

UNCLASSIFIED

(U) REPORT ON ATLAS/AGENA LAUNCH  
OPERATIONS - AMR vs. PMR

1130

Prepared by:  
Space Systems Division Space Launch Survey Team

1 May 1962

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REVIEWED

BY *[Signature]*

DATE *9/2/88*

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Headquarters  
SPACE SYSTEMS DIVISION  
Air Force Systems Command  
United States Air Force

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REVIEWED

BY 

DATE 2/21/88


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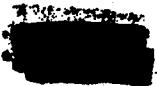
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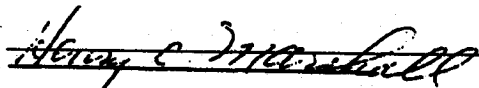
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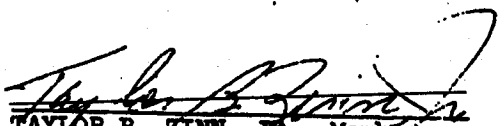
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REPORT SUBMITTAL


The findings, recommendations and conclusions of this report are hereby respectfully submitted:

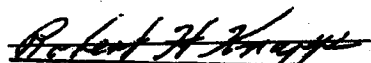
HENRY C. MARSHALL, Chairman  
Colonel, USAF, HQ SSD



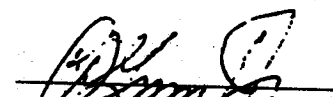
TAYLOR B. ZINN, JR., Member  
Lt Colonel, USAF, Hq 6555th Test Wing



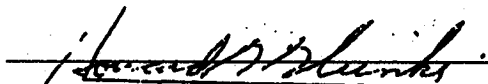
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## SUMMARY

A Space Launch Survey Team was established for the purpose of reviewing hardware, procedures, and organizational arrangements that relate to Atlas space launchings at the Atlantic Missile Range (AMR) and Pacific Missile Range (PMR). The objective of this survey was to analyze and evaluate any differences for the purpose of identifying those for which one of the alternates appears to be a preferential way of operating, or could contribute to a higher level of success or reliability of space launches.

The Survey Team visited AMR and PMR to review the organizational structure of the 6555th and the 6595th Aerospace Test Wings, their method of management, relationship with SSD, BSD, and the ranges, and control exercised over contractor activities. A comprehensive review of the operating philosophy including the sequence and type of checkout and launch procedures was conducted with contractor personnel and military project officers at each location, followed by a visual review of the type of equipment used for checkout and launch. Using the flight test reports, a detailed review was then made of all Atlas/Agema launches to date in order to determine all flight and significant pre-flight anomalies.

With respect to organization and management relationships, it appeared that the responsibility and authority of the 6555th ATW was more clearly defined and understood by both the Wing and SSD personnel than that of the 6595th ATW. The 6555th personnel felt that they had the full responsibility and authority to conduct space launches at AMR in accordance with Program requirements without excessive program office interference in their activities. On the other hand, the 6595th ATW has had to organize project offices as counterparts to SSD program offices to act as a "buffer" between the program offices and minimize interference with the launch element.

The range support at AMR is a much cleaner operation than that at PMR because of the complex scheduling and coordination problem imposed on the



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6595th ATW at PMR. This situation has been further aggravated due to program offices submitting Program Requirement Documentation directly to the Range and bypassing the 6595th ATW.

There is considerable difference in the launch control and checkout equipment at the two locations. AMR has manually operated R and D type of equipment while PMR has automatic equipment. Because of this basic difference in support equipment, it is not considered feasible to make checkout procedures identical at the two locations; however, essentially the same checks are performed at both places. Furthermore, it is not considered practical nor economical to replace existing equipment for the sole purpose of standardization in order to make checkout procedures identical. However, there is some obsolete equipment at AMR which should be replaced with more modern equipment, such as the LOX loading system.

A significant difference in the equipment and procedures between the two launch sites is the existence of a gyro laboratory at AMR which gives this launch base the capability to check the Atlas flight control systems to a much greater degree than is possible at PMR. While the evidence is not yet conclusive, it appears that this capability provides AMR operations with a slightly greater probability of mission success than at PMR. Further investigation has already been initiated to look into the flight control system tests and quality control procedures at the factory in order to determine if a gyro laboratory should be installed at PMR.

