U.S. ARMY AN/MSC-46

MARK 1B

Mark 1B (AN/MSC-46) Satellite Communications Terminals were designed and built by Hughes Aircraft Company, Fullerton, Calif., for the U.S. Army Satellite Communications (SATCOM) Agency for use in the Global Defense Communications System.

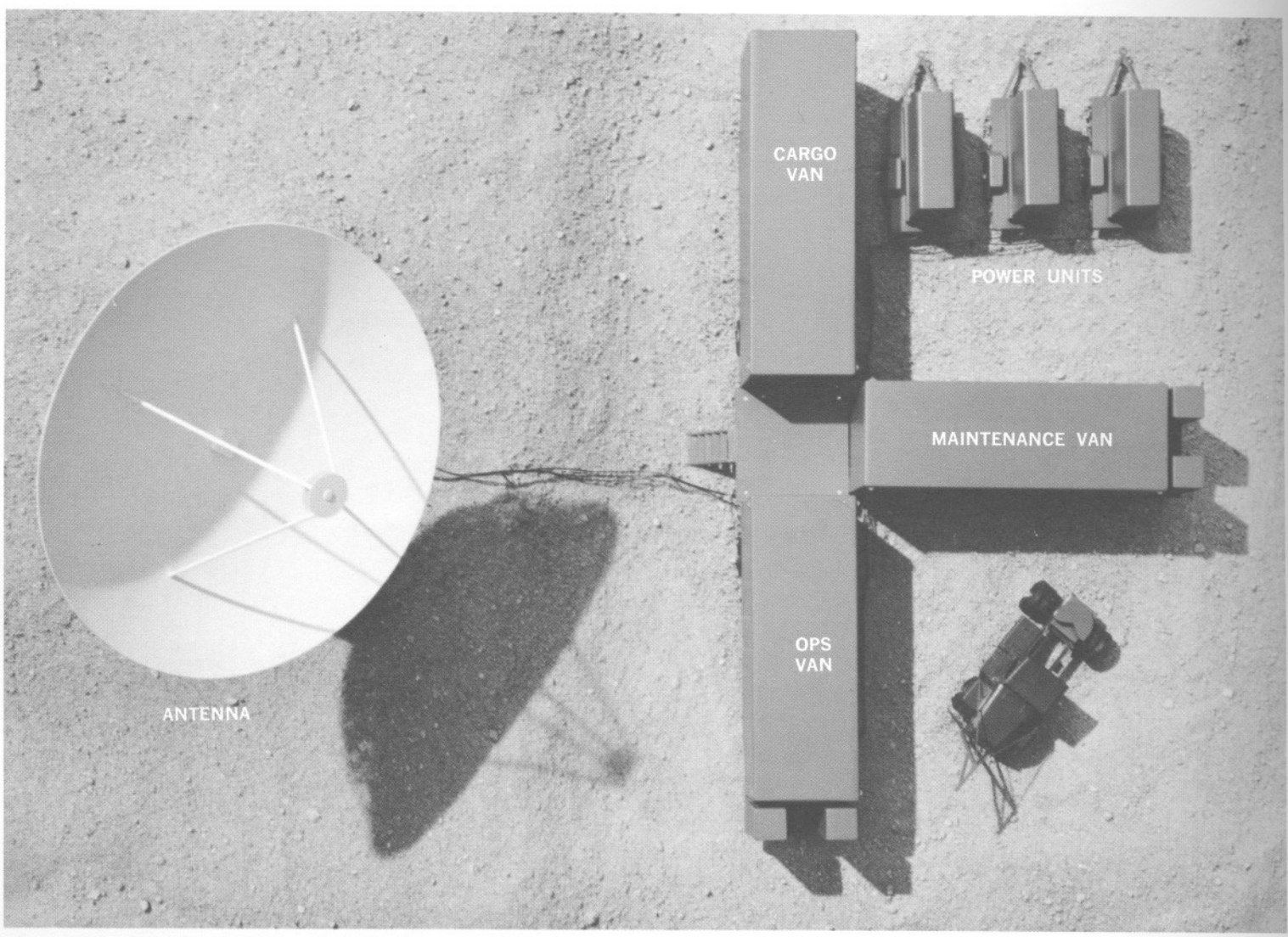
TRANSPORTABLE SATELLITE COMMUNICATIONS LINK TERMINAL

HUGHES

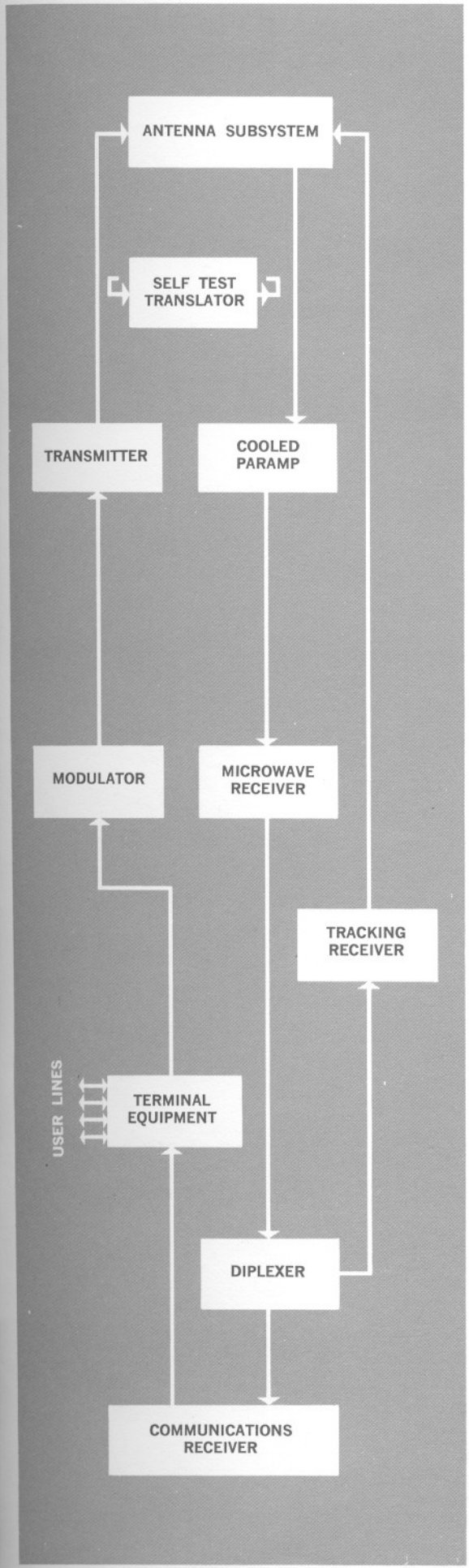
HUGHES AIRCRAFT COMPANY
FULLERTON, CALIFORNIA

DESCRIPTION Providing instant, reliable global voice and teletype communications through medium-altitude military satellites, the Mark 1B satellite communications terminals, built by Hughes-Fullerton for the United States Army, have been given the military designation of AN/MSC-46. Each terminal consists of a 40-foot-diameter parabolic antenna; a 58-foot-high, dual-wall inflatable radome; three 30-foot vans (an operations van, a cargo van, and a maintenance van); and three 100-kva diesel generators. The operations van contains major control and communication equipment; the cargo van accommodates the antenna and radome during travel; and the maintenance van