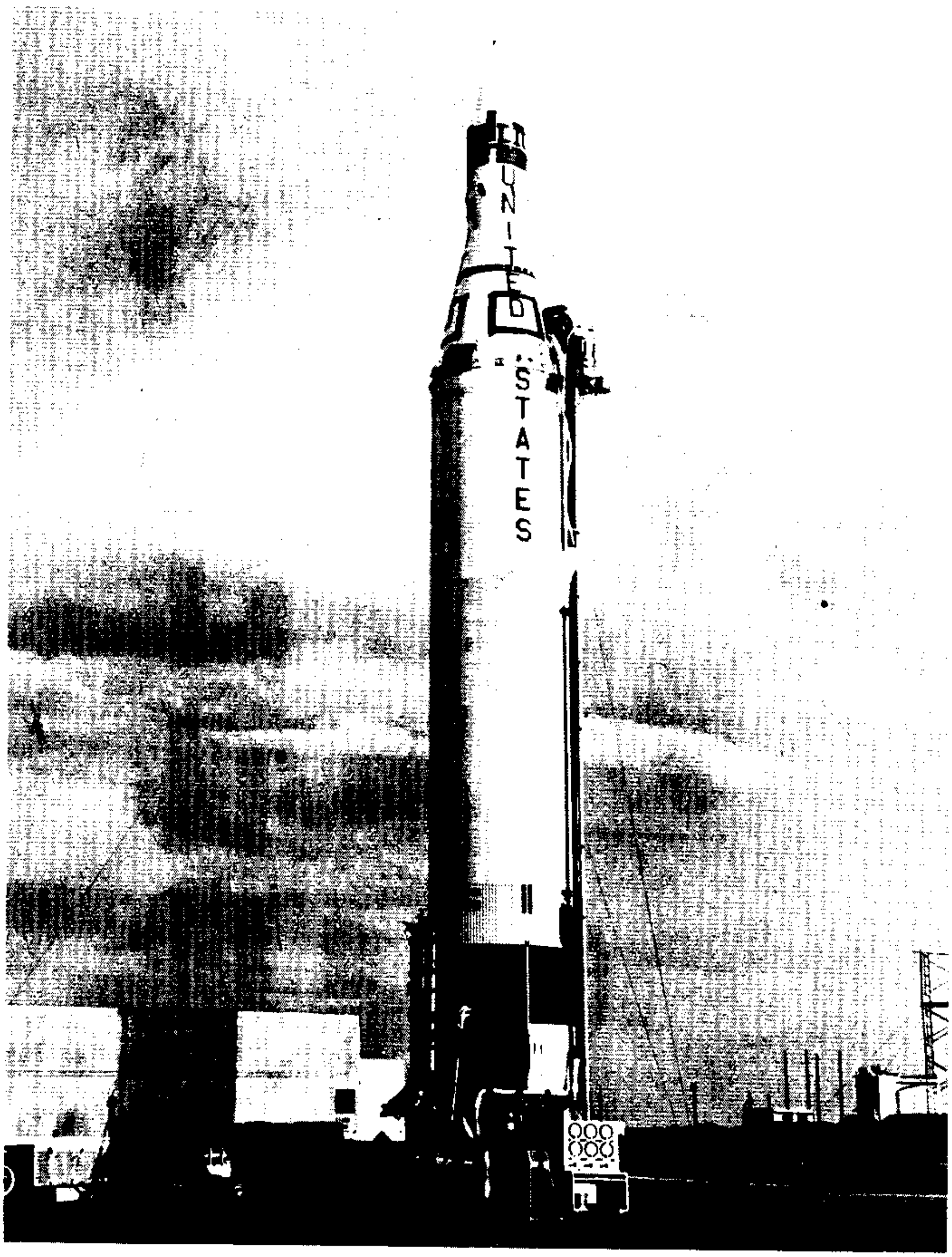
8. Memo, S/A to S/D, 7 Oct 57, subj: Soviet Sat; Memo, S/A to S/D, 23 Oct 57, subj: Army Spt of VANGUARD Pro; Memo, S/A to Spec Asst for Guided Msls, DOD, subj: Mil Sat, Hist Off files.
9. Memo, S/D to S/A, 8 Nov 57, subj: Scientifc Sat Pro; Memo, S/A to S/D, subj: Scientific Sat Pro, Hist Off files.

[redacted]

(U) From the initial launching, the Army's JUPITER C and JUPITER missiles participated in an extensive scientific satellite program. In fact, JUPITER 13, with primates Able and Baker aboard, marked the successful beginning of this nation's life-in-space program. A detailed listing of the over-all Army contributions to the satellite program may be found in Appendix 13.



JUNO II PAYLOAD



JUPITER-JUNO II SERIES

GLOSSARY OF ABBREVIATIONS

-A-

ABMA--Army Ballistic Missile Agency

ABMC--Army Ballistic Missile Committee

AEC--Atomic Energy Commission

AFBMD--Air Force Ballistic Missile Division

AFF--Army Field Forces

AF(JUPLO)--Air Force (Jupiter Liaison Office)

AFMTC--Air Force Missile Test Center

AFSWC--

AMC--Air Materiel Command

AMR--Atlantic Missile Range

AOMC--Army Ordnance Missile Command

ARDC--Air Research & Development Command

ASD--Assistant Secretary of Defense

Asst--Assistant

Auth--Authority

Appdx--Appendix

-B-

Ball--Ballistic

Bet--Between

BMC--Ballistic Missile Committee

BMO--Ballistic Missile Office

BOD--Beneficial Occupancy Date

BuOrd--Bureau of Ordnance (Navy)

-C-

CCMD--Chrysler Corporation Missile Division

CG--Commanding General

Chf(s)--Chief(s)

Cmdr--Commander

Cmt--Comment

COE--Corps of Engineers

COFORD--Chief of Ordnance

Conf--Conference

Const--Construction

Cont--Control

Corp--Corporation

CPE--Circular Probable Error

C/S--Chief of Staff

CTL--Combat Training Launch

CY--Calendar Year

-D-

DA--Department of the Army

DCSOPS--Deputy Chief of Staff for Operations

Def--Defense

Dep--Deputy

Dept--Department

Dev--Development

Dir--Director

Dist--Distribution

Div(s)--Division(s)

-E-

ECL--English Comprehension Level

-F-

Facil--Facilities

FBM--Fleet Ballistic Missile

FICo--Ford Instrument Company

FLDO--Field Office

FY--Fiscal Year

-G-

G&C--Guidance & Control

GM(DD)--Guided Missile (Development Division)

GO--General Order

GOR--General Operational Requirements

Govt--Government

GSE--Ground Support Equipment

GTG--Government-to-Government

-H-

Hist--History, Historical

-I-

IAF--Italian Air Force

ICBM--Intercontinental Ballistic Missile

IGY--International Geophysical Year

Info--Information

IO--Industrial Operations

IOC--Initial Operational Capability

IRBM--Intermediate Range Ballistic Missile

IWST--Integrated Weapon System Training

-J-

JAN(BMC)--Joint Army Navy (Ballistic Missile Committee)

JCS--Joint Chiefs of Staff

JEFO--JUPITER European Field Office

JPL--Jet Propulsion Laboratory

JUP--JUPITER

-L-

LOD--Launch Operations Directorate

LST--Live System Test

Ltr--Letter

-M-

MCA--Military Construction, Army

MC's--Military Characteristics

Memo--Memorandum

MFR--Memorandum for Record

Mgmt--Management

Mil--Military

Mo--Monthly

MOAMA--Mobile Air Materiel Area

MSFC--Marshall Space Flight Center

Msg--Message

Msl(s)--Missile(s)

Mtg--Meeting

-N-

NAA--North American Aviation

NACA--National Advisory Committee for Aeronautics

NASA--National Aeronautics & Space Administration

NATO--North Atlantic Treaty Organization

NIRAP--Naval Industrial Reserve Aircraft Plan

NM--Nautical Mile

Nr--Number

NSC--National Security Council

-O-

OASD--Office, Assistant Secretary of Defense

OCAFF--Office, Chief of Army Field Forces

OCO--Office, Chief of Ordnance

OCRD--Office, Chief of Research & Development

Off--Office

OGMS--Ordnance Guided Missile School

OJT--On-the-Job Training

OML--Ordnance Missile Laboratories

Opnl--Operational

Ord--Ordnance

Org--Organization

OSD--Office, Secretary of Defense

-P-

PAFB--Patrick Air Force Base

Pam--Pamphlet

P&P--Procurement & Production

Pers--Personnel

Present--Presentation

Prog--Progress

Propel--Propellant

Prop(s)--Proposal(s)

Pro(s)--Program(s)

-Q-

Qtr(ly)--Quarter(ly)

-R-

R&D--Research & Development

Ref--Reference

Res--Research

RIG--Radio Inertial Guidance

RIM--Receipt, Inspection & Maintenance

Rkt--Rocket

Rpt--Report

Rqmts--Requirements

RS--REDSTONE

RSA--Redstone Arsenal

-S-

S/A--Secretary of the Army

S/AF--Secretary of the Air Force

SACOP--Strategic Air Command Operational Plan

Sat(s)--Satellite(s)

S/D--Secretary of Defense

SINS--Ship Inertial Navigation System

SMS--Strategic Missile Squadron

S/N--Secretary of the Navy

SO--Special Order

Spec--Special

SPO--Special Project Office (Navy)

Spt(ing)--Support(ing)

ST--Statute

Subj--Subject

Svcs--Services

Sys('s)--System(s)

-T-

TAF--Turkish Air Force

Tech--Technical

Tng--Training

-U-

USAF--United States Air Force

USAFE--United States Air Forces, Europe

-V-

Vol--Volume

-W-

WDD--Western Development Division

Wpn--Weapon

WSMR--White Sands Missile Range

WSPO--Weapons Systems Project Office

APPENDIX I

CONSOLIDATED CHRONOLOGY OF SIGNIFICANT EVENTS IN THE JUPITER PROGRAM

1955

JUNE

13 Two alternate proposals for the 1,000 NM ballistic missile:

a. Single stage liquid fueled rocket (one engine).

b. Powered with two liquid fuel engines and has greater range capability using solid booster.

JULY

1 Initial Army proposal for a 1,500 NM missile.

SEPTEMBER

(Approx) Presentation by Dr. von Braun briefing the Secretary of Defense on Long Range Missile pointed out that the 1,500 NM missile was a logical extension of the REDSTONE.

22 Proposal for an Army-Navy 1,500 mile missile and a plan for development.

OCTOBER

An account of the schedule acceleration in development of the 1,500 NM missile; made proposal on possible simplification of guidance methods.

26 The C/S, DA announced to the Army Staff a plan for executing the 1,500-mile missile program in case the Army was assigned program responsibility. The plan provided for:

a. Formation of the ABMA

b. Assignment of personal responsibility to the CG, ABMA for the REDSTONE and the 1,500-mile missile programs.

c. Assignment to ABMA of those elements of Redstone Arsenal necessary to the execution of the ABMA mission.

1955 (Cont'd)

OCTOBER

26 d. The CG, ABMA to have direct access to the C/S, DA.

e. The CG, ABMA to have authority to issue instructions to other Army agencies capable of assisting him in the execution of his mission.

NOVEMBER

2 The JCS reviewed and agreed that there was a requirement for an IRBM.

8 The Secretary of Defense directed the S/A & S/N to establish an IRBM and a Joint Army-Navy Committee to direct the program.

16 Army assigned the project to execute the IRBM #2 program.

22 Maj Gen John B. Medaris designated CG, ABMA.

25 The CG (designate), ABMA presented a development plan to the JANBMC which provided for:

a. Preliminary design characteristics of the system.

b. A development program for testing JUPITER components on REDSTONE missiles to begin in March 1956 and for firing the first JUPITER in May 1957.

c. Funding requirements for FY 1956 and estimates for FY 1957.

