



AEROJET-GENERAL CORPORATION

9100 EAST FLAIR DRIVE EL MONTE, CALIFORNIA 91734

11 January 1974

R B. YOUNG
VICE PRESIDENT
ENGINEERING AND QUALITY ASSURANCE
(213) 572-6133

Mr. Mitchell R. Sharpe
Senior Historian
National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

Dear Mr. Sharpe:

This is in reply to your letter A&PS-MS-H dated 27 November 1973.

As I joined MSFC-NASA on 1 November 1963, I recall the circumstances of the introduction to the "Mueller all-up concept" quite clearly. You mention a George Mueller letter to Dr. von Braun on 1 November in which the concept was set forth. My recollection is that George had discussed this with Drs. von Braun and Rees prior to this date as Dr. Rees mentioned it to me in one of our meetings prior to my official arrival at MSFC on 1 November.

I have gone over my personal files from my MSFC assignment and have found no correspondence relating to the subject of interest. I know there was considerable in way of memos, minutes of meetings, and opinion papers but when I left Huntsville I left for my successor all files related to my responsibilities and took only that material of a personal nature.

However, I can give you some recollections of what went on, even after ten years time. The Saturn V launch vehicle flight test plan as devised by MSFC prior to George Mueller's arrival at OMSF contemplated two or three developmental launches incorporating, first, dummy second and third stages (S-II and S-IVB) on top of the first flight S-IC stage; second, launch with the first live S-II and dummy S-IVB with a second such configuration as a fallback position, and; third, planned flight having three live stages. The MSFC philosophy was predicated on flight proving each stage in sequence to minimize hardware risk and maximize overall program success potential. It was admittedly conservative but MSFC (von Braun and Rees) argued that the three stages comprising the Saturn V were all new, very complex, extremely expensive, and the initial launch, even after the rather extensive all-up stage static fire tests, had a low probability of success. The visible program impact of this philosophy and

the flight test plan evolved therefrom was an extended schedule leading up to the first manned flight, extended launch intervals of five to six months (to start), and increased program costs (time and hardware).

George Mueller argued that two (or three) additional launches of the S-IC and one (or two) additional flight(s) of the S-II would not significantly increase confidence in mission success or the actual hardware flight reliability; that ground testing should and must be the means by which the flight readiness of the stages was to be judged. If serious doubts due to technical unknowns, ground test failures, or unresolved developmental problems existed no launch should be attempted. Actual flight environment problems such as staging, in-flight start, stage shutdown, start sequencing, which could only be simulated in ground testing, were most apt to have significant cost and schedule impacts. Launches with dummy stages could contribute little to their definition or resolution and, if such were to be encountered, the sooner the better via the all-up launch approach.

As I recall, the initial MSFC reaction to the proposal, particularly among the senior technical staff, was one of shock and incredulity. Many expressed themselves with, "Impossible," "Won't work," "A dangerous idea," "George Mueller doesn't understand the problem," "It is simply not done that way." However, George Mueller was most persuasive and Drs. von Braun and Rees, although not embracing the idea initially, were quite objective and low key in voicing their doubts. I can't recall that at the time the concept became the program base line whether either Werhner or Eberhard really believed in the approach but nonetheless since it was the decision of George Mueller they supported it. Never to my knowledge did either lend any credence to the doubts that continued to be expressed by the "troops" at MSFC.

Having been involved in the Titan I program wherein the first launch was not all-up (inert second stage) and the Titan II program wherein the all-up concept was successfully employed in the first launch, my inclination was to strongly support the latter at MSFC. This inclination was tempered by my being new to the job, organization, and people. Hence, my initially expressed position was, "Let's look at it objectively and not reject it out of hand." As I became settled in my new position I pushed harder for the concept in my day to day contacts with my MSFC associates. Whether I made any converts, I don't recall.

Perhaps a few comments on my Titan experience will be of interest here. The many problems encountered in achieving the first Titan I launch were launch stand and first stage related and in retrospect would not have been increased if the second stage had been live. The issue here was that the system was not really adequately wrung out; the resulting launch once achieved did not contribute to real progress as much as resolution of the prelaunch and countdown problems did.

In other words, nothing related to actual first stage flight performance (which would have precluded successful operation of the second stage had it been aboard and ready as a subsystem to perform) was uncovered.

In the case of the Titan II program, the all-up first launch concept was adopted. The first launch after several attempts aborted due to countdown problems was successful. Subsequent flight failures were not related to stage interaction nor would have been isolated by Stage I launches carrying a dummy second stage. I believe the record of the Titan II flight test program is a most persuasive argument for the all-up first launch concept.

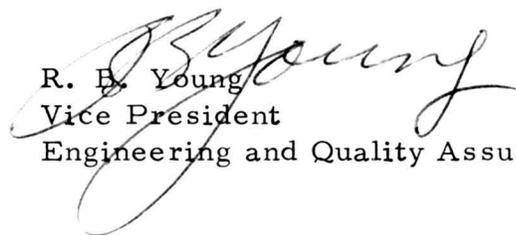
As far as the effect on IO planning and practices were concerned, since the all-up first launch became the program base line at about the time IO came into existence, it was the only plan base line we ever worked to.

As to specific objections raised by Lee James or Art Rudolph, my recollections fail me here. Knowing Arthur as I do, I would say he probably shook his head over the whole thing saying it was a poor idea and wouldn't work, but I can't make a firm quote. Suggest you ask Lee and Art as I am certain you are doing.

A final comment on my reaction. The Saturn V impressed me as being so complex that I doubted that the entire machine would ever work at one time as planned, regardless of what development launch concept was employed. As my knowledge of the vehicle increased during my Huntsville tour this conviction became stronger. The fact that I was completely wrong is illustrative of and a tribute to the fantastic technical accomplishments of the Saturn team. Truly, the launch vehicle performance has exceeded the fondest hopes of even the most optimistic of those close to the program.

I trust the foregoing reminiscence will be of some use to you in your endeavors. Thank you for calling on me.

Sincerely yours,


R. E. Young
Vice President
Engineering and Quality Assurance