houses spare parts and test equipment. The antenna has a four-horn, simultaneous lobe-comparison Cassegrain feed. A radio-frequency room, located behind the antenna reflector, is housed in a 5- by 7- by 8-foot box that supports the reflector. Placement of transmitters and receivers in this room minimizes RF losses and system-noise temperature, eliminating need for high-power radio-frequency rotary joints.

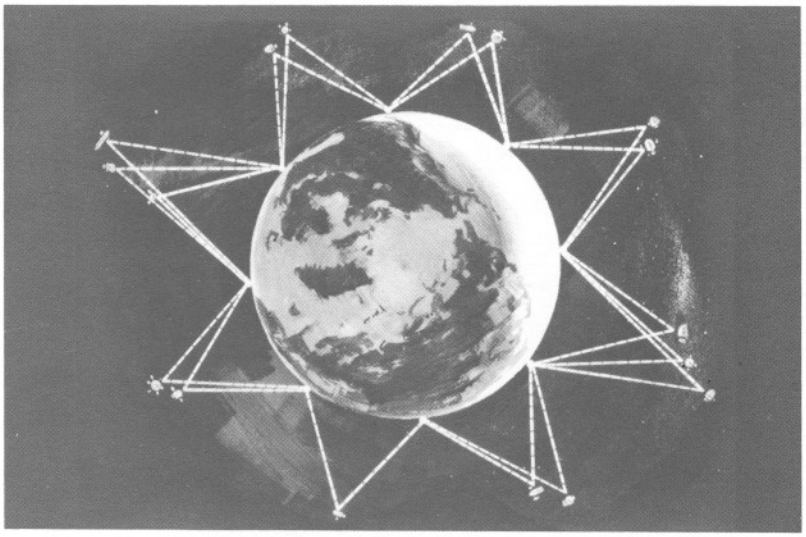
OPERATIONS Two of the Mark 1B terminals, even though they are thousands of miles apart, can communicate instantly and reliably through any satellite in the global system they can jointly "see." Antenna scan-generators permit rapid initial satellite acquisition, and once "locked on" to a satellite, the antenna can track automatically, even through the zenith. Mark 1B terminals can transmit and receive up to four voice and four teletype messages simultaneously. Satellite communications, supplementing crowded high-frequency radio circuits and limited undersea cables, have the additional advantage of being relatively unaffected by solar and atmospheric disturbances.