DECEMBER

1 A presentation to the NSC on the JAN IRBM #2 1,500 mile missile program. The CG (designate), ABMA, representing the DA and DN, discussed:

a. The development of an IRBM of 1,500 NM range from the Army REDSTONE missile Program.

b. The development of the missile by the highly experienced REDSTONE team of ballistic missile scientists and technicians.

c. Proposed configuration of the missile.

d. Proposed employment of an all-inertial guidance system and development of a radio-inertial system.

1955 (Cont'd)

DECEMBER

1 e. Navy selection of a contractor to design a shipborne system for marine launching capability.

The NSC approved the program, followed by Presidential approval of the highest National priority for the program.

2 The S/A and S/N set forth terms of reference for development of a dual land-based and sea-based IRBM. Essentially, these were:

a. Army and Navy will agree upon the MC's of a single missile.

b. The basic missile system to be developed by ABMA.

c. Equal priority will be given the sea-based and land-based capability.

d. Navy selection of a contractor to provide a Naval Weapon System.

e. Provisions for Army-Navy technical liaison personnel.

f. Provisions for JAN Executive Committee to resolve problems.

g. Provisions for a flow of information to Army-Navy on progress of the IRBM #2 by establishing a Joint IRBM Committee together with an Executive Committee.

h. Provisions for an OSD-BMC to review and approve IRBM plans and waive OSD directive procedures.

i. Designation of the established ICBM Scientific Advisory Panel (later known as DOD Scientific Advisory Committee) to provide scientific reviews.

6 The C/S, DA, announced that execution and organization of the 1,500-mile missile program would be established according to the plan announced on 26 October 1955 as soon as practical.

20 Memo from Deputy OSD to Chairman JANBMC releasing authorization for the IRBM #2 to proceed generally in accordance with the 28 November 1955 presentation. Also included were requirements within Army-Navy budgets:

1955 (Cont'd)

DECEMBER

20

FY 56	Army	Navy
R&D	10.0 M	8.0 M
P&P	16.0 M	
Facilities	7.7 M	
Appropriations Not Determined		9.1 M
	$33.7 M	$17.1 M

FY 57	Army	Navy
R&D	18.0 M	
P&P	38.0 M	
Facilities	14.6 M	
Appropriations Not Determined		40.5 M
	$70.6 M	40.5 M

22 ABMA established as a Class II activity under the jurisdiction of the Chief of Ordnance at Redstone Arsenal, Alabama.

1956

JANUARY

11 Gen J. B. Medaris drew up an agreement with Maj Gen B. Schriever, Western Development Division, governing the type engines to be used in both IRBM #1 and IRBM #2.

17 The S/A delegated extraordinary authorities to the Chief of Ordnance with power of redelegation to the CG, ABMA the execution of the IRBM #2 program.

19 OSD-BMC approval of Army request for IRBM #2 facilities at PAFB, Florida. AF was directed to include cost ($2.628 million) of facilities in a supplementary program for ICBM and IRBM #1. Facilities approved included:

a. Missile Assembly Building

b. Laboratory and Engineering Building

c. Launching Facility

d. Igloo and Solid Rocket Propulsion Building

23 Memo from the Chief of Ordnance to CG, ABMA, redelegated all authority contained in Memo from S/A to Chief of Ordnance, dated 17 January 1956.

27 The C/S, DA announced:

a. That the development of the 1,500-mile missile has top priority in the Army.

b. The establishment of the ABMA, with Maj Gen J. B. Medaris as the Commanding General.

c. The organization and its relationship to other Army agencies.

d. The authority of the CG, ABMA to obligate funds, including executing and amending contracts without review by higher authority other than that required by law which prohibits delegation.

e. That allocation of funds would be made on request of CG, ABMA, and in advance of his requirement.

1956 (Cont'd)

FEBRUARY

1 ABMA activated at Huntsville, Alabama, with Maj Gen J. B. Medaris Commanding.

(Approx) Original IRBM #2 Firing Plan (code named JUPITER in April 1956) established, including Navy missile requirements.

10 First meeting between ABMA-Navy-AEC representatives on nose cone and warhead; resulted in establishing the JUPITER Warhead Committee.

10 Chief of Ordnance directed the attention of all commanders to Ordnance Corps Order 3-56, dated 19 January 1956, which provided for utilization, on a priority basis, for other Ordnance installations to expedite the missile development program.

14 The Secretary of Defense Wilson made a decision that IRBM #2 (later JUPITER) would have a compromise--a 105 inch diameter.

21 The CG, ABMA, on recommendation of the IRBM #2 Warhead Committee, approved the design and specifications for the JUPITER nose cone.

23 ABMA submitted its fiscal plan to the JANBMC for development of IRBM #2 for FY 56-Fy 57).

MARCH

7 Military Liaison Committee approved MC for high yield warhead for use in JUPITER.

12 JANBMC approved JUPITER solid propellant program.

14 JUPITER A Missile 18, an adopted REDSTONE, was the first missile launched from Cape Canaveral, Florida, following activation of ABMA.

APRIL

(Approx) The IRBM #2 was named JUPITER.

4 The Secretary of Defense in a Memo to the Chairman, JANBMC, authorized the Navy to proceed with system studies and component development, including propulsion flight testing necessary to determine weapon system feasibility of a solid propellant version of the IRBM #2.

1956 (Cont'd)

APRIL

6 The ASD (R&D) requested the Chairman, AEC, to join the Department of Defense in a Joint Feasibility Study for a JUPITER warhead to achieve a full operational capability by January 1959 and operational status by January 1960.

9 The JANBMC designated the Army the cognizant agency for the radio-inertial guidance program, to include all missile-borne items and all surface equipment common to the land-sea-based systems.

18 Naval Design Requirements for JUPITER made available to ABMA from the local Navy office.

MAY

11-18 OCRD, DA, made a presentation to Dr. E. V. Murphree, Special Assistant to Secretary of Defense for Guided Missiles and to OSD-BMC on the Army employment of JUPITER scheme.

19 The CG, ABMA, recommended to the Dep D/S for Military Operations, DA, a stockpile-to-target sequence doctrine and organizational mobility concept to be used as a basis for Army employment of medium range ballistic missiles.

22 Maj Gen J. B. Medaris made a preentation, "JUPITER Program," to the Symington Subcommittee for the Senate Armed Services Committee; traced the history of the Army in ballistic missiles and the JUPITER development plan.

25 The OSD-BMC took the following action with respect to the JUPITER program:

a. Disapproved proposal to introduce a new contractor into the program aimed at developing an improved JUPITER liquid propellant engine.

b. Requested ASD (R&D) to review long-range rocket engine development.

c. Stopped any JUPITER ground support equipment obligations.

JUNE

6 Allocation of space within the JUPITER nose cone for warhead and major components of the adaption kit approved.

1956 (Cont'd)

JUNE

22 ABMA furnished the JAN Executive Committee the JUPITER Missile Development Plan which included provisions for:

a. 82 R&D JUPITER test missiles

b. 10 R&D spare missiles

c. 31 JUPITER A component evaluation tests

d. 12 JUPITER nose cone re-entry tests

26-27 Navy sponsored a JUPITER Symposium to present FBM solution problems and to acquaint Army-Navy personnel with the problems.

JULY

20 Policy meeting held at ABMA between top management of ABMA and Special Projects, BuOrd (Navy) to establish policy decisions on responsibility of the Army-Navy land- and sea-based missile test operations, and to define respective responsibilities relative to control, maintenance, and scheduling Navy sponsored activities associated with the JUPITER program.

26 The CG, ABMA, and the Dir of Special Projects, BuOrd (Navy) signed a Memo of Agreement setting forth:

a. Criteria to be met in the JUPITER test program to insure FBM shipboard application.

b. Division of responsibility for the test program

c. Division of responsibility for facilities provided PAFB, Florida, for the FBM program.

30 The Dir, BuOrd (SP) and CG, ABMA, approved a Navy Fleet Ballistic Missile Committee structure, together with Terms of Reference for the committee.

31 Total authorized JUPITER funds through FY 56 were:

R&D 10.720 M

P&P 29.000 M

MCA 0

1956 (Cont'd)

AUGUST

8 Construction of the largest static test stand in the US for testing rocket motors was completed at Redstone Arsenal and slated for use in the JUPITER IRBM program.

SEPTEMBER

30 A review of the JUPITER program indicated such success that the program could be accelerated and, therefore, resulted in a change to the firing schedule as follows:

a. JUPITER C #29 and #23 were removed from the schedule because of the successful flight of JUPITER C #27.

b. JUPITER Missile #1A and #1B were added to the schedule, thus permitting the first JUPITER missile firing some three months earlier than originally scheduled.

OCTOBER

1 Proposal for the FBM JUPITER Submarine Application document which presents a summary of conclusions and recommendations resulting from preliminary studies of an IRBM system capable of delivering high-yield weapons on land targets from submarines.

4-5 JUPITER Symposium held at ABMA.

NOVEMBER

7 Conference between Staff Members, House Appropriation Committee, and representatives of Navy Liaison Office, ABMA, discussed Navy utilization of JUPITER missile.

26 Secretary of Defense issued a Memo to members of the Armed Forces Policy Council fixing the roles and missions of the three Armed Services in the development of missiles. Those affecting the IRBM were: USAF, operational employment of the land-based system; Navy, operational employment of the ship-based system; Army, operational employment of the 200-mile range system.

DECEMBER

7 Secretary of Army in a Memo to Secretary of Defense recommended that the JUPITER program be continued through CY 1957 to permit an intelligent choice between THOR and JUPITER.

1956 (Cont'd)

DECEMBER

8 The Secretary of Defense in a Memo to the Secretary of Navy authorized the Navy to delete the liquid-propelled JUPITER from its IRBM program; abolish the JANBMC; and proceed with the solid propelled POLARIS IRBM.

Department of the Navy, BuOrd, SP, notified ABMA that, with DOD approval of the POLARIS solid propellant missile, the Navy would proceed in an orderly withdrawal from the JUPITER program.

1957

JANUARY

8 CG, ABMA, officially announced Navy withdrawal from the JUPITER program.

14 Presentation of the JUPITER program made to OSD Scientific Advisory Group. Particular emphasis placed on JUPITER inertial guidance system.

29 Chief, R&D, DA, furnished information on possible satellite use of JUPITER C missiles.

31 The JUPITER program was revised after Navy disassociation to 43 development flight missiles, plus 4 spares. All missiles to be assembled in ABMA laboratories.

FEBRUARY

1 ABMA informed Chief, R&D, DA, that Army JUPITER satellite could accommodate instrumentation of the VANGUARD payload, but not the sphere itself.

APRIL

2 Memo for Chairman, ABMC, from Special Assistant to Secretary of Defense for Guided Missiles stated OSD-BMC had approved Army proposed JUPITER program for 1 July 1957 through 30 November 1957.

JUNE

11 Presentation of the JUPITER program to the OSD-Scientific Advisory Group giving the progress of JUPITER program and firings to date.

18-19 JUPITER technical briefing on JUPITER missile and system.

JULY

30-31 Presentation to members BMD at ABMA on the JUPITER system concept in terms of AF operational requirements.

31 Total authorized JUPITER funds for FY 57:

R&D 25.0 M

P&P 115.9 M

MCA 17.2 M

1957 (Cont'd)

AUGUST

7 ABMA Message to Chief, R&D, DA, in four parts: Part I set forth effects expected from an arbitrary decision to cancel JUPITER effective 31 August 1957; Part II estimated costs incurred by the JUPITER program and recoverable funds; Part III, effects of overtime on the development schedule; Part IV emphasized that to arbitrarily cancel JUPITER without assigning challenging programs to ABMA would cause the nation to lose a valuable asset--a group capable of developing almost any type ballistic missile, anti-ballistic missile, or satellite system.

21 The success of RS-40 brought about a decision to discontinue flight tests of JUPITER-C re-entry type missiles. Missile hardware on hand was to be stored to constitute a shelf-life test applicable to the REDSTONE program.

