tle Range, plus some NASA stations in other parts of the world. Because ETR is the Air Force's lead range designation, and because it has worldwide management responsibilities, it was chosen for SOC headquarters.

The control center uses direct communications with all stations needed for any particular pass, using radio nets, leased lines and hard lines. Telemetry received by these stations is relayed verbally on these circuits in near-real time, with telemetry tapes sent on to the control center later.

Readouts—SOC's prime interest in the satellites it watches has to do with the vehicle's health. It can exercise command functions to read out its temperatures, voltages and currents for pass-by-pass progress reports on operations. But the center also dips into the satellite's experiments in a limited way.

First, it has the responsibility of making sure the experiments are all turned on and working. Through its command capabilities, it can direct the switching to redundant systems, if they are provided, for proper operation.

In addition, recordings of [illegible] mental performance can be made [illegible] the prime experimenter so desires. These outputs are commanded and recorded by SOC, but not interpreted.

Equipment—The satellite center is equipped with two Brush pen recorders, one with an eight-channel capacity, the other with 16. Two custom-made control boards and communications control boards make up the rest of the center's prime equipment.

The control boards are now wired so that command tones from either are fed into Cape Kennedy's command transmitters. When updating plans go into effect this fall, each panel will be capable of controlling a satellite through its own separate command system.

Only one new piece of major equipment will be needed to give the second panel independent operating capabilities. This is a "B rack," which has already been received and should be installed by October.

The rack is actually a small computer that [illegible] (X-Y) c[illegible] nates to allow the [illegible] follow the orbiting satellite, once [illegible] acquired. NASA's Electro-Scan [illegible] puter is now being used.

Closest spacing of satellite passes so far has been about 15 min. With the new mode, says Maj. Donald Sykes, chief, satellite operations section, orbital network operations branch, that time should be cut to five minutes.

Staffing—Two kinds of passes call for two kinds of staffing tables for the center. When a satellite is tracked and worked by the main control center at the Cape, a telemetry technician, an Air Force satellite operations officer and a member of the satellite support team (Pan American World Airways, Inc. engineer who assists in data interpretation) are working the panels.

But when a remote station handles the pass, only the satellite operations officer is on station, to communicate with the outlying station. □

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Dog Tests Increase Microwave Concern

EXPERIMENTAL EVIDENCE has been obtained at the University of Rochester and the Verona Test Site, Griffiss AFB, N.Y., which links microwave radiation with altered physiologic functions in dogs.

The studies indicate that repeated exposure to 1,240-mc. microwaves at 50 mW/cm² could produce blood defects and a decrement in performance capabilities even though overt incapacitation might not take place.

In addition, tests show that exposure to microwaves can cause subtle changes which may not be evident under normal conditions, but which could cause trouble when the subject was exposed to another stressor, such as X-irradiation.

The tests, funded by both the Air Force and the Atomic Energy Commission, were conducted with dogs. Dr. Sol Michaelson, principal investigator, reported results recently to the Aerospace Medical Association.

More than thermal?—Considerable controversy has surrounded the issue of whether microwave radiation produces physiological responses beyond simple thermal effects. However, a top Air Force physician told TECHNOLOGY WEEK that the Air Force is now very concerned about insidious effects of microwave radiation.

While results of Michaelson's studies appear to reflect physiologic responses to thermal effects, the scientist points out that it has been suggested that stress stimulus from microwaves comes not only from the thermal receptors of the skin, but also from other sensory skin receptors. Some effects are more pronounced with microwave exposures than with comparable thermal stress.

Whether thermal or non-thermal or both, Michaelson says, there is sufficient evidence to indicate that microwave exposure results in damage to compensatory and homeokinetic mechanisms of the body.

These effects, he points out, should lead to caution in consideration of raising the presently accepted maximum permissible exposure of 10 mW/cm².

Test procedure—The group tested 21 male and female dogs, exposing them in Plexiglas cages placed on a Plexiglas table in an anechoic chamber. Exposure was accomplished with a 1,240-mc pulsed microwave generator.

For five days, the dogs were exposed to a 50-mW/cm² field intensity for six hours. The scientists also gave one animal 10 exposures and another 23 exposures in addition to the basic dose. Two dogs also received only a single six-hour exposure.

Additional groups of dogs were given X-ray doses of 1,000 kvp X-rays (50 R/min.) either to the whole body (300 R), upper body (1,800 R) or lower body (900 R) before the microwave exposure. Four dogs each received the first two doses and three the latter.

All the dogs lost weight, indicating the thermal stress of the microwave exposure. However, during the first exposures, the whole body and lower body X-irradiated dogs lost more weight than did the normal dogs. The lower-body X-irradiated dogs lost slightly less, but this increased with more exposures.

Blood studies showed the influence of the microwave exposures, Michaelson said, although some hematologic changes were variable. In normal dogs, and to a somewhat lesser degree in the X-irradiated dogs, hematocrit and hemoglobin content decreased progressively throughout the series.

Some central nervous system effe[illegible]