Model of Deployed Mark 1B Terminal, Top View

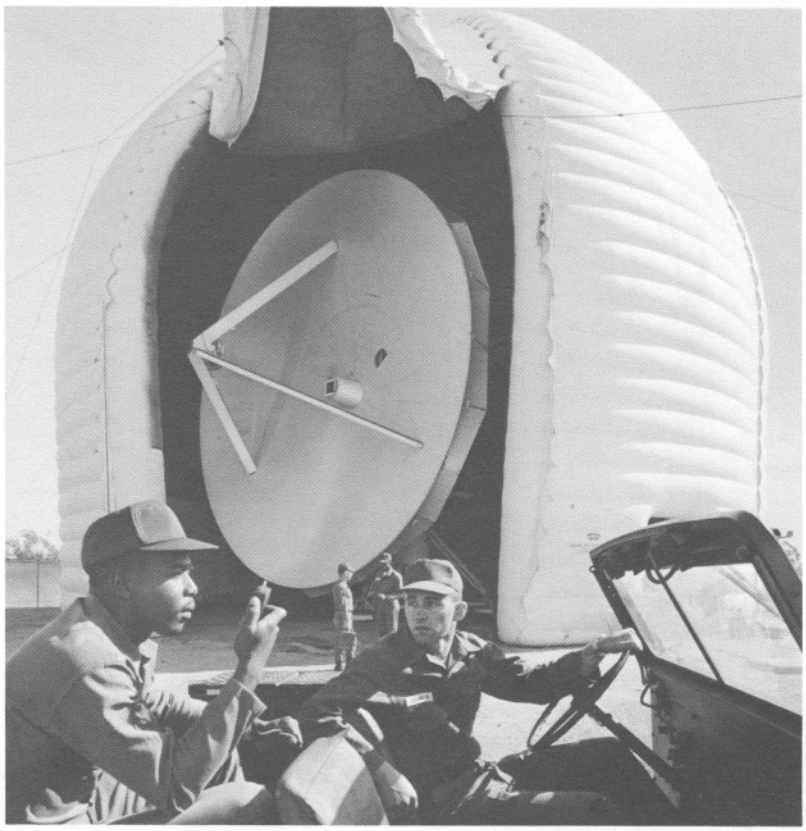


Block Diagram of the Mark 1B Terminal

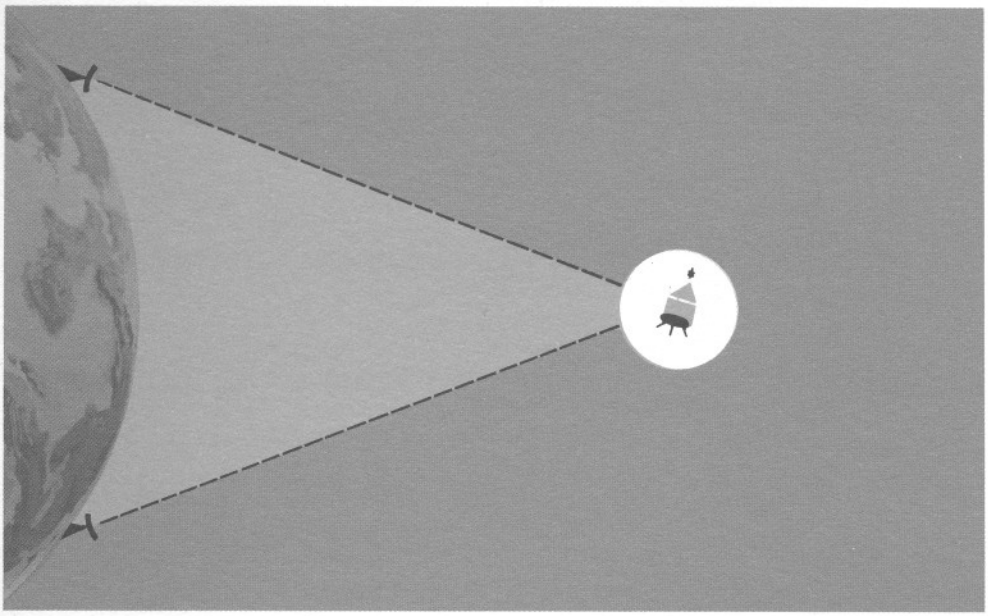


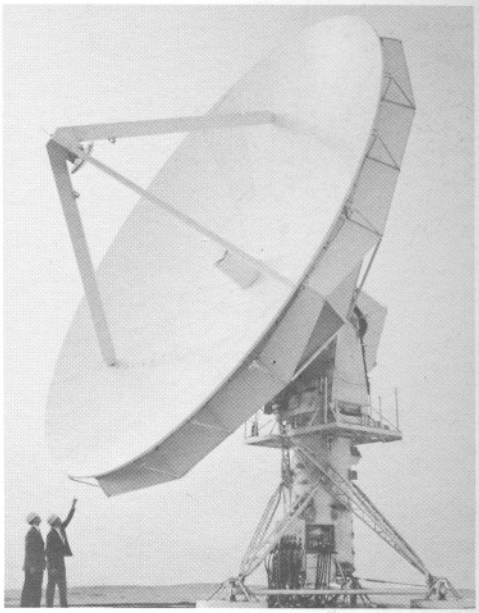
Satellite and Ground Terminals Offer Reliable Communication Network

DEPLOYMENT Mark 1B terminals can be transported to any site accessible by air, road, rail, or sea. Using scaffolds and tools supplied with the terminal, an eight-man military crew can assemble a terminal in 48 hours. These terminals—the first specifically designed for military communications—may be used with equal facility in forming earth-girding communication networks or fast, vital communication links to units involved in limited-action wars in remote parts of the world. The dual-wall inflatable radome protects the antenna from sand, dust, salt spray, rain, ice, snow, and intense cold or heat. Air conditioning and heating protect personnel and equipment in the vans.



The Mark 1B Antenna is Shown in the Eight-section Dual-wall Radome





Typical Link Between Two Terminals Using Medium-altitude Communication Satellite

EQUIPMENT SPECIFICATIONS

Antenna Diameter	40 Feet
Azimuth Rotation	± 360 Degrees
Elevation Rotation	—2 to 92 Degrees
Azimuth Velocity	9 Degrees per Second
Elevation Velocity	6 Degrees per Second
Antenna Servo System	Narrow Bandwidth for Tracking; Wide Bandwidth for Rapid Spatial and Frequency Acquisition
Tracking Accuracy	± 0.04 Degrees (With a Constant Acceleration of 0.013 Degrees Per Second Squared)