OCTOBER

7 The S/A sent a Memo to the Secretary of Defense pertaining to the significance of SPUTNIK I launch and recommending use of JUPITER C for early satellite launch.

ABMA submitted to AFBMD proposed schedule for planning and developing JUPITER weapon system; however, AFBMD declined responsibility for review or approval.

19 The Secretary of Defense verbally directed the CG, ABMA, as a matter of highest national urgency, to proceed with all actions required to prepare for JUPITER IOC missile production and to immediately undertake fabrication of prototypes of JUPITER peculiar GSE

31 Presentation of the JUPITER program to OSD Scientific Advisory Group on firings, growth potentials of JUPITER to 2,000 KM range, and production facilities at ABMA.

NOVEMBER

6-8 JUPITER training conference held at AFBMD.

7 President Eisenhower announced U. S. had solved missile re-entry problem.

8 Secretary of Defense ordered ABMA to prepare a JUPITER C missile for launching a satellite as part of the IGY program.

1957 (cont'd)

NOVEMBER

20 S/A recommended to Secretary of Defense that 30 January and 6 March 1958 be approved as launching dates for first two JUPITER C satellites. These dates were approved on the same date.

22 Dir of GM, OSD, directed DA to launch JUPITER C satellites to carry the cosmic radiation package prepared by Dr. James Van Allen of the University of Iowa.

27 Secretary of Defense directed AF to proceed with operational development of both THOR and JUPITER missile systems.

DECEMBER

5 R&D, DA informed that increase in time-at-site (Project HARDTACK) would jeopardize firing schedule at AFMTC and hamper JUPITER development.

30 Hq, USAF, conference to plan development of AF concept for employment of JUPITER resulted in scheduling a meeting of ABMA on 8 January 1958 to coordinate preparation of AF operations plan.

1958

JANUARY

2 In response to an inquiry from the Chief, R&D, DA, ABMA stated it could assure a third JUPITER C (JUNO I) firing to place a National Advisory Committee on Aeronautics (NACA) 12-foot inflatable sphere into a high altitude (500-mile perigee) orbit by mid-1958.

16 The 864th Strategic Missile Squadron (JUPITER) was activated at ABMA.

20 JUPITER Support Management Office (JSMO) was activated at ABMA. This organization, with five ABMA members, directed field logistical support activities for the JUPITER system.

29 Chief, R&D, DA requested information regarding the use of JUPITER C missiles in connection with the satellite program.

(Approx) The firing date of JUPITER Missile 5 was rescheduled from 26 February to 26 March to permit installation of additional telemetry instruments on the turbopump, gas generator, and lube oil system, and to permit further evaluation of the turbopump failures of Missiles 3A and 4.

(Approx) OPERATION GASLIGHT, a project designed to obtain photographic, spectrographic, and infrared measurements of re-entry nose cones will be conducted in conjunction with JUPITER Missile #5 Nose Cone recovery operations.

FEBRUARY

5 Conference was held at ABMA to develop relationships and responsibilities between ABMA and AF, and to establish an AFJUPLO at ABMA.

An AF JUPITER WSPO was established during this month at Inglewood, California, and a JUPITER Liaison Office at ABMA to facilitate coordination of the JUPITER weaponization program.

MARCH

31 The first individual JUPITER training classes for AF personnel began at OGMS, using REDSTONE equipment.

1958 (Cont'd)

APRIL

8 Conference held with AF JUPITER Support Management Office to discuss equipment for 3rd and 4th JUPITER squadrons.

14 JUPITER Project Office established at ABMA.

15 Assignment to ABMA of a top priority national space program (JUNO) necessitated rescheduling delivery of JUPITER.

JUNE

2 The 865th Strategic Missile Squadron (JUPITER) activated at ABMA.

16 ABMA planned to equip and train the 864th Strategic Missile Squadron (JUPITER) for its partial deployment overseas with not less than five missiles by 31 December 1958.

JULY

1 ABMA scheduled JUPITER missiles and ground equipment to overseas deployment of three squadrons in December 1958, August 1959, and February 1960, respectively.

During the month, the AF cancelled plans for training the 866th and 867th (JUPITER) Squadrons at Vandenberg AFB, California. All squadrons would be trained by OGMS at Redstone Arsenal, Alabama

AUGUST

28 JUPITER Missile 101 delivered to AF.

31 ABMA notified AFJUPLO that the administrative and supply personnel of the 864th Strategic Missile Squadron were ready for deployment.

(Approx) JUPITER Missiles 101-105 allocated for AF training purposes.

SEPTEMBER

1 The 866th Strategic Missile Squadron (JUPITER) activated at ABMA.

16 Guidance received from SAC in revising the configuration of the 864th Strategic Missile Squadron (JUPITER).

24 Third JUPITER Logistic symposium held at MOAMA, Brookely AFB, Alabama.

1958 (Cont'd)

OCTOBER

13 AF Inter-Command Planning conference successfully resolved detailed command responsibilities and relationships in the JUPITER program.

28 AF received its JUPITER training requirements to include training of NATO squadrons.

31 Tentative JUPITER overseas deployment sites selected and primary survey accomplished.

JUPITER Support Management Office (JSMO) Team sent to Europe during the month to discuss technical aspects of the JUPITER missile system installation with representatives of the Corps of Engineers and USAFE.

NOVEMBER

7 AF JUPITER Training Programming Conference resulted in decision to field three JUPITER squadrons to be trained in five cycles.

20 DA notified ABMA that AF had responsibility for operational emplacement of the JUPITER missile. This resulted in the elimination of GSE used exclusively for mobility from the JUPITER system.

21 ABMA and MOAMA prepared detailed plans for the transfer of logistic responsibility for JUPITER to AF.

During the month, USAF decided that only eight JUPITER missiles would be deployed with the 864th Strategic Missile Squadron; one missile for each of the six launchers, plus two maintenance float missiles.

1959

JANUARY

Environmental testing of JUPITER GSE fueling and erecting components was successfully completed at Eglin AFB, Florida.

Contractor storage sites at CCMD and FICo are in the process of being terminated. JUPITER assets to be transferred to Brookley AFB (MOAMA), the Weapon system storage site, prior to 31 March 1959.

FEBRUARY

9 DA approved a USAFE plan for deployment of the JUPITER weapon system to being 190 days after signing intergovernmental agreements.

MARCH

2 Conference at Headquarters USAF resulted in preparation of JUPITER training schedule.

APRIL

13 S/AF issued implementing instructions to USAF echelons for deployment of two JUPITER squadrons to Italy.

MAY

20 Detachment 5 Liaison Office, ATC, activated at Redstone Arsenal, Alabama, to perform JUPITER administrative mission for NATO students.

NATO Liaison officer and first increment of Italian (JUPITER) students arrived during the latter part of the month at ATC, Lackland AFB, Texas, for missile indoctrination and language training.

JULY

1 USAF postponed the (JUPITER) 1 April 1959 "M" date until the USAFE-IAF Technical Agreement was signed.

During the month, Sandia Corporation concluded that clarification of the warhead environment in the JUPITER could be made on the basis of tests already completed, plus three additional successful tests at 300, 800, and 1,500 NM ranges.

1959 (Cont'd)

SEPTEMBER

1 The 864th Tactical Training Squadron (formerly 864th Strategic Missile Squadron-JUPITER) completed formal training at Redstone Arsenal, Alabama.

5 Deployment of personnel to Italy for installation of JUPITER weapon system began.

9 Initial complement of IAF personnel began JUPITER training at OGMS, Redstone Arsenal, Alabama

25 Matching and mating of JUPITER Missile 206 with its GSE completed.

31 JUPITER Initial Operational Capability (IOC) Missile 221 delivered to USAF.

OCTOBER

11 First surface shipment of JUPITER IAF equipment by MOAMA deported aboard USS May-Lykes.

22 ABMA representatives conducted meetings in Rome, Italy, resolved security problems plaguing JUPITER deployment.

Delivery of JUPITER IOC Missiles 120, 121, and 113 during October 1959 marked the end of ABMA's in-house production of these missiles for the AF.

ABMA completed matching and mating of JUPITER Missiles 207 and 208 with GSE.

NOVEMBER

4 CCMD assigned responsibility for matching and mating of GSE for JUPITER missile (M210).

9 Contract with CCMD for fabrication of 15 JUPITER IRBM targets became effective this date.

15 The 864th Tactical Training Squadron completed its JUPITER IWST.

DECEMBER

9 The first IAF students began JUPITER IWST at Redstone Arsenal, Alabama.

1959 (Cont'd)

DECEMBER

12	The second JUPITER training missile scheduled for deployment to NATO I (Italy) departed Redstone Arsenal, Alabama, by air.
20-23	Two ships departed MOAMA with fourth increments of JUPITER equipment for NATO II.
29	Pentadome erected at JUPITER site in Italy for AF weapons supply.
31	Two hundred sixty-nine USAF Technical Assistance personnel and 365 dependents were on site in Italy with the JUPITER system emplacement.

1960

JANUARY

5 Final R&D production JUPITER Missile 30 shipped to AMR.

19 First three Italian launch crews graduated from JUPITER IWST at OGMS.

20 Representatives from ABMA Detachment C, MOAMA, JEFO, and CCMD attended JUPITER modification conference at Gioia del Colle, Italy.

25 U. S. Mediterranean Division Engineer at Leghorn, Italy, convened a pre-designed conference on NATO II (Turkey) JUPITER site construction.

27 ABMA shipped the first three tactical JUPITER missiles (201-203) to NATO I.

FEBRUARY

8 Cigli, Turkey, near port city of Izmir, selected as site for deployment of third JUPITER squadron.

10 USAF confirmed projected slippage in BOD's of JUPITER launch positions in NATO I.

12 ABMA received informal request to continue JUPITER training.

MARCH

28 Preliminary design review of JUPITER deployment site in Turkey (NATO II) conducted in Los Angeles, California.

29 The 7230th Tactical Training Group began on-site training of IAF (JUPITER) personnel.

APRIL

5 Technical review of JUPITER communications program for NATO I held in Rome, Italy.

28 Interservice Implementation Agreement, JUPITER Missile Program, USA-USAF, Dated 27 October 1959, revised to include training of AF personnel in JUPITER administrative and technical areas.

MAY

10 First JUPITER IAF individual training cycle completed at OGMS. Second cycle began on the 18th.

1960 (Cont'd)

JUNE

13 Signing of amendment to USAF-US Army Interservice General Agreement permitted transfer of JUPITER procurement functions from Army to AF.

30 Simulated flight test of JUPITER missiles on Launch Position 1 (NATO I) successfully completed and position scheduled for transfer to AF on 5 July 1960.

In May and June, ABMA personnel moved JUPITER Missiles 201, 202, and 203 and associated GSE to Italian Launch Postion I and II sites.

Chrysler Corporation contract to provide JUPITER (IRBM) missiles for NIKE ZEUS targets terminated at cost of $1.75 M

JULY

1 Configuration control of the JUPITER missile system transferred to MOAMA per Interservice Implementation Agreement dated 27 October 1958.

11 Overseas JUPITER Launch Position Number 1 was turned over to IAF; operational on 15 July 1960.

26 JUPITER Training Reprogramming Conference held at RSA.

AUGUST

12 ABMA representatives attended JUPITER Modification Review Board Conference at MOAMA.

SEPTEMBER

14 JUPITER Training Site Number 1 turned over to IAF.

28 Installation and Checkout (I&C)Team occupied JUPITER Launch Position Number 3 (Italy).

30 Approximately 50% of all GSE for JUPITER Launch Position Number 4 (Italy) on site.

OCTOBER

3 JUPITER Launch Position Number 2 turned over to IAF.

1960 (Cont'd)

DECEMBER

28 ABMA representatives attended JUPITER Weapon System Safety Meeting at AFSWC.

31 Eleven JUPITER missiles and nine sets of match-and-mate GSE delivered during the period.

Engineering Services for the JUPITER were transferred to the AF.

