

is beyond reasonable attainment for an unmanned system. The ability to conduct experiments and correlate inputs from ground-based specialists with results from many observations and sensor measurements affords an opportunity for an onboard scientific specialist to adapt experimental procedures to real time and possibly to edit and select the most appropriate data for transmission to the ground.

Clearly, a manned space station should not be planned to perform functions or execute programs that can be done better or more economically on the ground or by unmanned satellites. On the other hand, it would be proper to undertake special tasks on a manned space station that would be excessively demanding in cost, time, and manpower if undertaken by unmanned space experiments. Furthermore, unmanned satellites are constrained to perform those functions for which the technology either exists or can be developed with reasonable certainty and for which the tasks can be defined in complete detail and are not so complex or intricate that the probability of successful completion is unattractive. Nevertheless, a manned space station utilized as a research laboratory can furnish the needed insight into the kind of meaningful measurements and observations that are required before unmanned satellites can be employed to provide large amounts of data on a routine basis.

SPACE STATION REQUIREMENTS

The detailed program requirements are summarized herein in such a manner as to indicate the general scope of a space station system which would effectively accommodate the initial activities of all the programs and the greater portion of all the long-term activities.

Performance Requirements.

Orientation, stabilization, and gravity are the most significant program requirements related to space station performance. The requirements for each of these factors are summarized in table II.

TABLE II.—*Space station program requirements*

Program	Instrument orientation	Instrument stabilization accuracy, degree	Gravity
Astronomy.....	Inertial.....	0.001.....	No instrument rotation.
Earth resources.....	Earth.....	0.05.....	Do.
Meteorology.....	do.....	0.05.....	Do.
Biology.....	Independent.....	Independent.....	10-5 and centrifuge.
Long-term flight.....	do.....	do.....	Nominal zero and centrifuge.
Research and development.....	Inertial and earth.....	0.1.....	Nominal zero.
Orbital operations.....	Independent.....	Independent.....	Do.

Orientation and stabilization

Programs involving the use of optical and/or photographic instrumentation equipment dictate the orientation and stabilization accuracy requirements. For astronomy, inertial orientation is required and obviously the need is to look in the direction of space. Meteorology and earth resources programs obviously need to look at the earth and require continuous geocentric orientation. These requirements then are conflicting in both direction and stabilization modes, and on a single space station require that the astronomy programs be conducted sequentially with the earth observation programs when the astronomy instrumentation is operated attached to the station. During many portions of the astronomy program, it is desired to operate the instrumentation remote from the station, and under these circumstances the programs could be conducted simultaneously.

The stabilization accuracies required for the optical and photographic instrumentation most likely cannot be satisfied by the space station primary stabilization and control system. It is anticipated that the station system will achieve at least 0.5° stabilization and may achieve 0.1° stabilization. Separate stable platforms and/or gimbal mounts will be required for most of the program instrumentation. Those programs which are basically independent of station orientation or stabilization accuracy do require nominal zero gravity and this