

## ROCKETS AND MISSILES

# Test Missile Reliability

The intricate mechanism of an intercontinental ballistic missile makes testing of its over-all reliability a difficult problem for the scientist and technician.

➤ AN INTERCONTINENTAL ballistic missile (ICBM) containing more than 300,000 parts, each of which could possibly malfunction, must have an over-all reliability of 99.9999% if it is to perform successfully nine times out of ten tries.

Improvement of component reliability has been a major goal in recent years of missile engineers who also have been faced with problems of providing components with higher operating temperatures, reduced size and weight.

Reliability improvement is of "paramount importance to all of us," Arthur B. Billet, senior staff engineer of the aero hydraulics division, Vickers, Inc., Detroit, told the American Rocket Society meeting in Detroit.

The job of making missile components and accessories reliable in normal environments has been big enough, Mr. Billet pointed out, but now it is even bigger in view of the need for missile parts that will operate reliably in the so-called "hyper-environment" above a 15-mile altitude and at supersonic speed.

Some of the "hyper-environment" problems he mentioned are: 100 times more ozone than at sea level; low pressures; dissociated gases, such as atomic oxygen, that are extremely reactive; and radiation. Other stressful conditions arising from the missiles themselves are: temperatures increasing from minus 65 degrees Fahrenheit to 1,200 degrees Fahrenheit within a few minutes; accelerations up to 60 g's; violent vibrations; and zero gravity.

Mr. Billet spoke primarily on recent developments in hydraulic missile components as part of a "long range missile components" symposium.

The most significant development recently in hydraulic components has been miniaturization of equipment, Mr. Billet said.

## Final Exams Are Toughest

➤ ONE OF A MISSILE producer's toughest jobs takes place after his missile already has been built. That is final acceptance testing.

Such testing has been described as a confusion of inspections complicated by the need to test a missile's reliability without actually firing it.

D. K. Meikle, head of the missile final acceptance test department, Chrysler Corporation Missile Division, Detroit, told the Rocket Society that final checkout of a missile may take anywhere from six days for a tactical missile in production to one month for a missile in the research and development stage.

Missiles often are set up as if to be fired, and every component is then tested individually and finally all simultaneously for reliability.

However, some portions of a missile's electrical circuitry must be "jumped," or by-passed, Mr. Meikle pointed out. Otherwise, the missile would fire and be of no further value to the military services. These portions are tested separately.

Likewise, the fuel and oxidizer tanks are not pressurized in the same area where pressures are applied to pumps and other components. This prevents possible accidents which would cause the loss of the missile.

Mr. Meikle pointed out that in actual practice "final" testing of a particular missile is never completed.

Missiles already cleared and delivered to operational units, such as overseas missile squadrons, must be pulled off the line and retested from time to time. There are two reasons, he said:

1. Missiles already operational continue



*WEATHER PROBE — Engineers John R. Palmer (left) and George R. Landreman, Air Research and Development Command, Washington, D. C., demonstrate the separation technique of the rocket-boostered radiosonde, designed for sensing weather at 150,000 feet. As the rocket reaches its peak, the nose cone ejects to free the radiosonde. It then stabilizes by its own parachute and telemeters weather information for later evaluation to a reconnaissance airplane flying below.*

to undergo improvement. Missiles in the field, therefore, are modified on occasion and each modification calls for re-testing.

2. Also, some missiles are pulled back so engineers can test the effects of storage and handling.

Science News Letter, September 27, 1958

## MEDICINE

## Parkinson's Disease No Longer Incurable

➤ PARKINSONISM, or shaking palsy, is no longer a hopeless, progressive, incurable disease.

A five-year follow-up study of 700 brain operations for parkinsonism revealed that 80% of the properly selected cases found relief from the tremor, rigidity, deformity and incapacitation of parkinsonism after basal ganglia surgery.

Furthermore, these symptoms can be relieved by operation without fear of any psychological or neurological damage to the patient, Drs. Irving S. Cooper and Gonzalo J. Bravo of the department of surgery, New York University—Bellevue Medical Center, and the department of neurosurgery at St. Barnabas Hospital, New York, report in *Neurology* (Sept.), the official journal of the American Academy of Neurology.

An objective analysis of the results of the study lead to the conclusion that parkinsonism is one of the most treatable of all central nervous system diseases, the doctors state.

The three methods of treatment for the palsy disease that were studied in the cases followed were anterior choroidal artery occlusion, chemopallidectomy and chemothalamectomy.

Parkinson's disease is usually recognized as a slowly progressive organic affection of the central nervous system beginning in the fifth or sixth decade of life. It results in tremor of resting muscles associated with stiffness and slowness of movement accompanied by a set facial expression.

Science News Letter, September 27, 1958

## PUBLIC HEALTH

## Record Number of Disabled Rehabilitated

➤ DESPITE the decline in employment in some areas during the fiscal year that ended June 30, 1958, a new record was reached when 74,320 men and women were rehabilitated by the Office of Vocational Rehabilitation and were able to go back to work.

Among those rehabilitated, about 3,300 persons were greatly needed teachers, doctors and engineers. About 8,500 went into skilled trades and 6,300 into agriculture.

Nearly 15,000 of these rehabilitated handicapped men and women had been receiving public assistance which cost the taxpayers some \$14,000,000 each year. Rehabilitating them cost a total of only about \$13,000,000.

The Office of Vocational Rehabilitation is under the U. S. Department of Health, Education and Welfare.

Science News Letter, September 27, 1958