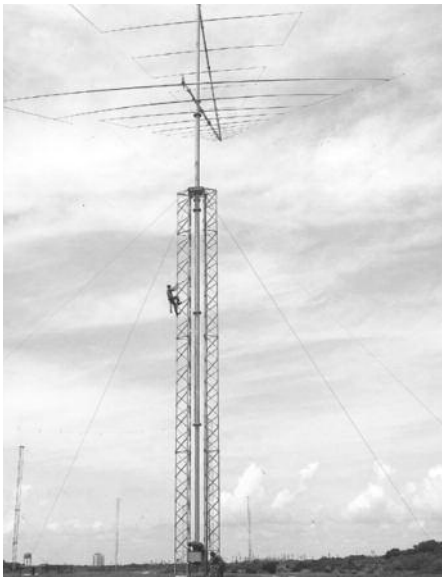
BY RONALD R. THOMAS

COMMUNICATIONS ON THE AIR FORCE EASTERN TEST RANGE

In the 1960s, the U.S. Air Force Eastern Test Range supported military missile test launches and the U.S. space initiatives, including the Mercury, Gemini, and Apollo programs. It extended from Cape Canaveral, Florida to Ascension Island located 5,000 miles downrange in the South Atlantic Ocean.

The Eastern Test Range had numerous downrange tracking sites on a number of islands that included Grand Bahama, Antigua, and Ascension Island. Also, several ships stationed in the Atlantic Ocean served as floating tracking sites. In addition, tracking airplanes were airborne during launches. All of those tracking sites had to be able to communicate with each other and with Cape Canaveral, and this required extensive high frequency radio communications capabilities.



Adjusting a log periodic antenna at the Cape Canaveral receiver site.

Cape Canaveral

Cape Canaveral consists of approximately 15,000 acres of scrub grass and sand jutting out into the Atlantic Ocean. In the 1960s, dozens of launch complexes, assembly hangers, a mission control building, numerous offices, press sites, and other facilities were located there.

In that era, approximately 10,000 military and civilian employees commuted daily to and from the Cape. Most people worked during the day, with a small number of support personnel on duty at night. Work hours had to be staggered to avoid morning and evening traffic jams.

In many ways, the Cape resembled a small city, even though nobody actually lived there. It had its own fire department and sewage treatment plant.

GEEIA

The U.S. Air Force 2862nd Ground Electronic Engineering Installation Agency (GEEIA) Squadron was responsible for the installation and depot-level maintenance of communications equipment on the Eastern Test Range. The squadron had several hundred military communications personnel and a small number of civilian employees at its office on Cape Canaveral. Personnel were assigned to three major areas: outside plant, inside plant, and electronics.

Outside plant personnel were involved with wire and cable projects, tower and antenna construction, and other related work. Inside plant personnel worked on telephone systems, missile communications equipment, public address systems, and other similar equipment. Electronics personnel worked on radio transmitting and receiving equipment, closed circuit television, and other types of electronic equipment.

The mission of the 2862nd GEEIA Squadron was to provide the eyes and ears for the Eastern Test Range. It was a major undertaking that involved installing and maintaining a wide variety of communications equipment, some of which was unique to the Eastern Test Range.

Communications

Voice communications over wire facilities

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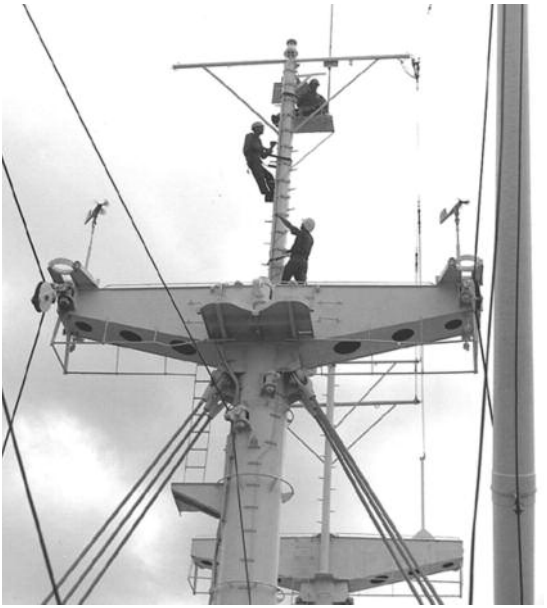
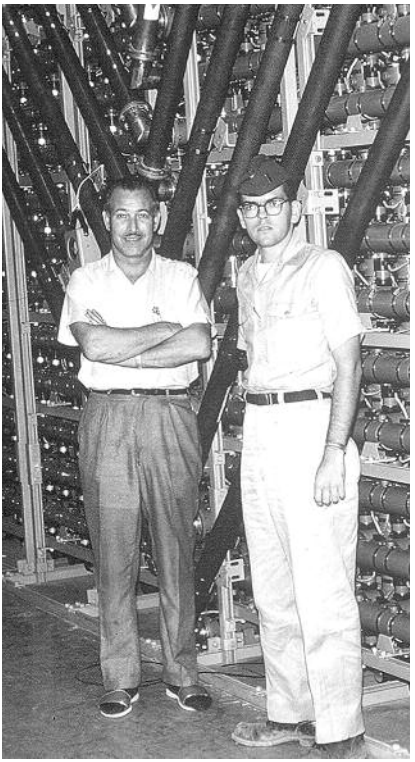
were critical to all of the activities at the Cape and the downrange locations. On Cape Canaveral, communications traveled through approximately 1,000 miles of buried, lead-covered cables that contained hundreds, and sometimes several thousand, pairs of copper wires.