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**PART I**

**STATEMENT OF THE PROBLEM**



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**I. STATEMENT OF THE PROBLEM.**

To identify and review major differences in equipment, procedures, and management structure which now exist between AMR and PMR Atlas/Agna Space launch operation. To evaluate these differences with the objective of determining their effect on the probability of success of the mission and to submit recommendations relative to standardization of organization, equipment and procedures which appear warranted from a cost/effectiveness standpoint. (See Tab VI for letter of direction).



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**PART II**

**GROUND RULES**



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II. GROUND RULES.

A. Due to the wide variation in mission test philosophy and hardware between Atlas R and D missile operations, Atlas/Mercury/Centaur operations, and Atlas/Agena operations, it was concluded that little, if anything, could be gained from an overall Atlas launch base evaluation. This study, therefore, considers only Atlas/Agena space launch operations at the two bases since the Air Force Atlas space program is heavily oriented toward this booster combination.

B. Because of the wide variation in payload at the two launch bases, no effort was made to evaluate payload launch base operations. This effort, therefore, is limited in scope to an analysis of launch base operations from the arrival of the Atlas and Agena on the base through the ascent phase of launch.

C. In conducting a review of Atlas/Agena launches at the two bases, it was concluded that the flight failure analysis would be more revealing if it included all Atlas/Agena Launches regardless of whether the overall mission was successful or not. This analysis therefore considered all anomalies which occurred regardless of whether or not these irregularities were detrimental to the flight.

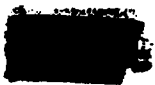


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**PART III**

**APPROACH TO THE PROBLEM**



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### III. APPROACH TO THE PROBLEM.

A. At the direction of the Commander, SSD, a Space Launch Survey Team was established to conduct this analysis. The survey team then made visits to both launch bases to obtain the necessary information for this study. At each location, the survey team covered the following:


1. A detailed review with ATW personnel of their organization structure, methods of management, functional relationships with their ranges, and method of control of the space launch operation.
2. A comprehensive review with both military and contractor personnel of the entire Atlas and Agena launch base operation. This review included checkout and test functions, launch operations, and general test philosophy.
3. A detailed tour of launch complexes and checkout facilities was taken at each base. This included a review of all equipment located on the pad, in the blockhouse, and at the MAB. This checkout and launch equipment was then reviewed with contractor and military launch base personnel to identify the differences between the two locations.

B. The survey team then obtained copies of flight test reports for all Atlas/Agena launches made to date. Each of these reports was reviewed in detail and all flight anomalies and significant preflight anomalies were identified. (See Tab IV for summary of each flight)

C. Using the anomaly data and the information obtained on launch base equipment and checkout procedure differences, a study was made to determine insofar as possible, whether or not the associated base checkout and launch procedures or associated equipment could be correlated with each failure or anomaly. In each case, both launch base procedures were reviewed to determine if one of the two procedures appeared to be preferential in dealing with the particular anomaly being considered. Conclusions were then drawn from the above study for use in the overall evaluation.

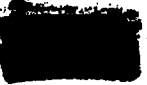


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D. The survey team was then divided into four study groups from analysis of the launch base differences in the following four areas:

1. ATW Organization and Management
2. Checkout and Launch Operations
3. Checkout and Launch Equipment
4. Comparison of Range Support

E. At the conclusion of the above analysis, and subsequent evaluation by the survey team as a whole, conclusions were drawn and the recommendations shown in Part III of this report were derived.

