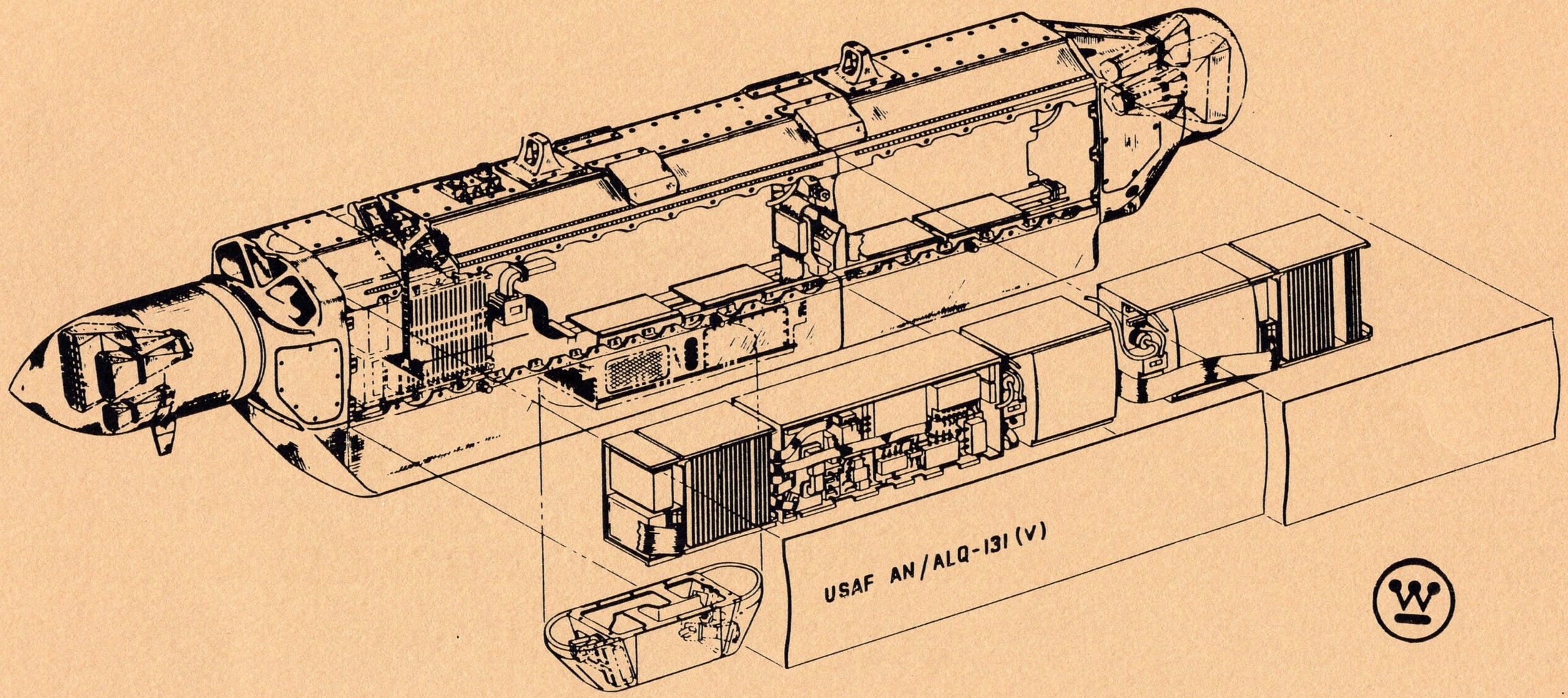
AN/ALQ-131 Modular ECM



80-0365A

AN/ALQ-131(V) MODULAR ECM POD

July 1981

WESTINGHOUSE DEFENSE AND ELECTRONIC SYSTEMS CENTER
Aerospace Division
Baltimore, Maryland 21203

80-0365-P-1

INTRODUCTION

The AN/ALQ-131(V) is an advanced tactical electronic countermeasures pod designed for use on high performance aircraft in the 1980 to 1999 time period. The pod is modularly constructed providing a high degree of adaptability to various mission requirements. Modularity extends to the subassembly level with emphasis on accessibility for ease of maintenance.

The functional modules are housed in modular canisters that comprise the basic pod structure. Individual canisters are self-sufficient with built-in structural support, cooling, and environmental protection. Each canister contains equipment bays for housing up to three functional modules. A standardized intermodule mounting and connection technique and a multiplexed command/data transmission system allow interchangeability of modules. Functional modules can be removed from the canister equipment bays without dismantling the pod.

The ALQ-131 provides coverage against the terminal threats and growth for early warning/acquisition type threats. It is capable of operation in preset jamming modes or in a power management mode with an internal receiver/processor, making the system responsive to the actual environment encountered.

The system is computer/software-controlled, providing the technique and mode control flexibility and reprogrammability required to effectively counter the varied and constantly changing threat environment. Reprogramming of the pod is easily accomplished in the field shop on the support equipment or on the flight line by means of a memory/loader verifier.