Twelve JUPITER missiles shipped overseas during the period. (One missile damaged enroute was returned).

1961

JUNE

Except for minor actions, the Army's role in deploying the JUPITER weapon system to Italy was completed during June 1961.

DECEMBER

31 Except for technical assistance, Army responsibility for support of the JUPITER program ended.

SEMIANNUAL PERSONNEL STRENGTH

CY 1956—1959

30 JUNE 1956

	Authorized	Assigned
Military	535	513
Civilian	3,237	2,636
Totals	3,772	3,149

31 DECEMBER 1956

	Authorized	Assigned
Military	592	624
Civilian	4,149	3,488
Totals	4,741	4,112

30 JUNE 1957

	Authorized	Assigned
Military	608	635
Civilian	4,206	4,100
Totals	4,814	4,735

31 DECEMBER 1957

	Authorized	Assigned
Military	625	629
Civilian	4,828	4,248
Totals	5,453	4,877

30 JUNE 1958

	Authorized	Assigned
Military	378	365
Civilian	5,015	4,817
Totals	5,393	5,182

SEMIANNUAL PERSONNEL STRENGTH (Cont)

CY 1956—1959

26 DECEMBER 1958

	Authorized	Assigned
Military	380	403
Civilian	5,452	5,336
Totals	5,832	5,739

30 JUNE 1959

	Authorized	Assigned
Military	382	398
Civilian	5,407	5,346
Totals	5,789	5,744

31 DECEMBER 1959

	Authorized	Assigned
Military	381	357
Civilian	5,343	5,321
Totals	5,724	5,678

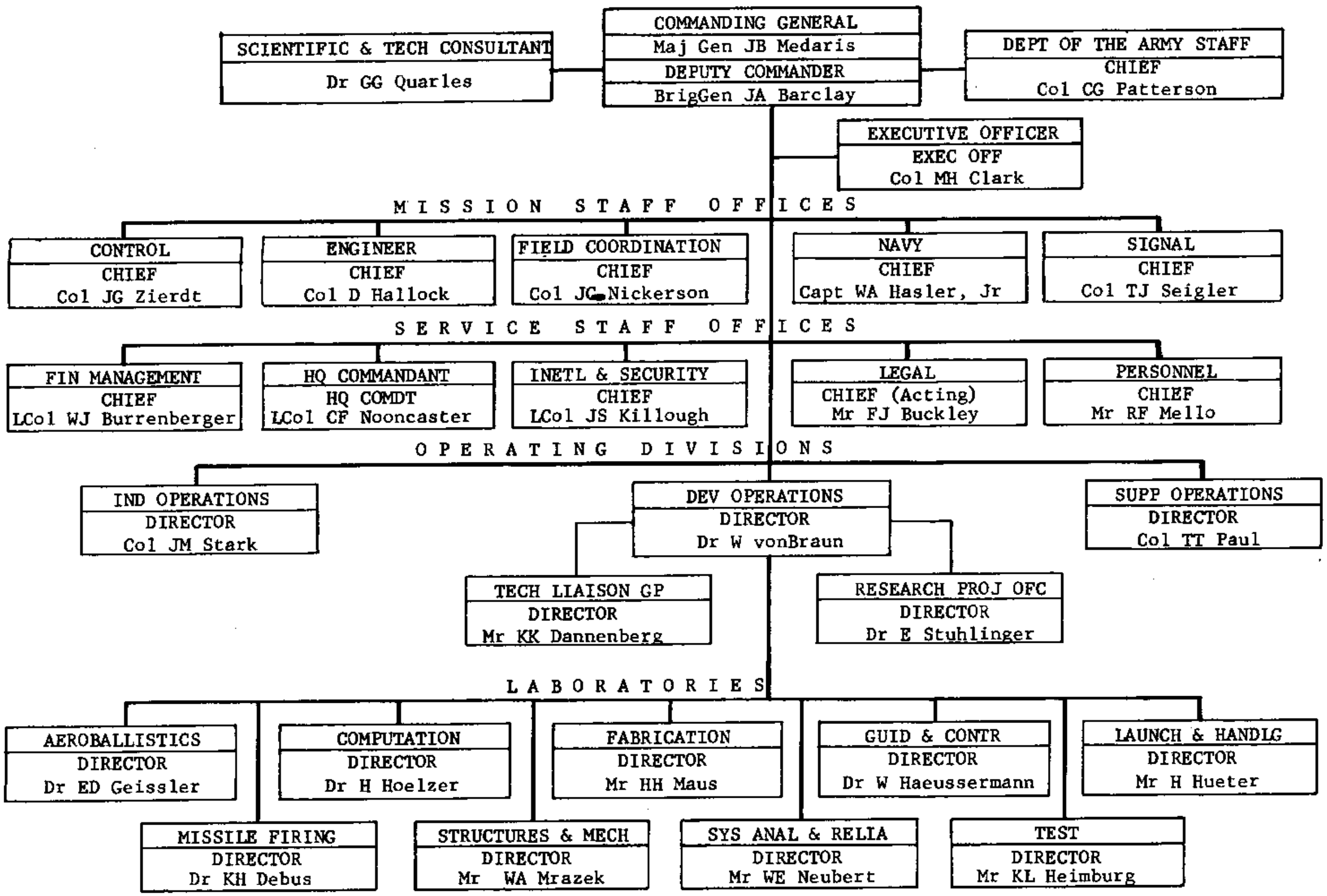
$25 MILLION FY 1957 MCA PROGRAM

PROJECT NR	PROJECT TITLE	AMOUNT
A803-803.110	Addition to Structural Fabrication Building	$ 860,000
A803-803.120	Structures and Mechanics Laboratory	5,526,000
A803-803.130	Extension to Guidance & Control Laboratory and Shop	4,623,744
A803-803.140	Computations Laboratory	1,414,000
A803-803.150	Addition to Engineering Building at Test Stand Area	595,500
A803-803.160	Guided Missile Test Shop	1,029,000
A803-803.170	Missile Assembly-Inspection Hangar	2,401,000
	JPL Facilities	1,500,000
	Extension of Utilities (RSA) to Support ABMA Facilities	500,000
	Surface Treatment Facility	1,150,000
	Signal Pictorial Services Building	485,000
	Additions to Test Stands for Power Plant Development	1,000,000
	Modification of Building 405-A	180,000
	Sub-Total	$21,264,244
	Contingiencies	3,735,756
	Total	$25,000,000

ARMY BALLISTIC MISSILE AGENCY

Huntsville, Alabama

15 Sept 56



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Appendix 4

JUPITER MISSILE FACT SHEET - 1959

		Maximum Range	Minimum Range
1.	**TRAJECTORY:**		
	Range (Nautical Miles)	1500	300
	Altitude (Statute Miles)	390	85
2.	**CPE** (Meters)	1500	1500
3.	**PAYLOAD**	1600 #	1600 #
4.	**DIMENSIONS:**		
	Length	60'	60'
	Diameter	105"	105"
5.	**THRUST** (Sea Level)	150,000 #	150,000 #
6.	**WEIGHTS:**		
	Dry	10,715 #	10,715 #
	Nose Cone (Body)	3,000 #	3,000 #
	LOX	68,760 #	68,760 #
	Fuel (RF-1)	30,415 #	30,415 #
	Lift Off	108,804 #	108,804 #
7.	**TIME:** (Seconds)		
	Total	1,016.9	486.9
	Maximum Dynamic Pressure (Ascent)	70	70
	Cut-off	157.8	123.7
	Separation (Thrust Unit)-Vernier Start	± 161.8	± 127.7
	Vernier Cut-off (Av.)	173.8	139.7
	Separation (Nose Cone)	339.3	305.2
	Zenith	552	262
	Re-entry (100 kilometers assumed)	950	351
	Maximum Dynamic Pressure (Descent)	983	428
	Impact	1016.9	486.9
8.	**SPEED:** (Mach)		
	Cut-off	13.04	6.33
	Re-entry	15.45	6.25
	Impact	0.49	0.49
9.	**ACCELERATION, MAX.**	13.69g	5.29g
10.	**DECELARATION, MAX.**	44.0g	12.0g
11.	**WARHEADS**	Nuclear	Nuclear
12.	**FUZING**	Proximity & Impact	
13.	**GUIDANCE SYSTEM**	Inertial	Inertial

JUPITER MISSILE FACT SHEET - 1959 (Cont)

E N G I N E S

Model	Description	Rated Thrust (lbs.)*	Thrust Tolerance (± lbs.)	Specific Impulse Min.	Specific Impulse Nom.	Burning Time Nominal (Seconds)
1st	Used on #1A and #1B	135,000	4,050	240	244	167
2nd	Used on #1 - #3A; Turbopump discharge duct 3.50"; flexible line 3.32" (ID)	139,000	4,170	241.3	244.9	163
3rd	Used on #4; discharge ducts and flexible line 4.26"	139,000	4,050	241.3	244.9	163
4th	Used on #5	150,000	4,500	245	247.5	152

* - AT sea level, using LOX and RF-1 fuel.

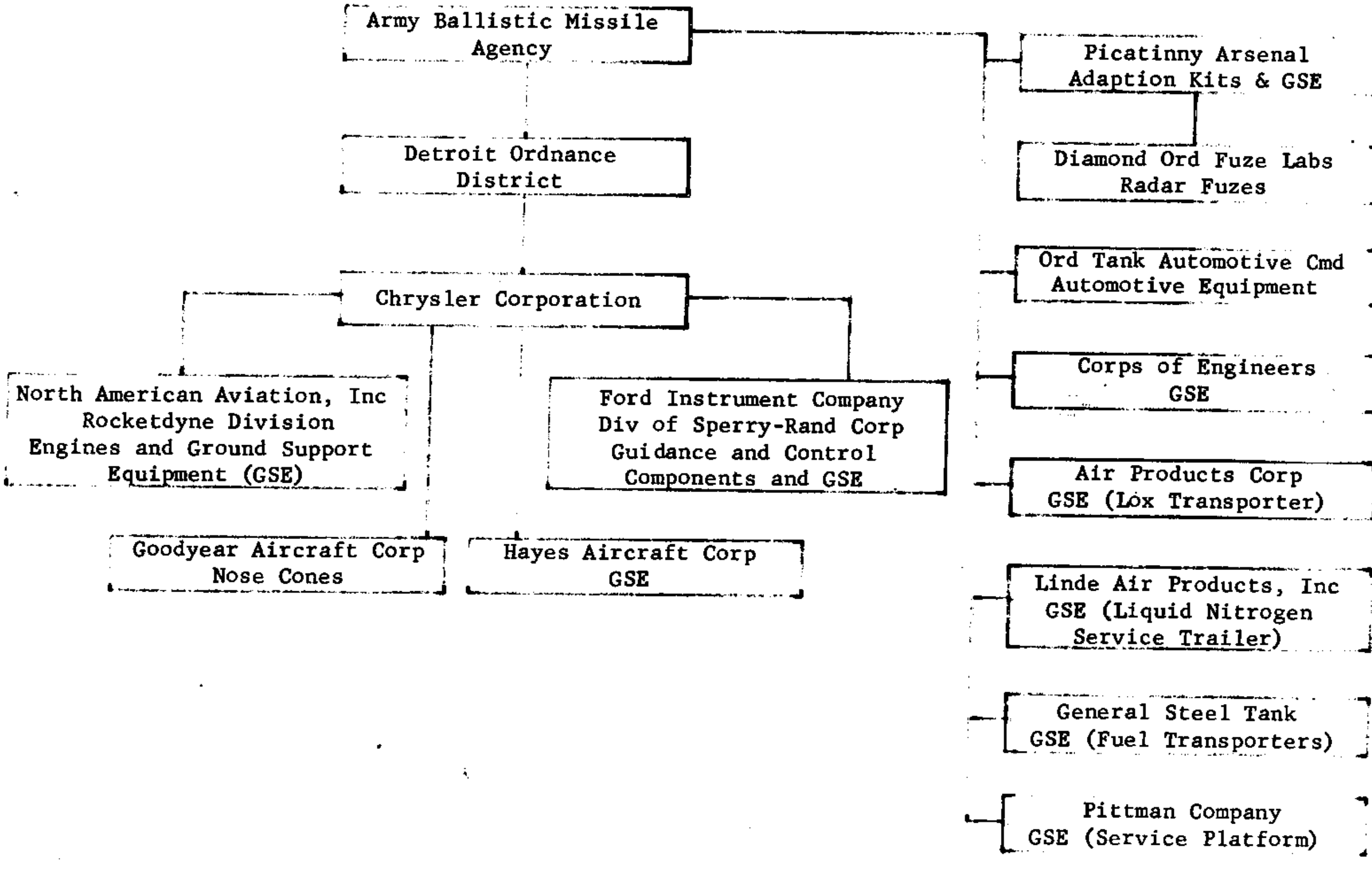
F U E L S

	LOX (99.5%)	RF-1*
MOLECULAR WEIGHT	32.0	165-180
FREEZING POINT (°F)	-361.8°	Av. -76°F
BOILING POINT (°F)	-297.4°	410°-572°
DENSITY (68°F) (gr/cc)	1.142**	0.801-0.815
COLOR	Light Blue	Colorless
ODOR	None	Typical Petroleum
TOXICITY:		
Inhalation	None	Mild
Contact	None	Mild
CORROSIVENESS	Non-corrosive	Very Mild
EXPLOSIVE LIMIT IN AIR	Non-explosive	
HANDLING HAZARD	High	Low
COMMERCIAL AVAILABILITY	Plentiful	Plentiful

