Work Load Increases in 7106 Over 7105

1. Harnesses - Due to the increased number of subsystems in these satellites, the complexity of the harness has gone from approximately

2. R.F.Systems - Due to a change in frequency allocation, we had to move our command receiver frequency much closer to our transmitter frequencies. This has caused a complete redesign of the R.F.System and resulted in many more highly critical filters.

3. R.S.System (Self Extending G.G.Rods) - This is a new requirement altogether. Essentially, these systems are small, self sufficient, satellites all by themselves. They require an independent vacuum sealed power supply, telemetry system, modulator, transmitter, band pass filters and antenna.

4. Basic Structure - Due to a sizable increase in weight and voluum, the basic multiface structure had to be enlarged and strengthened. The only

parts which could be used from the previous design were the upper and lower shells which have no structural purpose.

5. Memory Systems - On the last launch we used one memory system of [redacted] in 7105D. We had already flown the same system on [redacted] It provided such surprising and revealing data that we decided to use a larger syste[redacted] on all four primary satellites for this launch. x 4

6. Solar Aspect Systems - On this launch we require [redacted] aspect systems and the last time we used only two. x 2

7. Magnetic Aspect Systems - On this launch we require [redacted] aspect systems - last time only two were required. x 2

8. [redacted]

9. Solar Cells Strings - A total of 800 strings (32 cells/strings) are required on this launch. Last launch only 520 strings were required. x 1,55

10. [redacted]n the last launch, we flew a [redacted] which did not work very well. We feel we understand the problem and have undertaken a complete redesign of that system. It is a truly state-of-the-art development and it has looked good in the prototype tests. x 2

How many kinds?

[redacted]

11. Special Modulators - On the last launch a total of 44 units were flown. This launch 82 units will fly. This large increase forced a redesign of our modulators to provide more unique down links and also greater stability. X 2

12. R&D Systems - Last launch there were two R&D Systems; this launch there will be eight. X 4

13. Command System - had to be expanded in two ways. It had to provide 80 output where the previous system only needed 47. It also had to be programable, X 2

14. Reaction Wheel System - On this launch, we are trying a new type of It is semi-passive, i.e.,

design a speed controller to work with this wheel. Our system, which works on a high speed digital switching principle, controls the speed of that motor to 0.04%! This is well within the design goal of 1%. We have been able to package this system so compactly that we will be able to fly a back-up (reduntant) controller. This will be the first rod wheel system flown and if successful will be a very significant advance in the field of satellite stabilization. now

15. PITCH & YAW WHEEL SYSTEMS - On the last launch we used four pitch and yaw wheels to maneuver our 3-axis satellites. This launch, [redacted] are required. It was determined for orbital operation that for the yaw wheel system to be effective, that a "turn off" signal based on position rather than time was required. In order to accomplish this, a circuit involving approximately 40 integrated circuits had to be developed.

16. Microthrusters - In the past, microthrusters have been one of our biggest development areas. The ammonia vapor systems worked so well on the last launch that we decided to essentially fly four of the same type systems on this launch. Valves have always been the most critical component of these systems, however, we felt the problem had been solved by the Allen valve which we have extensive test time on and have successfully used in orbit on [redacted] For some undetermined reason, it has recently become apparent that the Allen Valve Company can no longer reproduce that valve to the original specs. We have since found another valve (Wright Valve Co.) which has so far looked extremely good. We are as encouraged as is possible under the circumstances of our previous experience. However, this unfortunate turn of events has cost us a great deal of unanticipated time and money.

17. Gravity Gradient Rods - This area has been our single biggest concern. It was not until the 7105 satellites had been in orbit approximately [redacted] that NRL, and the rest of the G.G.Community, realized that the overlapped rod, which everyone had used, was unsatisfactory. By that time we had already ordered all the GG rods for this launch, ($100K).

[redacted]

[redacted]

All of these units have to undergo extensive tests once they arrive at NRL. All flight units and backups must be tested in a hard vacumm at new temperature and voltage limits and also be vibrated. On all motor driven units, the D. C. motors must also undergo extensive vacumm testing as recent flight experience has proven this can be a very serious problem. All in all, the entire G. G. rod problem will consume the time of four very busy people for a minimum of three (3) months. The last of the flight rods are scheduled to arrive in late March '69.

