

the checkout of these pads which had been modified for launching uprated vehicles.

Launch Complex 37 is now undergoing modifications for the Lunar Module and we still have Block II modifications to be made to Launch Complex 34. However, we have succeeded in eliminating the major problems from these two launch complexes, and now we are well along with Launch Complex 39 for the Saturn V flights.

In our flights, we had little difficulty after getting to the launch pad with our flight hardware. Most of the problems were in the ground support equipment and facility items.

The Apollo launch data system, which is located in the Central Instrumentation Facility at KSC, became operational in December 1965. This system replaces the similar Gemini launch data system which was located primarily in the Mission Control Center at Cape Kennedy. Except for a few minor programming problems during our three missions, performance of the Apollo launch data system was successful.

Two of our three Apollo mission simulators were delivered early in the year. These two simulators have been used in the preliminary training for our flight crews.

We are supported in our mission operations by NASA's Goddard Space Flight Center and the Office of Tracking and Data Acquisition. Both Goddard and OTDA and their contractors made excellent progress during the year in facility construction and in installation of the equipment associated with the Unified S-Band equipment. We were able to give three of the stations a limited test on AS-202. Final system testing for design confirmation will occur on later flights.

As we install the Unified S-Band equipment, we are also in the process of putting in new data processing equipment at most of our manned space flight network sites. We are upgrading to the UNIVAC 642-B computer which is replacing the smaller UNIVAC 1218 computer. This work will continue through 1967. We have had success with the first equipments put on line, and they will provide support during upcoming missions.

Our first Apollo instrumentation ship, the VANGUARD, arrived at the Eastern Test Range in the fall of 1966 to undergo testing. The ship went out to an instrumented portion of the range for a check of metric tracking accuracy, and during the Gemini XII mission did some C-Band tracking and some communications work.

As you may recall, when we originally designed the Mission Control Center at Houston we had the capability of conducting a live mission from one floor and conducting simulated training exercises on the second floor. This was not used until last year when, at some time during all three of our preparations for Apollo shots, we were conducting training exercises on the second floor while live Gemini flights were flown from the third floor. This capability is now being upgraded so that two unrelated simultaneous live missions will soon be possible.

The training of our operations personnel which commenced late in 1965, progressed throughout 1966. As the Gemini program began to phase down, many experienced Gemini personnel were made available for use in the Apollo program. In the middle of 1966, some of our more experienced people in the Apollo Saturn I program also began to move over and prepare for the Apollo Saturn V missions.

One fundamental change in our launch and flight organizations was made from those used in the Gemini program. The change reflects the organizational responsibility arising from use of the NASA Saturn launch vehicles instead of Air Force Titan boosters. This internal realignment at KSC, along with the realignment of personnel, served to strengthen our launch organization.

SOFTWARE PROGRAMS

I would now like to discuss some of the software involved in the operations programming for the equipment shown here (fig. 96, MA66-9660). This chart is really divided into two phases. On the lefthand side of the chart are the facilities used for processing the data during the launch phase. On the right-hand side are those used basically during the orbital phase of the mission.

The box at the top represents the two pieces of flight hardware, the launch vehicle digital computer and the Apollo guidance computer.