The overall design of the system stresses high reliability and ease of maintenance. A built-in, centrally integrated, self-test system continuously monitors critical system functions and provides for a comprehensive diagnostic check of system operational status with automatic fault isolation provided to the module level. Semiautomatic support equipment provides fault isolation to lower levels.

The ALQ-131 is designed so that equipment modules with different or improved capabilities can be incorporated later with few or no changes in the basic system.

The ALQ-131 has successfully completed FOT&E* flight test evaluation at Eglin AFB, Florida, and power management has been demonstrated through development test and evaluation.

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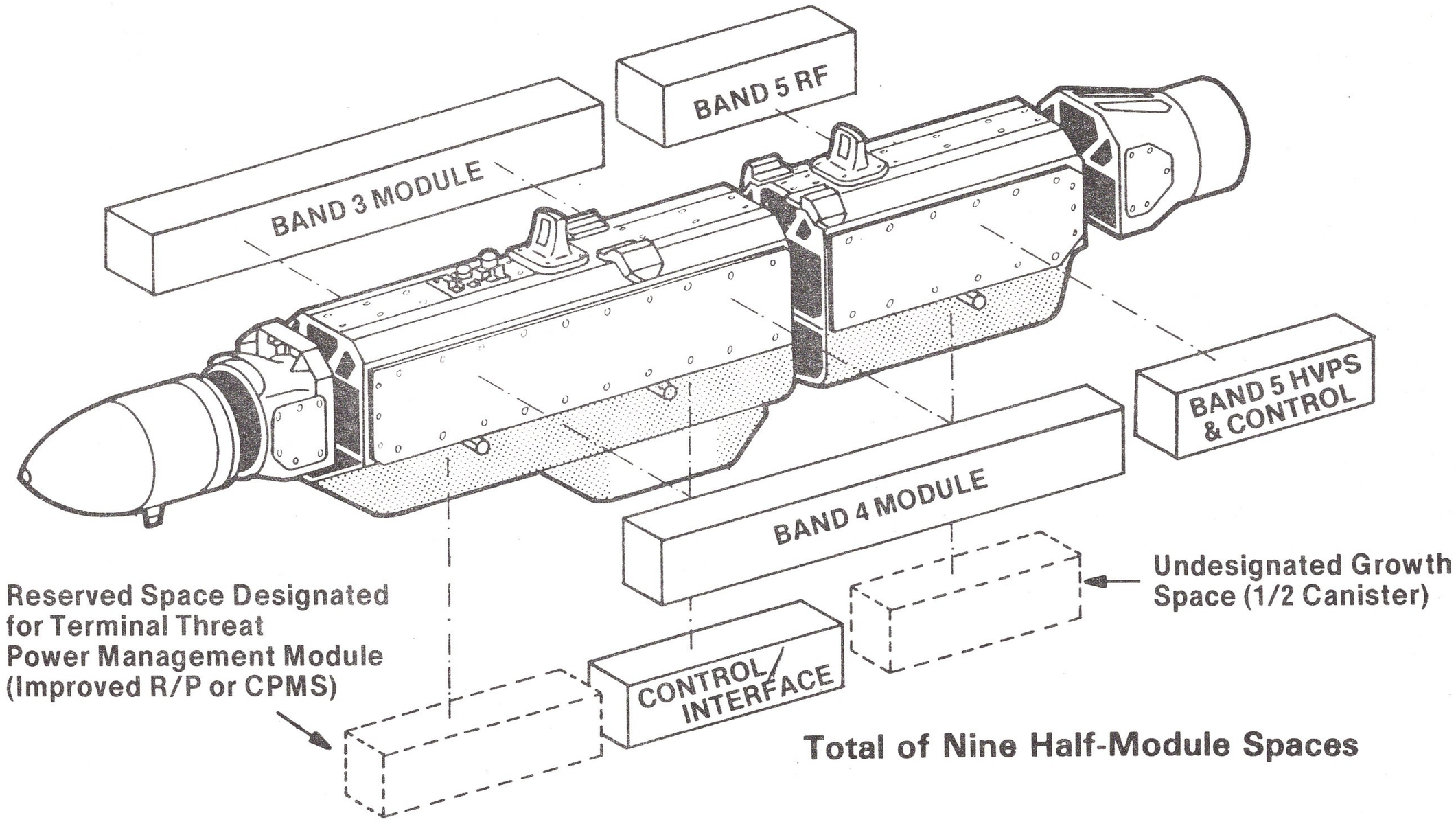
* Follow-On Test and Evaluation

One and One-Half Canister Deep Pod (Current Production Terminal Threat)



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COOLING

Cooling of the electronics in the AN/ALQ-131(V) is provided by a unique Freon-to-ram air/water cooling system that has no moving parts and requires no electrical power for operation. The cooling system is integral with the pod structure. Each pod canister has its own self-contained cooling system.