*RF-1 is a kerosene-type fuel consisting primarily of aliphatic hydrocarbons.
**Density computed at boiling point (-297.4°F)

CONTRACTORS STRUCTURE
JUPITER MISSILE SYSTEM

Prime Contractor - Chrysler Corporation



JUPITER A FIRINGS

22 Sep 55 JUPITER A Missile RS-11 was launched at 0051 hours EST from AMR after a three-hour hold. The flight was unsuccessful. The LOX container pressure and the combustion chamber decreased 50 seconds after liftoff. The temperature of Fin Number 1 went out of measuring range 72 seconds after liftoff. The servo battery current dropped to zero and the stabilized platform lost its reference. The range safety officer gave the emergency cutoff signal at 79 seconds. Impact occurred approximately 21,000 yards from the launch pad. The RS-11 was the first flight with the complete guidance system.

5 Dec 55 JUPITER A Missile RS-12 was launched from AMR at 1946 hours EST. The flight was successful. The actual range was 144.79 NM; .31 NM over; and 200 meters right of the intended impact point. The primary test objective was to test the complete guidance system. This was the first successful flight with the inertial guidance system.

14 Mar 56 JUPITER A Missile RS-18 was launched at 1936 hours EST from AMR. The flight was successful. The scheduled launching date of this missile was 13 March. Three holds were called because of LOX difficulties, telemetry difficulties, and replacement of a gate valve. The actual range was 133.58 NM; 10.3 NM under; and 5.66 NM right of the intended impact point. Separation occurred before the missile gained its correct velocity. Improper assumption of propellant flow for the trajectory calculation was primarily responsible for the incorrect cutoff. The primary test objectives were to test the complete guidance and control system to establish the performance qualities of the complete missile system.

15 May 56 JUPITER A Missile RS-19 was launched at 2321 hours EST from AMR. The flight was successful. The actual range was 169.4 NM; 13 NM over the intended impact point. Cutoff was given by the alcohol depletion switch that sensed alcohol injector pressure dropoff. Takeoff occurred 0.156 seconds after firing. The missile followed the correct trajectory with no obvious deviations. Missile cutoff occurred later than predicted and caused the missile to impact approximately 6.5 NM long. During descent the warhead turned left, causing impact to be several miles to the left of the aiming azimuth line. The primary test objectives were to test the angle-of-attack meter hardware (JUPITER control).

 [redacted]

19 Jul 56 [redacted] JUPITER A Missile CC-13 was launched at 0345 hours EST from AMR. The flight was successful. The actual range was 142.457 NM; .780 NM over the intended impact point. This was the first Chrysler fabricated and assembled missile.

8 Aug 56 [redacted] JUPITER A Missile RS-20 was launched at 0325 hours EST from AMR. The flight was successful. The actual range was 139 72 NM; 0.3 NM over the intended impact point. The primary test objectives were to test the accuracy of the guidance system and to acquire data for the establishment of design criteria for the JUPITER. This was the first time that the combustion chamber pressure was controlled.

18 Oct 56 [redacted] JUPITER A Missile CC-14 was launched at 0405 hours EST from AMR after a series of short holds. The flight was successful. The actual range was 137.870 NM; 72 meters over; and 338 meters right of the intended impact point. The primary objectives were to test the accuracy of the guidance system and to test angle-of-attack meters for the JUPITER.

30 Oct 56 [redacted] JUPITER A Missile RS-25 was launched at 2104 hours EST from AMR. The flight was not successful. The behavior of the missile appeared normal for the first 13 seconds, an early roll disturbance having been smoothly eliminated. Starting at 13 seconds after range zero, the gyro yaw signal indicated increasing yaw for a few seconds and the tracking devices at the same time showed increased displacement to the left of the standard trajectory. The malfunction apparently occurred between the yaw gyro potentiometer output and the outputs of the yaw amplifier of the mixing computer. The primary test objective was to test power plant performance.

13 Nov 56 [redacted] JUPITER A Missile RS-28 was launched at 2105 hours EST from AMR. The flight was successful. Actual range was 152.4 NM; 9.51 NM over; and 1.5 kilometers left of the intended impact point. The missile carried the LEV-3 rather than the ST-80 guidance system and used fuel depletion cutoff. The primary test objective was to test the Sandia payload.

29 Nov 56 [redacted] JUPITER A Missile CC-15 was launched at 0823 hours EST from AMR. The flight was successful. Actual range was 138.969 NM; .137 NM over; and 122 meters left of the intended impact point, a radial miss distance of 260 meters. The primary test objectives were to test the accuracy of the complete guidance system and to test JUPITER control components.

[redacted]

18 Dec 56 ([redacted]) JUPITER A Missile RS-22 was launched from AMR at 2230 hours EST. The flight was successful. Actual range was 401.6 NM; 84.9 NM over the intended impact point. The missile used Hydyne fuel. The primary test objective was to test the control of an unstable missile configuration by using an angle-of-attack meter (boom type) in the ascending phase (JUPITER control).

18 Jan 57 ([redacted]) JUPITER A Missile CC-16 was launched at 2037 hours EST from AMR. The flight was successful. Actual range was 61.6 NM; 400 meters left; and 0.21 NM over the intended impact point. The primary objective was to test the accuracy of the guidance system when the missile is fired in a short range trajectory at an extreme attitude to range ratio. The missile closely followed its predicted trajectory for a successful flight which terminated 70 meters beyond and 360 meters to the left of the expected impact point at 61.553 NM range. The short range trajectory was programmed with an extreme altitude-to-range ratio so the guidance system would be subjected to the most difficult short range expected in future tactical application.

14 Mar 57 ([redacted]) JUPITER A Missile RS-32, the first missile shipped directly from the Chrysler Factory to the test site to be flight tested, was launched at 0312 hours EST from AMR. The flight was successful. Actual range was 138.178 NM; 2.2 NM under; and 1250 meters left of the intended impact point. The missile functioned properly until 182 seconds when an unexplainable pitch deviation caused a slow tilting of the missile top section. The cutoff function at 120 seconds and the separation function at 13[illegible] seconds, after flight zero time, were both satisfactory.

27 Mar 57 ([redacted]) JUPITER A Missile CC-30 was launched at 2022 hours EST from AMR. The flight was successful from the standpoint of missions accomplished, with cutoff time 112 seconds and separation time 126 seconds after range zero time. Impact point was 220 meters short and 320 meters to the right, a radial miss distance of 390 meters. The primary objective was to test the accuracy of the guidance system when the missile was fired in a short range trajectory at an extreme altitude to range ratio.

26 Jun 57 ([redacted]) JUPITER A Missile CC-31 was launched at 0609 hours EST from AMR to test performance of the inertial guidance system, angle-of-attack meters, separation of explosive screws, and impact and radar fuzing systems. Range instrumentation difficulties and deteriorating weather delayed the firing from the initially scheduled time—0230 hours EST. The flight was successful. Actual range was

135.425 NM; 0.42 NM over; and 389 meters left of the intended impact point.

12 Jul 57 ([redacted]) JUPITER A Missile CC-35 was launched at 0130 hours EST from AMR. The primary test objective was to test the accuracy of the guidance system. The flight was successful. Actual range was 130.125 NM; 0.15 NM over; and 285 meters left of the intended impact point. All missions were successfully accomplished. The missile followed the predicted trajectory very closely. Survey of the impact crater indicated a miss distance of 50 meters over and 284 meters to the left of the predicted impact point, giving a radial miss distance of 389.5 meters.

25 Jul 57 ([redacted]) JUPITER A Missile CC-37 was launched at 2317 hours EST from AMR. The flight was successful. Actual range was 126.227 NM; 147 meters under; and 182 meters left of the intended impact point. The primary test objective was to flight test warhead and fuze functioning as a system. A survey of the warhead impact point indicated a miss distance of 147 meters short, 182 meters to the left of the predicted impact point, or a radial miss distance of 234 meters.

10 Sep 57 ([redacted]) JUPITER A Missile CC-38 was launched at 2141 hours EST from AMR. The flight was unsuccessful. The missile impacted 14 77 NM from the launch pad. Mechanical failure of the guidance tilt program caused the missile to assume a very steep trajectory which resulted in a short range flight.

2 Oct 57 ([redacted]) JUPITER A Missile CC-39 was launched at 1429 hours EST from AMR. The flight was successful. The impact point was 445 meters long and 452 meters to the right of the predicted impact point, giving a radial miss distance of 634 meters. This was the first flight test of the NAA A-6 engine with a sea level thrust of 78,000 pounds.

30 Oct 57 ([redacted]) JUPITER A Missile CC-41 was launched at 2352 hours EST from AMR. The flight was unsuccessful. Actual range was 48 NM, whereas the predicted range was 130.588 NM. At 68 seconds, a disturbance occurred in the lateral accelerometer and computer systems. Erroneous guidance instructions were transmitted to the control system, causing a sharp yaw at 70 seconds. Cutoff was initiated at 98.1 seconds. One of the objectives was to indoctrinate troops for participation in the tactical portion of the countdown.

10 Dec 57 ([redacted]) JUPITER A Missile CC-42 was successfully fired at 1936 hours EST from AMR. The missile followed the trajectory very closely and impacted on target. All missions were successfully accomplished. The predicted impact range was 141.895 NM. The miss distance has been certified as 153 meters radial, 94 meters over, and 121 meters to the left of the predicted impact point. The primary objective of the test was to flight test Hardtack adaption kit components as passengers.

14 Jan 58 ([redacted]) JUPITER A Missile CC-45 was successfully fired at 2024 hours EST from AMR. The flight was successful in that all missions were accomplished. The missile followed its predicted trajectory closely. Impact was 370 meters over and 86 meters to the right of the predicted impact point, a radial miss distance of 380 meters. This was the fifth complete flight test of warhead and fuze system.

11 Feb 58 ([redacted]) JUPITER A Missile CC-46 was successfully fired at 1954 houre EST from AMR. The flight was successful in that all missions were accomplished, with the exception of the Hardtack adaption kit mission. Impact was 258 meters over and 172 meters to the left of the predicted impact point, a radial miss distance of 310 meters. The primary objectives of the test were to test the warhead and fuze system and the guidance system.

