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RETURN TO SSZAA

STANDARDIZATION OF AGENA B

Standardization study completed 30 June 1962 - Chronology USAF

A PRESENTATION

of the

CASE FOR

STANDARDIZATION

including

CONTRACTUAL ASPECTS

1128

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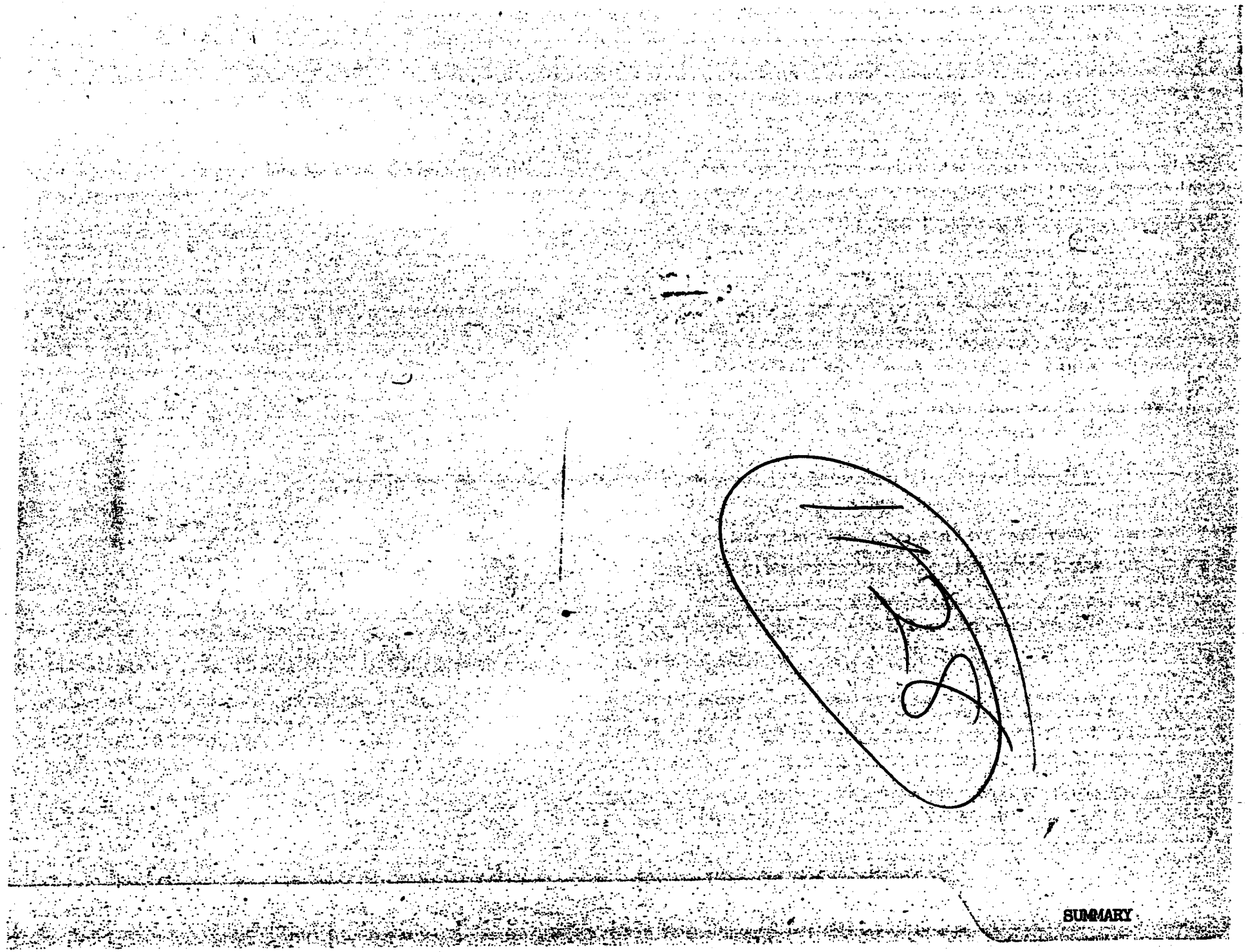
SUMMARY

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STANDARDIZATION OF AGENA B

SUMMARY

The presentation covers the evolution of AGENA configurations from the early beginnings under WS-117L, through the AGENA A, to the present day AGENA B. The evolution from three basic configurations to the multiple configurations serving the present array of military satellites is outlined. The expanding role of AGENA serving other governmental agencies such as NASA is noted. The role of AGENA as a stage vehicle offering not only orbit mission capabilities but also ascent-only mission capabilities is recognized.