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**PART IV**

**ANALYSIS AND EVALUATION**



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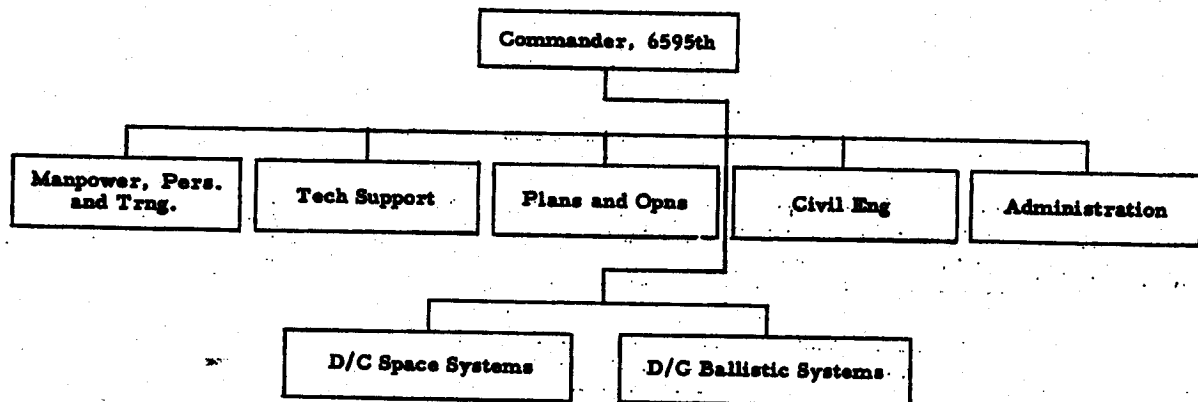
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**IV. ANALYSIS AND EVALUATION.**

**A. Organization and Management of Aerospace Test Wings.**

**1. 6595th Aerospace Test Wing.**

a. The 6595th ATW is assigned to SSD, but is operationally responsive to the Commanders of BSD and SSD.



b. The Wing is divided into two operational elements, Deputy for Space Systems and Deputy for Ballistic Systems.

c. Wing staff and support elements provide services to the Deputy Commanders and are responsive to their requirements.

(1) Administrative services provides normal administrative services for the wing such as security, document control, orders, etc.

(2) Tech Support provides materiel, communications, pad safety, range instrumentation, range coordination, etc.

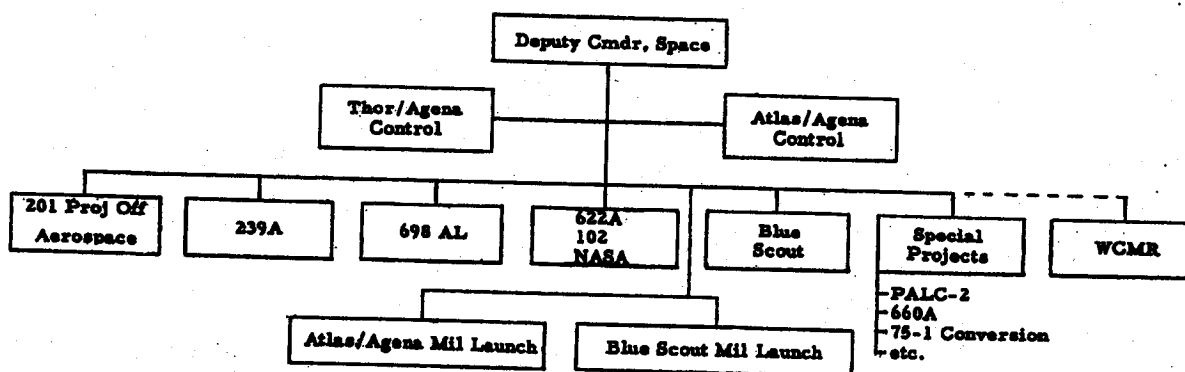
(3) Plans and Operations includes a Wing scheduling section which provides early program integration.

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(4) Civil Engineering provides surveillance of new facility construction and technical services on technical facility modifications.

(5) Manpower, personnel and training includes personnel assignments, classification and training for approximately 300 airmen assigned.

d. The 6595th ATW Deputy Commander for Space Systems is functionally organized as follows:



(1) The organization is program or project oriented. Aerospace functions as a part of certain project offices. The project officers in each office are responsible for:

- (a) Project documentation including review of Program Requirement Documents (PRD), preparation of Operational Requirements (OR) and also insures submission of Pad Safety and Flight Safety Reports to range, etc.
- (b) Chair Flight Test Working Group (FTWG), or Launch Test Working Group (LTWG), which is a management tool used by the 6595th ATW at PMR. This group is designated by Program Configuration i.e., 201, 239A, etc. The membership includes the ATW Project Officer (Executive Chairman), Aerospace Corporation, when contractually involved (Technical Chairman), each associate contractor, USAF Quality Control, management agencies of programs involved, 6595th ATW, 1