27 Feb 58 ([redacted]) JUPITER A Missile CC-43 was successfully fired at 1459 hours EST from the AMR. The flight was successful in that all missions were accomplished. Impact was 461 meters over and 64 meters to the left of the predicted impact point, a radial miss distance of 466 meters.

11 Jun 58 ([redacted]) JUPITER A Missile CC-48 was successfully fired at 2059 hours EST from AMR. The flight was a success in that all missions were accomplished with the exception of failure of the thrust governor. This failure was caused by human error before firing which caused excess velocity, thereby exceeding the predicted impact point by 8.36 NM. Programmed range to impact was 137.31 NM. All other missions were satisfactorily completed.

[redacted]

JUPITER C FIRINGS

20 Sep 56 [redacted] JUPITER C Missile RS-27, the first three-stage re-entry missile, was fired at 0145 hours EST from AMR. This missile attained an estimated range of 3,335 ST miles, an latitude of 682 ST miles, and reached MACH 18 velocity. The primary objective of the firing was the propulsion and separation test of a multi-stage vehicle. The missile was a four-stage configuration with the last stage inactive. The first stage was an elongated REDSTONE missile, the second and third stages were made up of 11 and 3-six inch scaled SERGEANT rockets, respectively. The payload consisted of approximately 20 pounds of instrumentation attached to the inactive fourth stage. The flight was successful and the sequence of operations occurred as programmed. This vehicle could have obtained sufficient velocity to place it in orbit, if the last stage had been activated.

15 May 57 [redacted] JUPITER C Missile RS-34, the second three-stage re-entry missile, was launched at 0255 hours EST from AMR to test the thermal behavior of a scaled-down version of the JUPITER nose cone during re-entry. The separated nose cone, which weighed 314 pounds, should have reached a nominal range of 1,112 NM. The missile began to pitch up at 134 seconds, and impact was 420 NM short of the intended impact point. The composite missile consisted of three stages. The first stage was an elongated REDSTONE thrust using alcohol and liquid oxygen as propellant. The second and third stages were made up of clusters of 11 and 3 scaled-down SERGEANT solid propellant rockets, respectively. The nose cone was not recovered; however, instrument contact with the nose cone through re-entry indicated that the ablative-type heat protection for warheads was successful.

8 Aug 57 [redacted] JUPITER C Missile RS-40, fired from AMR at 0159 hours EST, impacted at the predicted range. This success proved conclusively that the planned ablative-type heat protection for JUPITER warheads was satisfactory. The missile was a three-stage configuration—the first stage an elongated REDSTONE missile, the second and third stages an 11 and 3-six inch scaled SERGEANT rockets, respectively. The one-third scale JUPITER nose cone was attached to the final stage with scheme for separation provided. The nose cone traveled to a 1,168 NM range, reached a velocity of 4,004 M/Sec, and experienced a total heat input at stagnation point at 95% of that for the full scale nose cone at 1,500 NM. Naval Units recovered the scaled nose cone according to plan.

[redacted]

JUPITER MISSILES - R&D FIRINGS

1 Mar 57 [redacted] JUPITER Missile AM-1A, the first JUPITER flight, was fired at 1651 hours EST from AMR. The missile achieved a 48,000 foot altitude. Flight terminated at 74 seconds because of missile breakup. Failure was attributed to overheating in the tail section. The trajectory to this point was as predicted.

26 Apr 57 [redacted] JUPITER Missile AM-1B fired from AMR at 1512 hours EST to test the design version of the airframe and rocket engine. The flight terminated at 93 seconds because of propellant slosh. The missile achieved an altitude of 60,000 feet. The flight was partially successful.

31 May 57 [redacted] JUPITER Missile AM-1 was fired from AMR at 1308 hours EST to test the range capability and performance of rocket engine and control system. Although the missile was 253 NM short of its estimated 1,400 NM impact point, this was the first successful flight of the JUPITER. All phases of the test were successful during this first firing of the IRBM in the western world

28 Aug 57 [redacted] JUPITER Missile AM-2, the fourth JUPITER, was fired from AMR at 1602 hours EST over IRBM range and was the second successful flight of the series. The range error was 27.5 NM with a 36.5 NM lateral error. Range was predicted for 146 NM. LOX was cut off at 170 seconds. All flight missions were fulfilled satisfactorily. Separation occurred 5 seconds after burnout, as programmed. This was the first test of separation of body from thrust unit.

22 Oct 57 [redacted] JUPITER Missile AM-3, the fifth JUPITER, was fired from AMR at 2007 hours EST. This was the first flight with a heat protected nose cone. The ST-90 inertial guidance stabilized platform was operated with partially closed circuits. Cutoff was effected by the guidance system at 170.37 seconds. Since fuel was not depleted, flight time was 9.5 seconds longer than had been predicted for an approximate 1,100 NM range. The range error was 10.2 NM with a 3.4 NM lateral error. The nose cone survived reentry and impacted in the general vicinity of the predicted impact point. Again, a successful flight.

26 Nov 57 [redacted] JUPITER Missile AM-3A was fired from AMR at 2110 hours EST Mainstage, lift-off, and powered flight were normal. The missile passed through the critical dynamic pressure period and followed the prescribed trajectory until 101 seconds of flight when the engine thrust was terminated.

[redacted]

From an analysis covering the period before thrust termination, mechanical failure of the turbopump stopped the flow of propellants to the combustion chamber causing a complete loss of thrust. Telemetry signals ceased at 232 seconds. The missile was at an altitude of 65,000 feet when an explosion was observed from the Test Center above the horizon. The long range mission of this flight was not accomplished; however, other primary and secondary missions were considered successful.

18 Dec 57 ([redacted]) JUPITER Missile AM-4 was fired from AMR at 1[illegible]7 hours EST. The mainstage, lift-off, and powered flight were normal. The missile followed the prescribed trajectory. Thrust ended abruptly at 116.87 seconds of flight which resulted in a short-range impact. Failure was again attributed to turbopump malfunction. The long-range mission was not accomplished; however, other primary and secondary missions were successfully accomplished. The abrupt shutdown of the power plant resulted in a range of approximately 149 NM and an altitude of approximately 50 NM.

18 May 58 ([redacted]) JUPITER Missile AM-5, carrying America's first tactical type re-entry nose cone, was fired from AMR at 0005 hours EST. This was also the first flight test for first and second stage separation. Impact was 28.3 NM under and 15.6 NM to the right at a range of about 1,275 NM after approximately 960 seconds of flight. In less than five hours, the nose cone was recovered—the world's first recovery of an IRBM nose cone.

17 Jul 58 ([redacted]) JUPITER Missile AM-6B was fired from AMR at 0404 hours EST to a precalculated range of 1,241.341 NM. The nose cone impacted 1 NM short and 1.5 NM to the right of the predicted impact point. This was the first flight test of the complete inertial guidance system. The nose cone recovery mission was successful. This was also the second successful flight test of a full-scale tactical type nose cone, as well as a successful flight test of the JUPITER lightweight, high-explosive warhead.

27 Aug 58 ([redacted]) JUPITER Missile AM-7 was fired from AMR at 1815 hours EST. The countdown was normal. Operations were interrupted by one hold—a 15 minute delay for minor adjustments. Ignition, mainstage, and lift-off were normal. The missile followed the pre-selected trajectory closely during power flight, though cutoff was effected by fuel depletion rather than by pre-set guidance cutoff. The nose cone impacted 39 NM short and 15.7 to the left of the precalculated range of 1,246 NM. JUPITER 7 was the first flight test of the warhead and fuze system. This also marked the second flight test of the JUPITER all-inertial

[redacted]

guidance system, the fourth flight test of the NAA S-3D engine operating at 150,000 pounds thrust, and the first flight test of the solid propellant spin rocket and vernier motor.

9 Oct 58 [redacted] JUPITER Missile AM-9 was fired from AMR at 2249 hours EST. The missile was destroyed after 49 seconds of erratic flight caused by fire in the tail section. The fire was believed to have started by a pin-hole leak near the thrust transducer which burned through the fuel and LOX transducer lines. This was the first JUPITER missile to use swiveled turbine exhaust for roll control, also first use of solid vernier control.

13 Dec 58 [redacted] JUPITER Missile AM-13 was fired from AMR at 0353 hours EST. The missile's nose cone impacted in the pre-selected target area at a range of approximately 1,302 NM. The significant mission of the missile was the flight of a South American Squirrel monkey up to and down from outer space. The mission was considered highly successful, though the nose cone capsule containing the live passenger was not recovered. The flight is considered one of the outstanding achievements of the space research. The impact was 5.2 NM over and 0.75 NM to the right of impact point. The overshoot was caused by inter-action which occurred at separation between the booster and aft sections. A temporary cable connecting the two bodies had not been removed prior to launch.

21 Jan 59 [redacted] JUPITER Missile CM-21, the first Chrysler production qualification missile, was fired from AMR at 1910 hours EST. The nose cone impacted in the pre-selected target area at a range of 1,302 NM. Miss distance was 3 NM over and 1 NM to the left of the target. The overshoot was caused by failure of the vernier engine to cut off—high resistance of the squib firing circuit. Primary missions were successfully accomplished.

27 Feb 59 [redacted] JUPITER Missile CM-22 was fired from AMR at 1850 hours EST. The primary mission of impacting the nose cone in a pre-calculated target (MILS Network) was successfully accomplished. The nose cone impacted in the 1,302 NM target area, 2.8 NM over, with no lateral deviations. Again, the vernier engine ran to cutoff rather than the commanded 14 seconds—a near perfect flight. For the first time, missile roll was controlled by a turbine exhaust nozzle designed to eliminate problems experienced in previous flights.

[redacted]

3 Apr 59 [redacted] JUPITER Missile CM-22A was fired from AMR at 1934 hours EST. The primary mission of impacting a nose cone in a pre-calculated target area (MILS Network) was successfully accomplished with an impact of 0.8 NM under and 5.0 NM to the left of the 1,302 NM range. The lateral miss was believed to have been caused by a drifting gyro.

6 May 59 [redacted] JUPITER Missile AM-12 was fired from AMR at 2047 hours EST. All primary missions were essentially successful, although the impact was 69 NM short and 4.9 NM to the right of the 1,302 NM predicted impact point. This undershoot was due to thrust controller deviation which commanded the exceedingly high thrust level during the main power flight phase. Cutoff occurred at 144 seconds of flight.

14 May 59 [redacted] JUPITER Missile AM-17 was fired from AMR at 0052 hours EST to test impact accuracy. This shot may be considered as having hit the target. The impact was .26 NM over and 0.4 NM to the left of the predicted point of impact. Accuracy of the MILS Network was approximated at ± 0.25 NM. All primary and secondary missions were accomplished except for photographic recording of the second separation. This could not be accomplished because of the firing date.

28 May 59 [redacted] JUPITER Missile AM-18 was fired from AMR at 0235 hours EST. The flight was successful with impact ranging from 0.1 to 0.4 NM from the target. The missile traveled a 1,302 NM range. The significant mission of the missile was to test the effects of cosmic radiation, increased gravity, and weightlessness on live passengers and bio-medical experiments of material housed in the nose cone. On board were an American-born Rhesus Monkey, Able; a Squirrel Monkey, Baker; and the bio-medical experiments—yeast, corn, mustard seeds, fruit-fly larvae, human blood, mold spore, and fish eggs. Able and Baker were recovered unharmed within one and one-half hours after liftoff. This milestone marked the first recovery of living creatures from a flight through near space. The bio-medical experiments were for NASA analysis.

9 Jul 59 [redacted] JUPITER Missile AM-15 was fired from AMR at 2001 hours EST to test missile accuracy. All primary and secondary missions were successfully accomplished and impact was well within 1 NM of the pre-selected point, approximately 1,302 NM downrange—a miss distance of only 0.48 NM short and 0.09 NM to the right.