Analysis led to the conclusion that a single basic vehicle could be produced that would be capable of fulfilling a satisfactory portion of the requirements of each program. A comprehensive study was initiated to determine if a configuration could be selected to achieve standardization. The results of the study were conclusively positive. Charts used in the oral presentation are included in this brochure for your reference.

There is a discussion of the procurement aspects of obtaining the Standard AGENA on a competitive basis, utilizing a fixed price contract. The advantages and disadvantages of competition to establish a second source at this time are discussed. Likewise, utilization of a fixed price type contract at this time is explored. Conclusions and recommendations are presented regarding the procurement aspects of obtaining the Standard AGENA at this time. Soliciting competition for establishment of a second source and utilizing a fixed price type contract at this time is not feasible, practicable, nor desirable. Charts used in this portion of the presentation are also included for reference.

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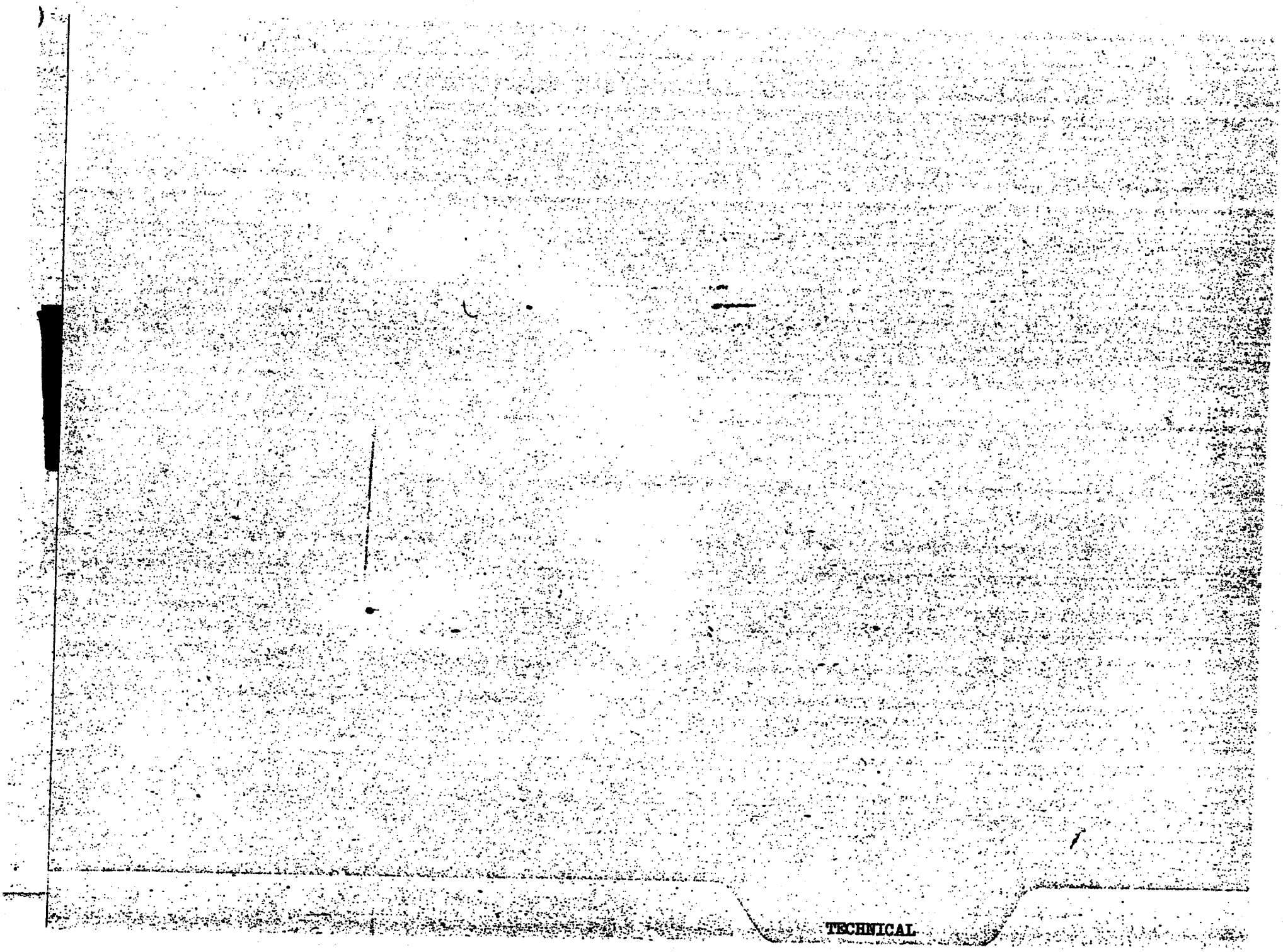
TECHNICAL