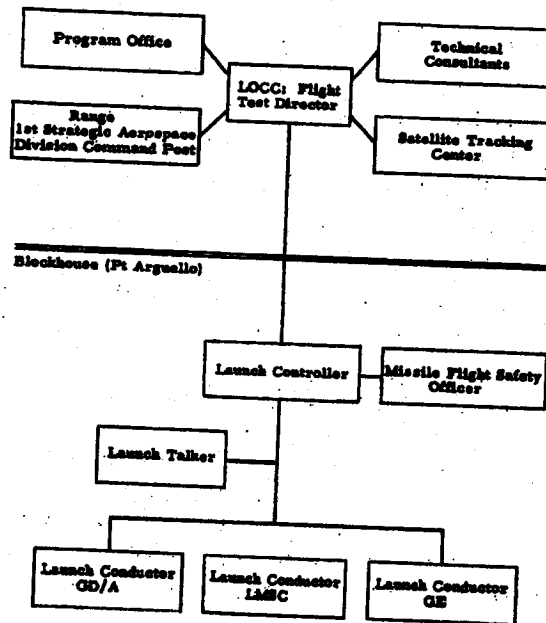
STRATAD and PMR. The FTWG publishes two documents on each missile operation. The Launch Test Directive (LTD) includes a description of the vehicle test sequence, the launch restraints and milestone countdowns. The second document is the Flight Test Report (FTR) published some fourteen days after each flight. It is a fairly comprehensive review of the vehicle history at PMR including the flight results based on data available within approximately ten days following launch.

- (c) Exercise technical test control over MAB launch vehicle checkout.
  - (d) Coordinate all program matters between VAFB personnel and SSD Program Offices.
  - (e) Exercise overall management of Program office matters at VAFB, including master schedules.
- (2) Management of the associate contractor's operations at PMR is accomplished by project office and control branch personnel with the assistance of Western Contract Management Region Representatives. Aerospace Corporation furnishes technical support for the Special Projects Program only.
- (3) New project officers are established when the scope of a particular program indicates a need.
- (4) The Thor/Agema and Atlas/Agema control branches perform identical functions. The functions of these branches are:
- (a) Exercising technical test control overall pad tests, both airborne and aerospace ground equipment (AGE).
  - (b) Scheduling all tests on the pads and rescheduling tests as required.
  - (c) Coordinating and monitoring all modifications and the demonstration associated with both ground and airborne equipment.
  - (d) Conducting the launch countdown with full responsibility for the proper verification that all systems are ready for launch.
  - (e) Reporting all deficiencies noted in the tests and demonstrations through the project officer to the Program Office.
  - (f) Defining test objectives for system validation tests.
  - (g) Assisting contractors in detailed test procedure preparation for system level testing to insure the launch vehicle will perform the flight test requirement specified.

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e. The 6595th ATW Atlas/Agna Launch Organization is as follows:



- (1) The Launch Operations Control Center (LOCC) is the focal point of all information flow concerning the launch operations at VAFB. This is the launch headquarters for the Wing Commander, and is manned by him or his representative, the project officer, the integrating contractor (LMSC or Aerospace) and a representative of the respective Program Office. All problems not directly affecting the vehicle countdown are coordinated here. The LOCC therefore, acts as a filter for the blockhouse thus relieving the launch controller of the added burden of coordinating problems external to the vehicle countdown.
- (2) The Launch Controller is the 6595th ATW officer appointed by the Commander to conduct the countdown. He is responsible for launch vehicle readiness and is responsive only to the Commander and the Missile Flight Safety Officer (MFSO).
- (3) The Launch Conductors are responsible to the Launch Controller for the readiness of their respective systems. They are required to report all matters affecting the launch readiness of their systems to the Launch Controller, who in turn provides the necessary direction for actions to be taken.

[REDACTED]

f. Relations with contractors.

(1) Because of the charter of this Wing, an extraordinary amount of control of contractor activity is exercised.

(2) A basic Wing policy is that the contractor will be responsive to Wing management. This requires that the Wing technical management be based on a good logical engineering approach, putting emphasis on personnel capabilities.

(3) The present relations are harmonious and based on a mutual respect between contractor and military personnel.

g. Relations with outside agencies.

