

ble for developing the Apollo command and service modules and the lunar module that will land men on the surface of the moon and for the flight operations of these systems. What is now the Kennedy Space Center in Florida was established as an outgrowth of the launch operations directorate of the Marshall Space Flight Center.

We generally refer to these newer centers as our "development" centers because of the nature of their mission responsibilities. Although their emphasis is on the development and conduct of space missions, we still maintain the research and advanced technological development base at these centers as a means of anticipating the best means for carrying out and planning our future programs and, in the process, to maintain their technical competence. These centers have been responsible for our major space flight missions including our manned Mercury and Gemini missions in which almost 2,000 hours of manned space flight were achieved and the capabilities of man to operate in space were demonstrated. These flights also demonstrated the capability to control, rendezvous, and dock vehicles in space and evaluated many other requirements for manned space operations. The NASA development centers have also directed the development of such projects as the TIROS, Nimbus, Syncom, Relay, Ranger, Mariner, Surveyor, and many other major scientific space experiments and satellites that apply this technology for communications and meteorology.

All of these organizational units were, therefore, based on the scientific, engineering, and management discipline competence that was already in existence as a national resource. These skills are now applied to different mission goals and have resulted in substantial progress toward the achievement of those goals.

In order to carry out the programs that have been established, the NASA civil service employment has grown from 8,420 employees in 1958 to a peak of 33,726 in 1967 and is now down to 32,422. Combined with the contractor and university people who are working with us in our installations, this manpower and the equipment and facilities that are available to them give NASA the competence to carry out the missions assigned to it and also provide the competence that can be applied to other activities by NASA within its overall area of responsibility.

If we consider the history of all of these centers from their NACA and Department of Defense background to the current time, we find a continual change in work assignment, in mission goal, and even in discipline mix. Facilities have also undergone continual change. For example, the altitude wind tunnel was built at the Lewis Research Center in 1942. Its 20-foot diameter test section was used to test aircraft reciprocating engine-nacelle-propeller combinations at speeds of 500 miles an hour and at conditions equivalent to 50,000-foot altitudes.

During World War II tests in this facility resulted in important contributions to the improvement of the B-29. That facility is now known as the space power chambers. It has been divided into separate environmental space chambers that simulate conditions up to altitudes of 400,000 feet and temperatures approaching space conditions. It is, therefore, now a space environmental test facility. From aircraft tests at 500 miles an hour and altitudes of 50,000 feet we have now gone to tests of the Centaur rocket and to models of large solid rock nozzles and also to tests of space power systems.