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In early 1959 the capability to build a restartable liquid engine was confirmed at Arnold Center. This one fact immediately allowed the use of higher altitude orbits with practical weight lifting capability using two stage vehicles instead of the three and four stage combinations then available. A vehicle was configured, called the AGENA B, and assigned for use by the multiple programs using the AGENA A. The level of development of the respective mission payloads was substantially higher at this time; therefore, the increased capability of the AGENA B enabled each program to specifically identify mission requirements. However, the background of minimal mission capability which prevailed continued the development of optimized vehicles for each program. Six additional configurations were defined in three programs; two Discoverer, caused by engine development status; two MIDAS, caused by progressive design improvements; and two SAMOS, due to different missions. Status of these configurations is as follows:

Configuration	Programmed	Built	Launched (To Date)
6. Discoverer	4	4	4
7. Discoverer	23	13	7
8. MIDAS, Series II	3	2	1
9. MIDAS, Series III	4		
10. SAMOS	2	1	0 (1 cancelled)
11. SAMOS	2	1	1 reprog - 1 canc.

II - PROGRAM STATUS

During the design and test of the AGENA B, recognition of the capability of the vehicle induced several additional programs to consider its use, a process which is still continuing. The development defined for each of the three programs previously mentioned is also progressing as approved. Each is being pursued using the optimization technique that was necessary due to "state-of-the-art" at the inception of WS-117L. Limited capability available at the start of WS-117L demanded complete integration of an entire vehicle to make the mission feasible. The programs now schedule heavier payloads and greater life requirement associated with assured reliability making redundant equipment and large weights the result, and continuing the requirement for optimized vehicles. Following the optimized vehicle concept, eleven more configurations have evolved; six SAMOS, (1) two new missions, with two steps in one mission; (2) one reprogrammed mission, with program schedule and costs causing an increase from two to three configurations; four NASA, caused by four missions; one Advent; and one MIDAS, required to demonstrate operational capabilities. These program configurations are scheduled as follows:

Configuration	Programmed
12. SAMOS F-2	1 (Reprogrammed from Configuration 11)
13. SAMOS F-2	3

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Configuration (cont'd)	Programmed (cont'd)
14. SAMOS F-3	4
15. SAMOS E-5	1
16. SAMOS E-5	7
17. SAMOS E-6	9
18. NASA Ranger	5
19. NASA S-27	1
20. NASA Comsat	2
21. NASA NIMBUS	
22. Advent	3
23. MIDAS, Series IV	5

At this time, four additional missions are being identified for the future with at least twenty flights planned. One, SAINT, 4 each; two, SNAPSHOT, 4 each; three VELA HOTEL, 5 each; and four MIDAS, Series V, more than 7 flights.

III - ANALYSIS OF SITUATION

AGENA, because of somewhat strict adherence to the principle of optimization and to individual tailoring to satisfy peculiar mission requirements, has been produced in twenty-three different configurations. And at this time four more are in the final stages of planning and procurement, and may be subjected to the same technique. Several months ago it became overwhelmingly evident that AGENA had achieved a much larger role in military space systems endeavors than was originally envisaged for WS-117L. In addition, other agencies such as NASA were beginning to plan space missions using the AGENA as a stage vehicle. AGENA was also recognized to require not only orbit mission capabilities but also ascent-only mission capabilities, e.g. the ability to serve many and varied space missions and payloads.

Analysis of the several configurations clearly indicated a repetition of certain functions which were designed into the original WS-117L vehicle and remain in those now being configured. These functions are being performed by components that are still basically the same in function as they were in the beginning. Mission peculiarities that have acted to cause configuration change have gradually evolved as differences in the application of hardware from its original functional intent or in duplication to achieve a longer vehicle life.

The extent to which component developments and functional applications have changed the basic concept of AGENA has a direct bearing on the ability to produce a single basic vehicle capable of fulfilling an appreciable (satisfactory) portion of each program's requirements. It was determined that a comprehensive study should be initiated to review all programs, classify all functions--common and peculiar, and determine if a configuration could be selected to achieve standardization. This work was started [redacted] 1961.

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IV - AGENA STANDARDIZATION

While the results of our contract study effort have not been officially presented as of 15 August 1961, the findings were clear that standardization could be satisfactorily achieved. Sufficient study was accomplished to indicate that singleness of functional design prevails for those components which are necessary to perform ascent functions. The degree of extension of these components functionally to accomplish on-orbit requirements is a pecularity of each program.

In the study conducted the feasibility of placing a Standard AGENA into final design and production was established. All programs were canvassed throughout all systems and subsystems. All functions were assembled and categorized--common and non-common. All functions were compared with equipment capabilities and equipments were selected having common functional capabilities. Modifications, minor in nature necessary to other equipments were determined. All individual program requirements were assembled and categorized such as life, power, attitude, altitude, etc.