26 Aug 59 [redacted] JUPITER Missile AM-19, a short range (300 NM) IRBM, was fired from AMR at 2030 hours EST. The nose cone impacted 0.03 NM short and 0.22 NM to the right of the intended

[redacted]

target. This was the first JUPITER missile to be programmed for a short range flight. All primary and secondary missions were accomplished.

15 Sep 59 [redacted] JUPITER Missile AM-23, scheduled for launch at 0430 hours EST, was fired from AMR at 1645 hours EST. The flight was erratic at liftoff and the missile destroyed itself after 13 seconds, just before command destruct. Failure of a silver soldered connection joint to the pressure sphere caused destruction of the missile. The nose cone housed several biological specimens.

30 Sep 59 [redacted] JUPITER Missile AM-24 was fired from AMR at 2028 hours EST. The primary mission of impacting the nose cone in a pre-calculated target area was successfully accomplished. The missile covered a pre-calculated range of 1,299.4 NM, with the nose cone impacting within 1.25 NM of the predicted point. In addition to the usual ST-90 Stabilizer Platform, the missile carried a second system for relative accuracy and for drift investigations. It also housed a telemetry system. A significant mission was to determine environmental flight conditions.

21 Oct 59 [redacted] JUPITER Missile AM-31, the first full range tactical prototype, was fired from AMR at 2220 hours EST. All missions assigned to the flight was successfully accomplished. The missile covered a prescribed range of 1,600.448 NM, with the nose cone impacting 0.9 NM short and 0.6 NM to the right. This was the fourth Chrysler-assembled missile to be flight tested.

4 Nov 59 [redacted] JUPITER Missile CM-33 was fired from AMR at 1938 hours EST to a pre-selected range of 1,299.4 NM. The nose cone impacted 0.56 NM short and 0.09 NM right of the impact point. The test successfully accomplished all intended missions. This was the first highly successful, Chrysler-assembled JUPITER fired in the test program and was the first fired without static firing.

18 Nov 59 [redacted] JUPITER Missile AM-25 was successfully fired from AMR at 2031 hours EST to a pre-calculated range of 664.8 NM. Nose cone impacted 0.9 NM over and 1.0 NM left of the target. This was the first medium range flight for a tactical prototype.

9 Dec 59 [redacted] JUPITER Missile AM-32 was fired from AMR at 1908 hours EST. The original countdown of 480 minutes was shortened to 240 minutes. The flight was successful in all phases. The nose cone impacted 0.3 NM over and 2.0 NM right of the 2,299.4 NM range.

[redacted]

16 Dec 59 [redacted] JUPITER Missile AM-26 was fired from AMR at 1903 hours EST to a prescribed distance of 300 NM. The flight was successful in all phases. Impact was 0.1 NM to the right of the 300 NM range.

25 Jan 60 [redacted] JUPITER Missile AM-28 was fired from AMR at 1948 hours EST to a prescribed range of 1,299.4 NM. The nose cone impacted 0.04 NM over and 3.27 NM to the left. All missions were successfully accomplished despite elevated temperatures in the tail section. The primary mission of this flight was to test the two-way deflector launch table and to analyze elevated temperatures in the tail section.

4 Feb 60 [redacted] JUPITER Missile 30, the 28th R&D firing, was fired from AMR at 1919 hours EST to a pre-calculated range of 1,299.4 NM. The flight successfully accomplished all primary and secondary missions. The nose cone impacted 0.65 NM short and 0.52 NM right of the intended target.

[redacted]

JUPITER LIVE SYSTEM TEST

20 Oct 60 (U) JUPITER Missile (LST) 217, the first to be fired under simulated tactical conditions using GSE prescribed for the JUPITER deployed to NATO I, was fired from AMR at 1102 hours EST. The missile successfully accomplished all primary and secondary missions. The nose cone impacted 1.1 NM over and 0.2 NM right of the pre-determined target 962.5 NM downrange.

JUPITER COMBAT TRAINING LAUNCH

22 Apr 61 (U) JUPITER Missile (CTL) 209, the first in a series of 12 CTL firings, was launched from AMR to a prescribed range of 1514 NM. The nose cone impacted .79 NM over and 2.19 NM right of the intended target. All missions were accomplished. The missile followed the intended flight path and performed within the accuracy requirements of the JUPITER system. IAF troops conducted the firing after LOD of MFSC completed the preliminary checkout. The primary mission of the test was to evaluate the capabilities of launch crews under operational alert conditions.

4 Aug 61 (U) JUPITER Missile (CTL) CM-218, the second to be fired under the operational control of NATO troops in the CTL program, was fired from AMR at 1919 hours and 04 seconds EST to a range of 1,514 NM. The missile was originally scheduled for firing on 3 August but was postponed because of the fuel probe in the fuel start tank and the microswitch on the fuel pumping lever arm which controls the fuel flow rate. All missions assigned to the missile and to the NATO training launch crew were successfully accomplished.

6 Dec 61 (U) JUPITER Missile (CTL) CM-115, the third NATO operational control CTL, was fired from AMR at 1737 hours and 24 seconds EST to a prescribed range of 1,516 NM. The missile was well constrained to the intended flight path and within accuracy requirements of the JUPITER system. The missile impacted in the target area and all missions assinged to this test were successfully accomplished.

18 Apr 62 (U) JUPITER Missile (CTL) CM-114 was fired from AMR at 1317 hours and 54.1 seconds EST to a predicted impact point of 1,514 NM from the firing site. All functions of the flight were normal up to 153 seconds, at which time fuel depletion was reached and normal guidance cutoff was not achieved. The missile impacted approximately 230 miles short of the intended target. All missions assigned to the NATO training launch crew were accomplished.

STATUS OF JUPITER U. S. AIR FORCE MIPR'S A/O 22 JUNE 1962

MIPR NO.	AMOUNT	ISSUED	UNISSUED	AVAILABLE FOR WITHDRAWAL	BILLED	UNBILLED
FISCAL YEAR 1958						
01-601-8-1410-55 Am 1	$ 85,753,000.00	$ 85,753,000.00	$ 0.00	$ 0.00	$ 85,753,000.00	$ 0.00
01-601-8-1410-56	86,947,000.00	86,947,000.00	0.00	0.00	86,947,000.00	0.00
01-601-8-1410-57	30,000,000.00	30,000,000.00	0.00	0.00	30,000,000.00	0.00
Sub-Total FY 58	$202,700,000.00	$202,700,000.00	$ 0.00	$ 0.00	$202,700,000.00	$ 0.00
FISCAL YEAR 1959						
01-601-9-1410-1 Orig	$ 26,000,000.00	$ 26,000,000.00	$ 0.00	$ 0.00	$ 26,000,000.00	$ 0.00
01-601-9-1410-111 Am 4	138,012,581.00	138,012,581.00	0.00	0.00	138,012,581.00	0.00
01-601-9-1410-112 Am 6	54,123,523.00	54,123,523.00	0.00	0.00	54,123,523.00	0.00
01-601-9-1410-211 Am 1	6,968,000.00	6,968,000.00	0.00	0.00	6,968,000.00	0.00
01-601-9-1410-315 Am 3	1,252,455.00	1,252,455.00	0.00	0.00	1,252,455.00	0.00
01-601-9-1410-316 Am 2	950,623.00	950,623.00	0.00	0.00	950,623.00	0.00
01-601-9-1410-322 Am 2	605,000.00	605,000.00	0.00	0.00	605,000.00	0.00
01-601-9-1410-448 Am 5	3,251,091.00	3,251,091.00	0.00	0.00	3,251,091.00	0.00
01-601-9-1410-457 Am 1	721,843.00	721,843.00	0.00	0.00	721,843.00	0.00
01-601-9-1410-463 Am 1	237,964.00	237,964.00	0.00	0.00	237,964.00	0.00
01-601-9-TS-182 Am 1	95,087.00	95,087.00	0.00	0.00	95,087.00	0.00
01-601-9-1414-323 Am 2	664,962.00	664,962.00	0.00	0.00	664,962.00	0.00
Sub-Total FY 59	$232,883,129.00	$232,883,129.00	$ 0.00	$ 0.00	$232,883,129.00	$ 0.00
FISCAL YEAR 1960						
01-601-0-1410-79 Am 4	$ 1,521,000.00	$ 1,521,000.00	$ 0.00	$ 0.00	$ 1,521,000.00	$ 0.00
01-601-0-1410-80 Am 2	0.00	0.00	0.00	0.00	0.00	0.00
01-601-0-1410-81 Am 4	5,142,259.00	5,142,259.00	0.00	0.00	2,877,719.30	2,264,539.70
01-601-0-1410-82 Am 7	76,857,767.00	76,609,374.00	248,393.00	248,393.00	68,557,424.98	8,300,342.02
01-601-0-1410-93 Am 4	984,923.00	984,923.00	0.00	0.00	984,923.00	0.00
01-601-0-1410-174 Orig	37,400.00	37,400.00	0.00	0.00	37,400.00	0.00
01-601-0-1410-178 Am 4	447,057.00	447,057.00	0.00	0.00	447,057.00	0.00
01-601-0-1410-250 Am 2	0.00	0.00	0.00	0.00	0.00	0.00
01-601-0-1410-264 Am 1	0.00	0.00	0.00	0.00	0.00	0.00
01-601-0-1410-265 Am 3	12,325,937.00	12,325,937.00	0.00	0.00	10,533,307.23	1,792,629.77
Map Jup 60-1 Am 1	1,805,240.00	1,805,240.00	0.00	0.00	1,805,240.00	0.00
33-600-0-None 107 Am 1	45,256.00	45,256.00	0.00	0.00	45,256.00	0.00
33-600-0-None 107 Orig	82,792.00	82,792.00	0.00	0.00	82,792.00	0.00
Sub-Total FY 60	$ 99,249,631.00	$ 99,001,238.00	$248,393.00	$ 248,393.00	$ 86,892,119.51	$12,357,511.49

STATUS OF JUPITER U. S. AIR FORCE MIPR'S A/O 22 JUNE 1962 (Cont)

MIPR NO.	AMOUNT	ISSUED	UNISSUED	AVAILABLE FOR WITHDRAWAL	BILLED	UNBILLED
FISCAL YEAR 1961						
Map-Jup 61-1 Am 1	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00
01-601-1-1410-513 Am 3	161,000.00	161,000.00	0.00	0.00	51,075.00	109,925.00
01-601-1-1410-514 Am 3	0.00	0.00	0.00	0.00	0.00	0.00
01-601-1-1410-515 Am 4	4,873,835.00	4,873,835.00	0.00	0.00	4,190,291.70	683,543.30
01-601-1-1410-601 Am 2	439,000.00	408,433.89	30,566.11	30,566.11	408,433.89	30,566.11
01-601-1-1410-661 Am 1	3,668,237.00	3,668,237.00	0.00	0.00	3,120,719.44	547,517.56
Sub-Total FY 61	$ 9,142,072.00	$ 9,111,505.89	$ 30,566.11	$ 30,566.11	$ 7,770,520.03	$ 1,371,551.97
FISCAL YEAR 1962						
01-601-2-Eng-710, Am 2	$ 610,500.00	$ 610,500.00	$ 0.00	$ 0.00	$ 331,023.80	$ 279,476.20
01-601-2-1410-674 Am 1	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total FY 62	$ 610,500.00	$ 610,500.00	$ 0.00	$ 0.00	$ 331,023.80	$ 279,476.20
GRAND TOTAL	$544,585,332.00	$544,306,372.89	$278,959.11	$278,959.11	$530,576,792.34	$14,008,539.66

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JUPITER WEAPON SYSTEM TRAINING COURSES

(U) The following list of courses outlines the individual special training in support of the JUPITER weapon system program:

Missile Systems Analyst/Technician, SM-78 (CN ASA31470P-1 & 2): Train selected AF personnel to supervise and/or perform the checkout, alignment, and presetting of the guidance and control systems; analyze and isolate malfunctions in airborne systems and ground support equipment at launch emplacement or receiving, inspection, and maintenance areas. Training will include instruction or removal and replacement of guidance and control system components and checkout and alignment of the propulsion system.