(1) The wing is responsible for technical test control. This includes definition of individual test objectives, scheduling, conduct, and acceptance of tests.

On the other hand the respective program office is responsible for technical direction and systems engineering to provide the hardware with which the flight test may be achieved. On occasion, conflict between wing and program office has resulted due to overlapping of functions particularly in the area of test control. Unrealistic scheduling by program offices of launch base activities has had an unfortunate effect also.

(a) VAFB contractor organizations are contractually authorized a two shift operation (nominal eight hour days). However, for over a year the VAFB contractors have been committed to a 24 hour, seven day a week operation in support of program office requirements. This means that for an extended period of time some personnel have been subjected to 12 hour days, seven days a week. This practice must inevitably result in some deterioration of human factors.

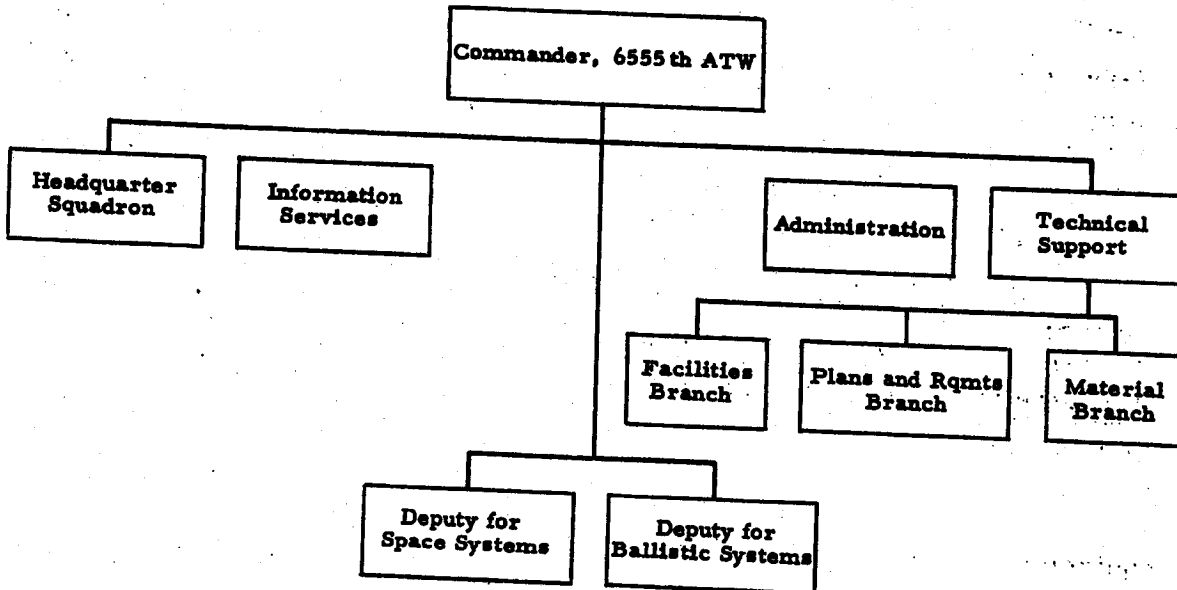
(b) High intensity schedules induce a reluctance to slip the schedule for reruns of unsatisfactory tests. This shortcutting of normal test procedures, waiver of specifications and/or requirements may result in a deterioration of reliability.

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2. The 6555th Aerospace Test Wing.

a. The 6555th ATW is assigned to BSD, but is operationally responsive to the Commanders of BSD and SSD, and is the single point of contact with AMR for BSD and SSD on operational matters.



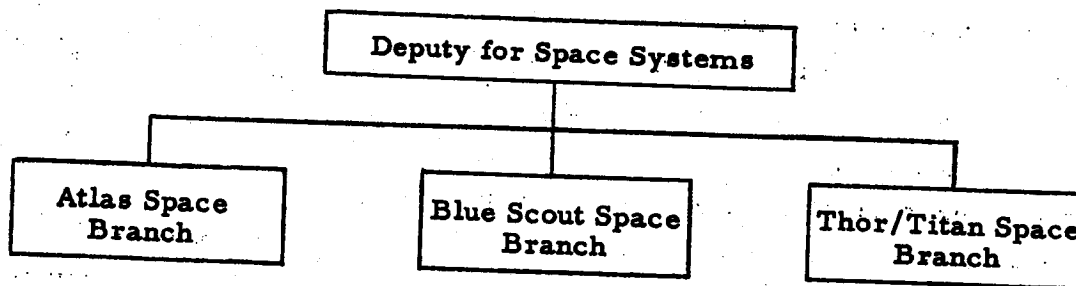
b. The Wing is divided into two operational elements, Deputy for Space Systems and Deputy for Ballistic Systems. The Wing Commander considers his primary function to be the exercise of technical test control over the flight test phase of BSD and SSD programs at AMR.