[redacted]

Summary of Entire 7106 Situation

1. The 7106 launch represents a large increase in work load over the 7105 launch.

2. We are certainly no "better off" from a personnel standpoint for this launch.

3. The total overtime allotment for 7106 is well below what was needed on 7105.

Based on a detailed understanding of these three factors it is my conclusion that we will miss our scheduled launch date by a significant amount. I cannot, as yet, predict with any accuracy how much we will slip, mainly because we haven't yet had enough experience operating under the present conditions. However, if the last five weeks is any sort of guideline, we are in real trouble. We accomplished in five weeks what we would have accomplished in three to three and a half weeks under previous circumstances. There were five Saturdays and one Holiday in that period when virtually no one worked because the overtime budget couldn't stand it. At that rate we will miss our launch date by 3.5 to 4 months. late Sept

Since overtime is not the whole problem, neither is it the whole solution. However, it is the area that we can do something about immediately. The advantage of more overtime is that it can help to relieve the "bottlenecks" and speed up the slow item. In other words, it allows us to "attack" the problem. At present, we are having to gear our schedule, in maie schedule because

we do not have enough overtime to do anything about it. Since these schedules are a matter of a lot of items stacked in series, delays just keep adding one on top of the other - the result is rather devastating.

I think there are some very good reasons for getting the 7106 launch into orbit as soon as possible and I feel we should do the best job we can toward that end. I don't feel we are right now. More important than my feelings on this subject is our sponsor's feelings.

Major Tests -

7. (7) Thermal Vac with Solar Simulation - These tests must be run continuously and since they are not in secure space they must be attended at all times, by cleared personnel. These tests will consume approximately 320 overtime hours each - assuming no problems. They run from Monday thru Saturday, two shifts, five men/shift. The seven tests alone will use approximately 2,200 hours.

8. System Tests - These are the main electronic tests. Two are required for each primary payload. Typically, these tests consume approximately 120 hours of overtime each. That is 960 total hours. These tests must be attended at all times since the P.L. is in a temperature chamber. These chambers have malfunctioned in the past and ruined the system under test. It is therefore our present policy never to leave these tests unattended.

8. R.F.I. & Pattern Tests - These tests will each consume approximately 120 hours of overtime. That is 6 men x 5 days x 4 hours/man-day. This is a total of 960 hours.

Just these three types of tests will consume 4,120 hours of overtime.

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Personnel:

Since 7105, we have gained:

1. Len Hearton - a direct replacement for Cudmore, an R. F. Section Head; he is cleared.

(1M) X 2. George Flach - a young E. E. just out of school

(1M) X 3. [redacted]n E. T. in the R. F. Section

4. [redacted] a graduate student who will probably leave when he gets his PH.D.

(1M) X 5. [redacted] an E. T. in the Anechoic Chamber

not new 6. Wally Urman - designer from ESD. Worked for us a good percentage of the time before transfer.

not new 7. [redacted] - draftsman from ESD. Worked for us a good percentage of time before transfer.

not new { 8. 9. 10. [redacted] - All three were long term loans from ESD which had to be transferred to maintain status quo.

Since 7105, we have lost:

1. John Poole - A section head with (six years of experience) - especially on this project. A very great loss.

2. Pat Cudmore - A section head with (six years of experience) Also a very great loss.

3. [redacted] four years of experience

4. [redacted] - five years of experience. Had been a P.L. coordinator on last two launches.

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HANDLE VIA [illegible] CHANNELS ONLY

5. J. Roszak - seven years of experience - handled our command system.

6. R. Gran - eight years of experience - handled data reduction.

Although the "head count" is up by four people, three of those are "conversions" of long term loans - so actually the "head count" is really only up by one. When you also consider the "quality-experience factor" of the people we lost and compare that against the inexperience of the new personnel, the overall result is that, at present, we have less capability than we had for the 7105 launch. The fact that the people who remained from the last launch have acquired increased skills is more than offset by the tremendously increased work load placed on them.