Missile Guidance System Analyst, SM-78 (CN ASA31450P-1 & 2): Transition train AF personnel to supervise and perform checkout, alignment, and presetting of the guidance and control system. Analyze and isolate malfunctions in airborne and ground equipment and remove and replace malfunctioning units.

Guidance System Mechanic, SM-78 (CN ASA31170P-1 & 2): Transition train selected AF personnel to inspect, maintain, bench check, repair, adjust and align guidance and control system components.

Missile Test Equipment Technician Guidance and Control, SM-78 (CN ASA31570P-2 & 4): Transition train AF personnel to service and maintain ground support equipment associated with guidance and control systems, including checkout and test equipment in the various trailer and/or used in the receipt, inspection, and maintenance area. Maintain, check, and service other items of special test equipment used in guidance and control systems, and maintain standard items of test equipment.

Guided Missile Maintenance Officer, SM-78 (CN OSA3124B-1 & 2): Transition train selected AF personnel in the maintenance procedures, principles of operation, and malfunction analysis of the SM-78 missile systems and ground support systems and equipment. Training includes logistics, operational, and maintenance concepts of the SM-78 weapon system.

Hydraulic Repairman/Technician, SM-78 (CN ASA42172-1 & 2): Transition train selected AF personnel in the inspection, checkout, troubleshooting, maintenance, repair, and servicing of the hydraulic systems on an SM-78 missile and ground support equipment.

Missile Technician (Airframe), SM-78 (CN ASA43370-1 & 2): Transition train selected AF personnel to perform visual inspections of an SM-78 missile and related ground support equipment at launch emplacement; initiate and/or maintain maintenance forms and records; perform manual emergency procedures; assist in the removal of missile system and ground support equipment components; supervise missile transportation and handling operations; assist in recycle maintenance; install explosive bolts, primer cord, and spin rockets; and assist in mating of nose cone to aft section and thrust unit.

Guided Missile Operations Officer, SM-78 (CN OSA1824-1): Transition train AF personnel to manage and coordinate the launch emplacement required to launch the SM-78 missile, including operational and maintenance concepts related to launch operations and countdown procedures.

Ground Aircraft & Missile Support Equipment Repairman, SM-78 (CN ASA4215-1 & 2): Transition train selected AF personnel to perform operation, inspection, and service of the 100 KW and 30 KW generator sets used in support of the SM-78 missile system and to understand general missile and ground support equipment electrical system operation, peak load generator requirements, and electrical power cabling and distribution.

Electrical Power Production Repairman, SM-78 (CN ASA56751-1 & 2): Train selected AF personnel to operate, maintain, repair, and adjust electrical power generation and distribution system components.

Liquid Fuel Supply Specialist, Unconventional Fuels, SM-78 (CN ASA64350B-1 & 2): Train selected AF personnel in the procedures and safety precautions required for:

1. Transferring fuel to the launch site.
2. Filling the launch site fuel trailer.
3. Transferring liquid oxygen to the launch site.
4. Transferring liquid oxygen from the 9-ton trailer into the 19-ton trailer.
5. Transferring LN_2 to the launch site.
6. Transferring LN_2 from the transporter into the LN_2 trailer.
7. Operating the fuel filtering and dewatering equipment.
8. Functioning and operating the vacuum trailer.

Liquid Fuel Systems Maintenance Specialist, SM-78 (CN ASA56850-1 & 2): Train selected AF personnel in the operation, servicing, maintenance, trouble analysis, and repair of the liquid fuel transfer and related systems. Training will cover the detail and specific functions of the total liquid fuel transfer loops from liquid oxygen and fuel storage trailer to their point of entry. Removal, repair, calibration, and replacement of propellant system components will be covered.

Liquid Fuel System Electrical Analyst, SM-78 (CN ASA42350-1 & 2): Train selected AF personnel in the operation, servicing, and maintenance, trouble analysis, and repair of the liquid fuel transfer and related electrical system. Training will cover the detail and specific functions of the total liquid fuel transfer loops from liquid oxygen and fuel storage trailer to their point of entry. Removal, repair, calibration, and replacement of liquid fuel electrical system components will be covered.

Missile Test Equipment Technician (Propulsion), SM-78 (CN ASA31570P-1 & 2): Train selected AF personnel to perform maintenance; calibration; troubleshooting; and repair of electrical, pneumatic, and related checkout test equipment for the propulsion system by using electrical mechanical test equipment.

Missile Engine Mechanic, SM-78 (CN ASA43351-1 & 2): Train selected AF personnel in the operation, checkout, trouble diagnosis, and repair of the missile propulsion system and components. Detailed and specific instruction will be given on the simulated operation; inspection; trouble analysis; and maintenance of the propulsion system, propulsion components, propellant feed systems, and related high-pressure gas systems. Instruction will include operation of the leak tester, propulsion components tester; rocket engine electrical; and pneumatic test stand, universal test stand, fuel disconnect tester, pneumatic flow tester, and interpretation of propulsion system operation data flow and simulated engine operation. Detailed instruction on propulsion system component removal, repair, maintenance requirements, installation, and engine build-up will be included. Familiarization on the propulsion loop, fueling system, and launching data will also be included, using fluid flow in system in the final phases of individual training.

Liquid Oxygen Generation Plant Operation and Maintenance, 25-Ton/D (CN ADS56250-1 & 2): Train key maintenance and instructor personnel in the operation and maintenance of the Gas Generating Plant used as part of the SM-78 weapon system. Scope of training includes detailed instruction in the erection, assembly, operation, check-out, troubleshooting, and repair of the oxygen-nitrogen generator. Familiarization with diesel engine operation and the scheduling of generator POL supplies is also covered.

Nose Cone/Warhead Specialist, SM-78 (CN ATS46350A-1): Train selected AF personnel in receipting for, inspecting, testing, assemblying, and monitoring of the JUPITER nose cone and warhead.

Integrated Weapon System Training, SM-78 (CN ASA31000-2): Qualify selected graduates of the JUPITER weapon system individual training courses as operational teams capable of maintaining and launching the JUPITER missile within the specified time limitations.

Ballistic Missile Inventory Management Procedures and Log Bal Network Operations (IRBM) (CN ADS64570-1 & 2): Train selected AF personnel in supply procedures used in the maintenance of supply records, inventory, stock levels, and inputs. Personnel will be trained in supply procedures peculiar to the operational ballistic missile supply organization, including processing of supply documents and reporting and verifying all transactions affecting inventory control. Personnel will also be trained to operate Log Bal Net communications equipment—key punch, data transceiver, teletypewriter, verifier, and signal unit. Training in the operation of the Log Bal Network will include simulated transmission and receipt of data and maintenance of records essential to the inventory control.

JUPITER AND JUPITER C SPACE MISSIONS

31 Jan 58	(U)	JUPITER C Missile RS-29, launched from AMR at 2247 hours EST, successfully placed EXPLORER I—the first U. S. satellite—into earth orbit. It carried a payload weighing 30.8 pounds. All four stages performed satisfactorily.
5 Mar 58	(U)	JUPITER C Missile RS-26 was launched from AMR at 1328 hours EST. The mission, to place a scientific payload (EXPLORER II) weighing 18.83 pounds into orbit, was not successful. Ignition failure of the last stage caused the vehicle to return to earth prior to orbit.
26 Mar 58	(U)	JUPITER C Missile RS-24, a standby replacement for JUPITER C 26, was launched from AMR at 1238 hours EST. The 31-pound satellite (EXPLORER III) carried aloft an 18.53-pound scientific payload. It had the same type carrier vehicle as EXPLORER I. Its instrumentation, however, included a miniature tape recorder not carried on the first satellite. This recorder made it possible to collect data on radiation, micro-meteorite impact, and temperatures throughout the entire orbit and, in turn, relay this information back to earth by signal as the satellite passed over ground stations.
26 Jul 58	(U)	JUPITER C Missile 44, the fourth missile of satellite configuration, was successfully placed into orbit from AMR at 1000 hours EST. It was the third successful attempt to place a satellite in orbit. The configuration of this missile was the same as the previous satellite carriers. The satellite (EXPLORER IV) weighed 37.54 pounds, and its payload weighed 24.97 pounds. The primary purpose of this satellite was to measure high energy radiation.
24 Aug 58	(U)	JUPITER C Missile 47, with an assigned mission to eject EXPLORER V into orbit, was fired at 0117 from AMR. The satellite weighed 37.1 pounds and carried a 25.76 pound payload. The powered flight phase was normal for a satellite carrier. However, in the spatial flight phase, the booster collided with the top section about 12 seconds after separation, and the altitude reference was fired in the wrong direction. The satellite failed to go into orbit.
22 Oct 58	(U)	JUPITER Missile C-49 (EXPLORER VI) was fired from AMR at 2221 hours EST. The missile failed to orbit a 35.5 pound payload containing a NACA high visibility balloon to provide a high altitude atmospheric density data and to serve as a radar target. Rotational spin vibration of the cluster caused the payload to break off at 112 seconds.

6 Dec 58	(U)	The first lunar attempt was a modified JUPITER Missile 11 (JUNO II) fired from AMR at 0044 hours EST. The missile failed to attain escape velocity after cutoff occurred approximately 3.7 seconds too soon. It traveled 66,654 miles toward the moon and was a successful test of the four-stage JUNO II vehicle in the main power phase.
3 Mar 59	(U)	From AMR at 0011 hours EST, ABMA launched JUNO II Vehicle 14-PIONEER IV, the second Army missile to carry a NASA lunar probe experiment. The missile lofted the payload on a trajectory past the moon and into orbit around the sun—the first U. S. solar satellite. Radio contact with the vehicle continued to a record distance of 406,620 miles from the earth.
16 Jul 59	(U)	The firing of JUNO II Vehicle 16 from AMR at 1237 hours EST failed five seconds after launch. A malfunction developed in the electrical network at liftoff and disorder caused the vehicle's gimballed engine to be thrown into a full deflection, which, in turn, caused the vehicle to turn over.
14 Aug 59	(U)	JUNO II Vehicle AM-19B was launched from AMR at 1931 hours EST. All stages fired but the primary mission of placing a 25.5 pound payload carrying a 12-foot diameter NACA-developed inflatable sphere was not successful. The purpose of this payload was to establish the density characteristics of the sphere's orbital behavior and to obtain information relative to the flight-path phenomena observed in other satellites. This failure was due to disturbances causing the cluster to fire in an incorrect direction.
13 Oct 59	(U)	JUNO II Vehicle AM-19A, damaged by explosion of JUPITER Missile 23 on 16 September 1959, successfully placed a 91.5 pound satellite (EXPLORER VII) in orbit. The vehicle rose from AMR at 1031 hours EST. The vehicle continues to circle the earth sending back radiation and weather information.
23 Mar 60	(U)	JUNO II Vehicle AM-19C was fired from AMR at 0835 hours EST. The first stage was normal, but the satellite was not placed in orbit.
3 Nov 60	(U)	JUNO II Vehicle AM-19D was fired from AMR. The primary mission of placing into orbit the 90-pound Ionosphere Direct Measurement Satellite (S-30), EXPLORER VIII, was a success. The missile and booster were successes.

24 Feb 61 (U) JUNO II Vehicle AM-19F was fired from AMR. The primary mission of placing the Ionsphere Satellite (S-45) into orbit was not accomplished. The payload and fourth stage which were secured to the third stage cluster by shear pins prematurely separated from the vehicle 4.5 seconds after shroud separation.

27 Apr 61 (U) JUNO II Vehicle AM-19E was fired from AMR. The primary mission was to use Gamma Ray Telescope (S-15) in placing EXPLORER XI into orbit. The vehicle tumbled end-over-end 10 times a minute.

24 May 61 (U) JUNO II Vehicle AM-19G, the 10th and last to be fired, was launched from AMR. The vehicle, carrying an Ionosphere beacon set as payload, was not a success.

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