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Lockheed
MISSILES
& SPACE
COMPANY



November 13, 1966

REGINALD R. KEARTON
VICE PRESIDENT

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Dear Al:

The attached paper is the result of our hindsight look at Program 206-II which we recently discussed. For your information, I have discussed this paper with John Martin and have given him a copy of same.

I hope it will be of some use to you, as I am sure it will help us.

Sincerely,

The Honorable A. H. Flax
Assistant Secretary of the Air Force
(Research and Development)
The Pentagon
Washington 25, D. C.

(Attach.)

A GROUP DIVISION OF LOCKHEED AIRCRAFT CORPORATION
SUNNYVALE, CALIFORNIA

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MAJOR FACTORS CONTRIBUTING TO PROGRAM 206-II SUCCESS

It was believed that a useful purpose might be served in a hindsight review of the factors which contributed to the early success of the Program 206-II.

Preliminary examination indicated two broad categories of influence, i. e., intangible and tangible factors. It should be noted that the term intangible might be defined as discernible but hard to quantify factors which represented the subjective judgment of the contractor. The tangible, on the other hand, were those elements which would be easy to quantify and which any viewer would be unlikely to refute.

First of the intangibles were:

- o The amount and nature of the cooperation between the Air Force System Program Office (SPO), including the Aerospace Corporation support, and the LMSC Program Organization.
- o The contractor program office which had made available to it an abundance of appropriately experienced personnel, together with a degree of projectization which was effective through the delegation of necessary authority.
- o A carefully devised incentive contract biased toward technical performance which resulted in a powerful management tool for motivation of all employees associated with the program to promote early and continued success.

A discussion of these factors follows:

1. From the beginning of the program there has existed a stable and tight SPO/LMSC relationship which has led to a very high level of mutual trust and confidence in the technical administration of this program. Effectiveness of the relationship has been aided by the tight change control on the general systems specification which had no significant changes after the first six months of the program. Problems, when first identified, have been given prompt attention by the Air Force/Aerospace/LMSC team, thus allowing timely resolution. Examples are such problem areas as the Command Programmer and the SCF software. These represented significant program features which were GFE to LMSC, which required and got decisive Air Force/Aerospace action.
2. This whole environment was aided by the LMSC choice of experienced key personnel who were given adequate authority to perform their job. As a result of the LMSC management trainee concept on programs extant at the initiation of 206-II, such as Standard Agena, 206-I, 241, and others, properly trained people were provided at no detriment to the existing programs. The physical co-location of all concerned LMSC elements led to de facto total projectization in all parts of the program. These circumstances were further aided by the LMSC program management concept of delegating cost, schedule, and technical responsibility for end-item segments.

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In this approach, all system and subsystem personnel were given extensive training early in the program on the total system technical approach as well as the contractual incentive provisions. In addition, techniques were developed to measure the individual's cost, schedule, and technical performance on a weekly basis. This technique, together with comprehensive design reviews and hardware audit programs, permitted program motivation to extend from the Group Engineers to the supporting organizations such as Manufacturing and Product Assurance.

3. The incentive contract which featured vehicle performance had the desired result. It was of particular importance that all performance was to be measured as a negative from optimum. In other words, any performance less than perfection represented a loss to the company rather than a more classic approach which provided a potential gain. The contract will experience a cost overrun of 5% or less. This did not result from irresponsible fiscal management, but rather many program decisions which were believed to contribute to better reliability. These actions were broadly within the scope of the contract but not foreseen. They did not represent difficult trade-off decisions, since it was believed that vehicle performance would offset the penalty to the company.

Turning now to the tangible factors:

- Endowment
of
CDP
philosophy*
- o A timely, carefully reviewed, effective design. This included minimum technical risks with emphasis on those which were considered of a higher risk.
 - o A novel spacecraft testing concept embracing factory readiness before shipment to the launch pad, with least possible testing needed at that point.
 - o Realistic costs with an underlying philosophy of both Air Force and company management of allowing only what was necessary, but at the same time that which was essential to ensure mission success.

A discussion of these factors follows:

1. The program was able to draw upon the existence of a well thought out preliminary design. It is to be noted that the final design is almost identical to the design originally proposed by LMSC with the exception of changes in the Command Subsystem and the addition of certain redundant features. The willingness of the Air Force to accept LMSC's proposal permitted an extremely orderly program. This was further aided by the existence and execution of a detailed and logical development program which allowed six months for design, six months for component fabrication and development, six months for systems qualification, and six months for manufacturing flight hardware and preparing for launch. This program plan, combined with the Development Test Vehicle, permitted the inevitable problems to be absorbed in almost one year of detailed systems testing.

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Also noteworthy was the highly coordinated and cooperative management of the significant interfaces, particularly that between the LMSC hardware and that of the payload contractor. It should be noted that the higher risk areas (many of which were based on prior proven hardware of similar functional purpose) received special attention in all areas from systems analysis through the intervening steps such as concept, design, interface analysis, manufacture, etc., to the final factory systems test.

2. Implementation of the factory to pad concept with the firm backing of the SPO created the situation wherein flight hardware after being thoroughly tested at the factory was delivered to the launch pad in such condition that no anomalies existed. Corollary to this has been the implementation of computer programmed checkout using the RF linkage which permitted the accurate testing of flight hardware to a much greater depth than which has been possible before by manual means with hard wire connections. The value of this test method was further strengthened by requiring that the confidence tests at the launch pad be functionally identical to those executed at the factory during final Systems Test.
3. The extensive preparations by both the Government and the Contractor, both before and after contract award, resulted in an agreed upon and well understood work statement. This, in turn, made possible credible detailed cost agreements which, as the program evolved, were easy for both the SPO and Contractor to relate to work yet to be accomplished. In all of this operation, the Contractor operated upon the philosophy that the most effective program was one which provided an adequate emphasis on those areas which allowed the now demonstrated early success.

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