

Remove 4 GSE fittings from Actuator Arms.....	12
Install Actuator Heat Shield Support at Structural Fins A & B.....	40
Install Actuator Heat Shield Panel at Fins A & B.....	60
Install 4 Boot Assemblies at Fins at A & B.....	40
Remove Fuel Emergency Drain Cover.....	2
Remove 2 LOX tank Module Covers.....	2
Remove Module Assembly Cover (Connect to GSE).....	4
LOX Emergency Direct (Connect to GSE).....	8
LOX Emergency Drain Valve (Connect to GSE).....	9
Install Coupling.....	3
Install Timer Distributor.....	8
Install Environmental Duct Adapter.....	6
Install LOX Fill & Drain Line.....	4

Mr. FULTON. We all realize that is what the contractor has not done. When they have the change orders pasted on the side, you didn't expect them?

Dr. MUELLER. That is what I was going to say. We do make delivery decisions to transfer work from one plant to another.

Mr. FULTON. That is what I am asking about.

Dr. MUELLER. But that is not a contractor that does that. It is the Government itself that does it. That is the point I am trying to make.

Mr. FULTON. Will you give us some little history about it?

Dr. MUELLER. We will be pleased to.

(The information requested follows:)

In the spacecraft and launch vehicle areas, a series of NASA board actions precede the turnover of the item vehicle to NASA. The contractor identifies to the board, in writing, the known changes or deficiencies that are outstanding at the time of turnover. The board, with the assistance of working groups evaluates the documentation, the physical vehicle and test results. A decision is made to accept the vehicle with certain "open" work to be accomplished later or make the contractor bring the vehicle up to an acceptable level of completion before acceptance. For the spacecraft this turnover action occurs at the contractor's facility since the spacecraft is then delivered to KSC. For launch vehicles, the turnover point is usually after acceptance testing at a facility such as SACTO or MTF since acceptance firing cannot be conducted at the contractor's plant. In either case, the turnover is formally documented with known outstanding work positively identified.

In the case of launch vehicles, the move from the contractor's facility to the acceptance test facility is preceded by a formal review board but there is no written acceptance by the government of the stage. The vehicle still belongs to the contractor and tests are conducted by the contractor with supervision and assistance by NASA to insure the tests are run in conformance of government requirements. The demonstration of the launch vehicle is a prerequisite for government acceptance. For spacecraft, there are a series of in-plant tests that represent this same demonstration of performance.

There are several reasons for accepting a piece of hardware with known open work still to be performed. We, of course, refer only to items of a relatively minor nature. Were a discrepancy of a major nature to appear, it is held for correction where it can best be handled, schedules notwithstanding. During the early part of a program where time is a factor, initial production overlaps, to an extent, the later phases of the ground test and verification effort. Refinements and modifications which result continue even through delivery dates of these earlier units. Discrepancies found by inspections just prior to delivery must be accommodated. Discrepancies are uncovered during testing which follows manufacture. In all cases the modifications which are dictated by these occurrences are evaluated by both the contractor and NASA on the basis of schedule impact versus work complexity to determine the best place in the total vehicle flow to make the change or correct the fault.

There is a certain amount of work that is always done after a stage arrives at a test stand or a vehicle arrives at KSC. Any deferred or added work is also scheduled into the flow. Neither we nor the contractor like to defer work.