This was long before the development of fiber optic cables, and those lead-covered cables were interconnected by splicing them together. This required soldering the individual wires in one cable to the wires in another cable, one wire at a time. Then a lead splice case was wrapped around the splice point and hot lead was poured over the seams of the splice case to seal it.

Those cables also carried data communications, but special video cables were installed to support the bandwidth demands of the closed circuit video communications equipment. Because Cape Canaveral is at sea level, there was a risk of flooding—which



GEEIE personnel working on an antenna on one of the Eastern Test Range tracking ships.

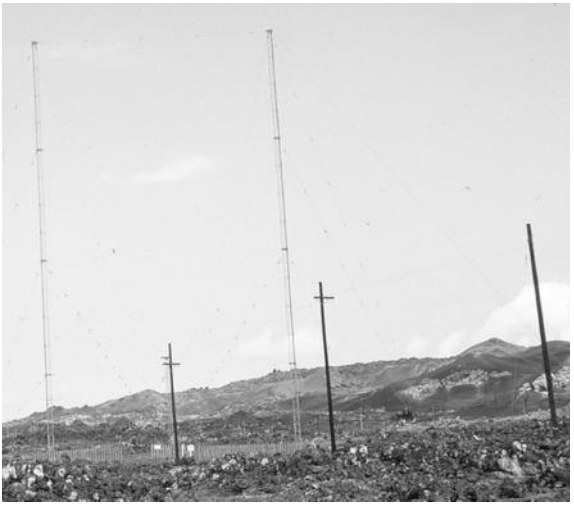


The author and a GEEIA civilian engineer pose with a 50 kW transmitter (left) and the antenna switching matrix at the transmitter site on Ascension Island.

could put all those buried cables at risk. Therefore, they were pressurized with an inert gas to keep water from entering.

Each launch complex had an extensive complement of missile communication equipment. That equipment provided multi-channel voice communications capability between the launch pad, the nearby blockhouse, and—via radio facilities—the downrange sites.

Cape Canaveral's launch complexes, assembly hangers, and other buildings made wide use of public address systems. They served the critical function of alerting personnel about launches as well as normal work activities. Because of the size of the buildings, making those systems work effectively was a challenging task.



Transmitting antennas on Ascension Island.

At each launch complex, closed circuit television cameras provided a view of the missile to personnel in the blockhouse and mission control. That information was needed during every launch.

Cape Canaveral and the downrange facilities had their own telephone systems for normal administrative communications. Those systems were all electromechanical and required frequent depot-level maintenance.

High frequency (HF) radio communications equipment, operating in the 3 MHz to 30 MHz range, provided communications between Cape Canaveral and the downrange tracking sites. In an age of cell phones and satellite communications, it is difficult to appreciate the important role of radio in that era. Even normal, daily administrative telephone calls to and from the tracking sites to the Cape had to go via HF.

On the Cape there was a receiving site that included numerous receivers and antennas. The transmitting site was located 30 miles south of the Cape at Malabar, Florida. All of the downrange sites had HF radio equipment and sophisticated antenna systems. However, the Ascension Island site, located 5,000 miles from the Cape, had the most complex facilities of all the downrange sites.

Ascension is a barren, 35-square-mile island created when a volcano blew up sometime in the distant past. American astronauts went there for training before going to the moon because scientists thought the moon terrain would physically resemble that on the island.

Traveling to Ascension required a three-day, 5,000-mile trip in an Air Force C-130 cargo airplane, with intermediate overnight stops in Brazil, at Antigua and Recife. Passengers sat in web seats that ran down each side of the airplane's interior, while the middle of the airplane held cargo. The seats were uncomfortable, the airplane was noisy, and there was very little light. Most, passengers just sat there, stared at the cargo, and waited for the trip to end.

The Ascension Island HF transmitter site had 10, 25, and 50-kilowatt single side band transmitters. Both the transmitting and receiving sites had large towers with complex fixed and rotatable antennas. Sophisticated switching systems connected the various transmitters and receivers with the appropriate antennas.

Radio frequency propagation prediction for HF communications on the Eastern Test Range was a complex and never ending challenge. The sunspot cycle went from a high in 1960 to a low in the mid-1960s to another high about 1970. In addition, the tracking ships were constantly repositioned, which further complicated HF radio communications. Propagation prediction and frequency selection were not for the faint of heart.

Today, Cape Canaveral is still in operation. However many of its 1960s-era launch facilities have been abandoned in place because they are no longer needed and would be too expensive to remove. Also, the communications facilities of the 1960s have been replaced by more modern technologies. Finally, Ascension Island, once a restricted facility, has been opened up to tourist visits. But reaching the island is still a long, boring trip, and few people bother to make it.