A design compatible airframe was conceived, a mockup was constructed, and mission common components were installed. Provisional space was set aside for mission peculiar functions and related components. Thus, a single vehicle, basically simple in design, and meeting all program requirements was established. This vehicle has built-in adaptability for advanced components without change in basic design of structure. A modular concept is employed in addition for flight and mission equipment. Vehicle equipment has not been co-mingled with payloads and payload peculiar equipment or with additional vehicle equipment necessary for a particular mission.

For the simple high-performance ascent type mission only a limited amount of equipment need be carried. For program systems where AGENA is used on orbit additional equipments are loaded in spaces where provisions have been made for these equipments. When not required, the equipment and its wiring harnesses may be left out.

To date, the AGENA has been designed, engineered, and produced on an experimental basis as an R&D item for use on military satellite systems. In most cases there have been "block type" releases of three or four vehicles of a particular configuration to satisfy mission requirements of an R&D nature. In no case to date has there been identification of vehicle or mission in operational terms. Design for production on a line basis with the associated standard requirements for uniform installation of certain equipment and provision for additional special equipment has not been practiced. Also each vehicle, because of its narrow configuration orientation, has not had the advantages of design for accessibility, maintainability, reproducibility, or interchangeability. These refinements, more common to production items, were [redacted] ther economical nor feasible.

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Neither were they considered compatible with schedule requirements. Contractual arrangements further inhibited wide spread generalization of vehicle requirements, hence standardization has not heretofore been a subject for serious consideration.

Times have changed as has been pointed out above. The use of AGENA is expanding and the numbers to be considered are ample enough to require that the vehicle be engineered for production. The experience and know-how accumulated over the past three years coupled with the results of the recent study add to the desireability and practicability of standardization.

V - ADVANTAGES OF STANDARDIZATION

1. Technical considerations

a. Standardization will facilitate production and permit the employment of common tooling capable of higher rates. Special jigs and other tooling would primarily be limited to the mission peculiar bits of structure, modules and other assemblies.

b. Line production techniques automatically provide for lower costs and firmer scheduling.

c. Basic vehicle is not committed to a program requirement until complete, thus allowing the best in flexibility of assignment.

d. Test practice in present programs is to test at levels of successive complexity. No change in this basic policy is contemplated. Contrary to present practice but beneficial, single test specifications and written procedures are applicable to standardized vehicles. As test experience is gained, additional simplification will result.

e. The processing of vehicles of different configuration has caused duplication of checkout test facilities under present practices. This has been considered preferable to continuous modification as production proceeds. Standardization will permit a single checkout line for the basic vehicle geared to higher processing rates with reduced equipment and facilities required.

f. Checkout of basic standard vehicles after mission equipment modules are added is a separate operation equipped especially for the total vehicle being processed.

g. The test results of a vehicle flight or ground test will be directly applicable to all programs after standardization. Presently, vehicles are considered as separate design problems

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and application of test results must be made by inference.

h. Standardization provides for additional line development of the AGENA and product improvement by scheduled production blocks becomes possible.

i. Standardization provides adaptability for advanced components without necessity for change in basic design.

j. All the "ilities" are enhanced by standardization--producibility, accessibility, maintainability, reliability, interchangeability, etc.

k. Weight penalties normally expected to be associated with standardization are non-existent with but one exception--Discoverer on THOR. Refer to the weight comparison chart.

2. Programming considerations

a. Standardization will promote more efficient production programming activity. By separating the common elements, the AGENA can be budgeted and scheduled on a production basis with an orderly progression of blocks. The block concept for configuration purposes, while in existence for small numbers of vehicles in most programs, becomes really effective when total numbers for all programs are considered. Bulk procurement of subcontracted components may be encouraged as well as larger lot production releases.

b. The programs gain from standardization by having the capability to use any basic vehicle coming down the line. Present practice allocates vehicles at an early date and exclusively by contract. Any malfunction or accident to the AGENA can cause a launch date slippage months in advance.

c. Development of mission packages need not be paced by AGENA production schedules. The totally integrated vehicle, which has been the rule of the past, required payload completion dates in sufficient time to allow installation of flight hardware during the assembly process, four to six months prior to launch. Standardization of AGENA would permit this installation just prior to the system test period, normally two to three months prior to launch. Development problems and slippages on one mission package would not hold up another program activity. The Standard AGENA would accept the next available mission package should such a problem exist.

d. The Standard AGENA will be procured on a contract separate from the payload or mission contract. The accumulation and segregation of costs will be improved as will the efficiency of fabrication and test. Learning will take its proper and regular place in the production scheme.

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