Slave Accuracy	± 0.057 Degrees (With an Acceleration of 0 to Maximum of 2 Degrees per Second Squared)
Tracking Feed	Four-horn Simultaneous Lobe Comparison
Transmit Frequency	7.9 to 8.4 Gigacycles per Second
Transmit Polarization	Right-hand Circular
Transmitter Output	15 Kilowatts
Receiver, Front End	Closed-cycle-cooled Parametric Amplifier Followed by Broadband Uncooled Tunnel Diode Amplifier
Receiver Frequency	7.25 to 7.75 Gigacycles per Second
Receiver Polarization	Left-hand Circular
Noise-Temperature	210°K
Tracking Receiver	Dual-Channel Phase-Frequency Multiplexed System Providing Azimuth and Elevation Error Signals to Antenna Servo
Link Bandwidth Capability	Four Duplex Voice Channels and Four Teletype Channels
Power Source	Three 100-Kilowatt Motor Generators (Two on Line, One Spare)
Radome Diameter	56 Feet

ENVIRONMENTAL SPECIFICATIONS (OPERATING)

Antenna	Operate in 30-mph Winds (Gusts up to 60 mph) Outside Radome; Operate in 120-mph Winds Within Radome
Air Temperature (72-hour Exposure)	—25°F, +125°F
Relative Humidity	Low of 5% at 125°F; High of 97% at 80 to 85°F
Maximum Elevation	8000 Feet Above Sea Level
Sand and Dust	Wind-carried Sand and Dust Particles
Rain	3-Inch Continuous Rainfall per Hour
Ice	1 Inch Thick
Salt Spray	As Encountered in Coastal Areas
Vibration	Total Excursion of 0.03 Inch Over Frequency Range of 10 to 50 Cyles per Second
Bounce and Shock	As Encountered in Military Transport
Tropical Conditions	Resistant to Tropical Fungi

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MA 66-10-14 • 65198 • JUNE 1966