c. Wing Staff and supporting elements include material, administration, facilities, plans and programs, information services, and a headquarters squadron. These supporting elements provide services to the Deputy Commanders and are responsive to their requirements. Early participation by Wing elements in the planning phase of all programs requiring launches from the AMR is essential in the providing of adequate and timely support as the program progresses. Conduct of flight test operations is the function of the Wing and the delegation of this authority is essential. The detailed scheduling of checkout and launch of each vehicle following its arrival at AMR is done by the Wing with due consideration for launch windows, overall program schedules, and the desires of the program offices concerned.

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d. The Deputy for Space Systems has three branches which are organized according to the type of booster used in the space programs, i.e., programs using Atlas boosters are handled in the Atlas Space Branch. The number of programs using or planning to use the Atlas Launch Vehicles and the limited personnel resources of the Wing were prime factors considered in organizing the branches according to launch vehicle configuration rather than by programs.



e. The Atlas Space Branch is divided into two sections - Plans and Requirements (P and R) and Flight Test Operations (FTO). The P and R section is physically located at PAFB and the FTO section at Cape Canaveral. Each officer in P and R is assigned the responsibility to handle all requirements on one or more programs. Each officer in FTO is assigned a physical area and/or a vehicle system to control. The Chief of FTO is responsible for the checkout of all Atlas Launch Vehicles. The Chief of the Atlas Space Branch is responsible to the Deputy for Space Systems for the test phase of all Atlas boosted programs assigned by SSD.

f. Space programs in the early planning phase are coordinated with AMR by a support element of the Wing - Plans and Programs Branch. When a program reaches the stage where project control is required, it is assigned to the branch handling the specific booster. The P and R section of this branch then handles all program documentation to obtain the support required at AMR. The office works closely with the SSD program offices in the preparation of the PRD. The AMR considers the Commander of the 6555th ATW as the Director of SSD and BSD test programs at AMR, and requires his signature on all requirements documents.

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g. The Flight Test Working Group (FTWG) is a management tool used by the 6555th ATW at AMR to control the checkout of vehicle systems. The FTWG is also designated by configuration, i.e., Atlas/Agena. The membership includes representatives of the Atlas Space Branch (Executive Chairman), Aerospace Corporation, when contractually involved (Technical Chairman), each associate contractor, USAF quality control, management agencies of programs involved, and AMR (Pan American World Airways program management representative). The FTWG publishes two documents on each missile operation. The Flight Test Directive (FTD) is a compilation of the checkout procedures, by contractor designation, that are to be accomplished on each vehicle system from receipt through launch. Launch restraints and milestone countdowns are also included. The concurrence of each associate contractor and approval by the Wing is shown by signoff before publication. The second document is the Flight Test Report (FTR) published some fourteen days after each flight. It is a fairly comprehensive review of the vehicle history at AMR including the flight results based on data available within approximately ten days following launch.

h. Management of the associate contractors' operations at AMR is accomplished by branch personnel with the assistance of the USAF secondary contract administration personnel at AMR (AFSCTSO) and the Aerospace Corporation as contractually committed. Aerospace Corporation furnishes technical support in two areas to the 6555th ATW:

- (1) Project type support (confined to those programs contracted for) consisting of System Engineering and Technical Direction (SE and TD) on new systems and program peculiar modifications to standard boosters. They also provide technical consultant services on other project matters.
- (2) Technical staff type support is provided across the board and includes such items as range capabilities, range safety studies, research on special technical problems, and review of program requirements for consistency.

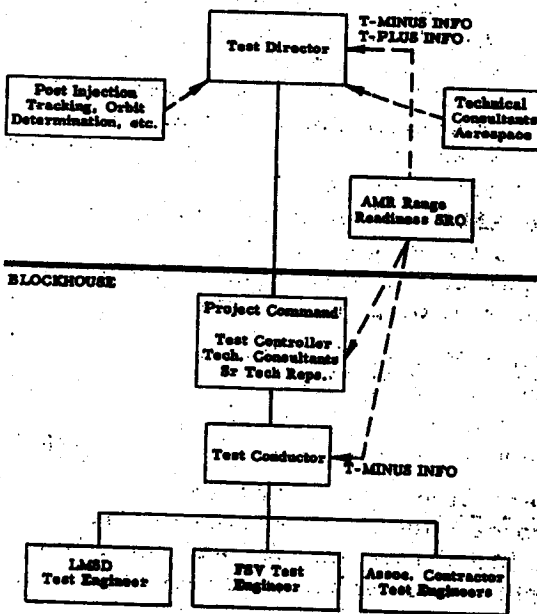
i. No military launch capability exists for Atlas Space boosters at present. The requisite manpower and training program for an Atlas/Agena capability on Complex 13 has been submitted to SSD. If approved, the military launch team will be integrated with the Atlas Space Branch.

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[REDACTED]

j. The 6555th ATW Launch Organization is as follows:



- (1) Test Director - The Test Director, AMR, is responsible for the mission objectives. He receives inputs from the Test Controller, the Superintendent of Range Operations, and Test Directors at locations outside AMR, and evaluates the data to determine if mission objectives can be met. His decisions will be guided by operating priorities, launch operating procedures, and his knowledge of the limitations of available test resources and funds. He informs the Test Controller of the necessity for launch countdown holds to be imposed for mission objective reasons. The Test Director will be a 6555th Aerospace Test Wing officer specifically designated by the Wing Commander on those programs for which SSD is the management agency. The Test Director may be a representative of the Management Agency or an officer of the 6555th Aerospace Test Wing for those programs under a Management Agency other than SSD.
- (2) Technical Consultants - (Test Director) are missile and technical contractor, and military representatives, requested by the Test Director to make appropriate recommendations concerning the mission status and readiness and attainment of mission objectives.

The following personnel are located in the blockhouse.

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- [REDACTED]
- (3) Test Controller<sup>1</sup> - The Test Controller is the 6555th Aerospace Test Wing Officer specifically designated by the Wing Commander to act in that capacity for any specified test. He has overall supervision of the launch operation and exercises technical test control. He is responsible to the Test Director for the readiness of the launch vehicle and the launch complex and for regulating the launch countdown progress as necessary to correlate with the status of other mission support facilities outside the AMR. When problems arise that could affect launch or mission objectives he will utilize the Project Command organization to determine the appropriate course of action that will be passed to the Test Director for decision.
  - (4) Other Project Command Members - (Project Command consists of the Test Controller assisted by the Senior Technical Consultant Representative and the Airframe Contractor's Senior Technical Representatives.)
  - (5) Test Conductor - The Test Conductor is the booster airframe contractor representative specifically designated to fulfill this duty for any specified test. In the launch vehicle assembly checkout and launch operations, the Test Conductor will operate in accordance with directions and operating procedures of the Flight Test Directive and the Countdown Manual. He will make launch vehicle system operational decisions that (a) do not compromise the launch schedule, vehicle flight readiness or launch test objectives; and (b) do not interfere with other programs that share facilities and/or equipment. The Test Conductor receives information on the range status to support the launch operations directly from the Superintendent of Range Operations (SRO). He is directly responsible to the Test Controller for the conduct of the overall countdown. If problems of compromise or interference arise, he will report them to the Test Controller.
  - (6) LMSD Senior Test Engineer is the upper stage Airframe Contractor representative specifically designated to fulfill this duty for any specified test. A Senior Test Engineer has operational supervision of his portion of the countdown and is responsible to the Test Controller for the technical readiness of his stage. However, during the countdown he will report to the booster Test Conductor.

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<sup>1</sup> The 6555th Test Wing Launch Organization provides for two basic functions, Project Command and Launch Operations. The Test Controller has overall supervision of the launch operation and exercises technical test control.