In cross section, the basic structure of one canister resembles an I-beam. The web and lower flanges of this I-beam comprise structural cold plates on which the equipment modules are mounted. To form an evaporator, the I-beam structure has internal coolant passages throughout its length, into which Freon-II refrigerant is loaded. The internal passages continue into the upper part of the I-beam which forms a condenser. Freon vapors from the evaporator are cooled in the condenser by ram-air. Expandable water may be carried in the ram-air ducts for aircraft dash operations beyond the flight envelope of the system.

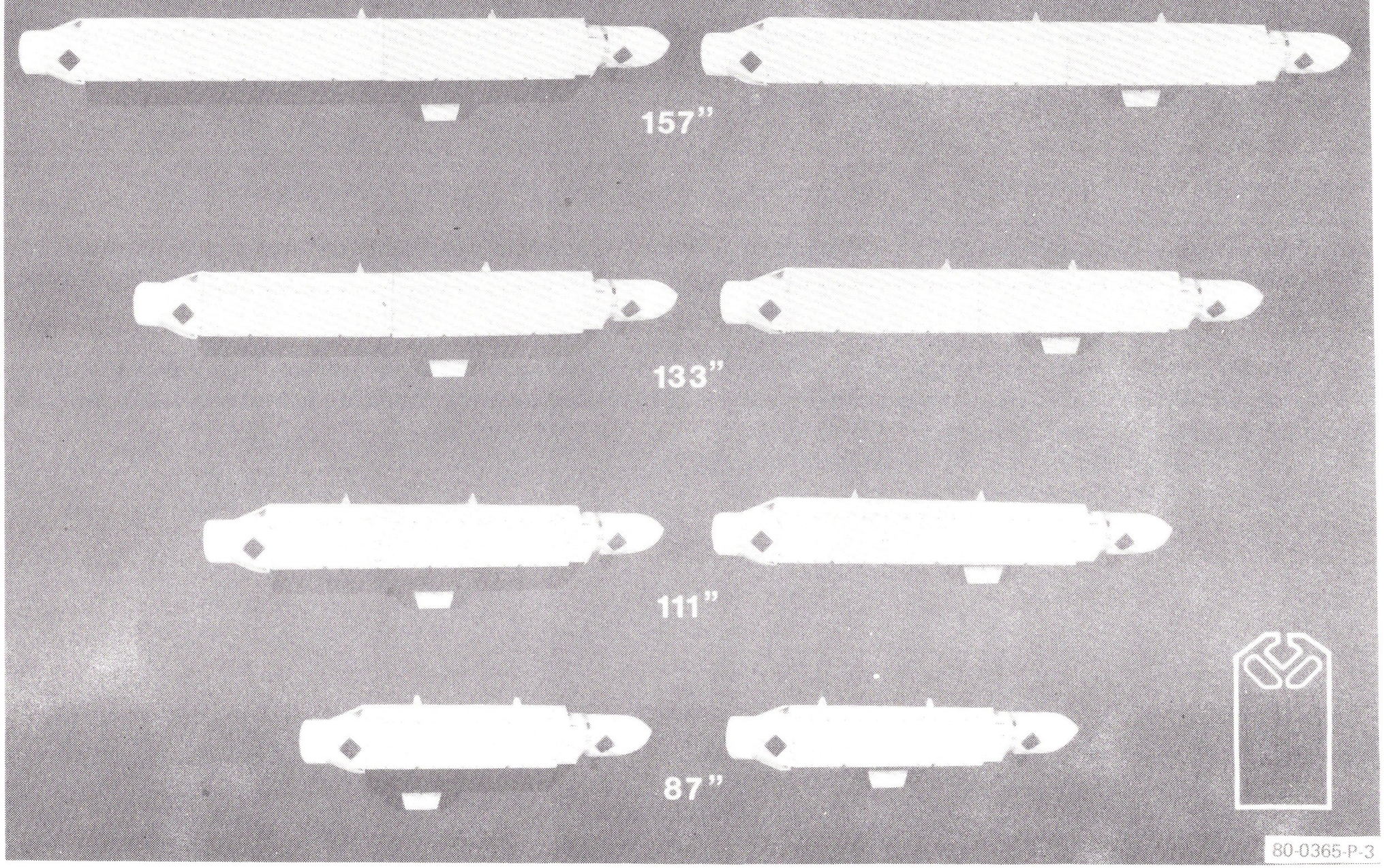
When the aircraft is in a roll attitude, condensed Freon returns to the evaporator via roll tubes. The system is charged with Freon via a filling valve, and a rupture disc provides relief should the pressure exceed 215 psia.

Drain/vent plugs in the hardback area facilitate maintenance, and a sight gauge on each canister permits verification that the Freon charge is adequate.

The cooling capability of the system is illustrated here for the terminal threat pod in curves of operating time as functions of aircraft speed and altitude.

Cooling system performance and reliability have been verified as it has operated maintenance free during all flight test operations.

ALQ-131 Basic Configurations



VERSATILITY

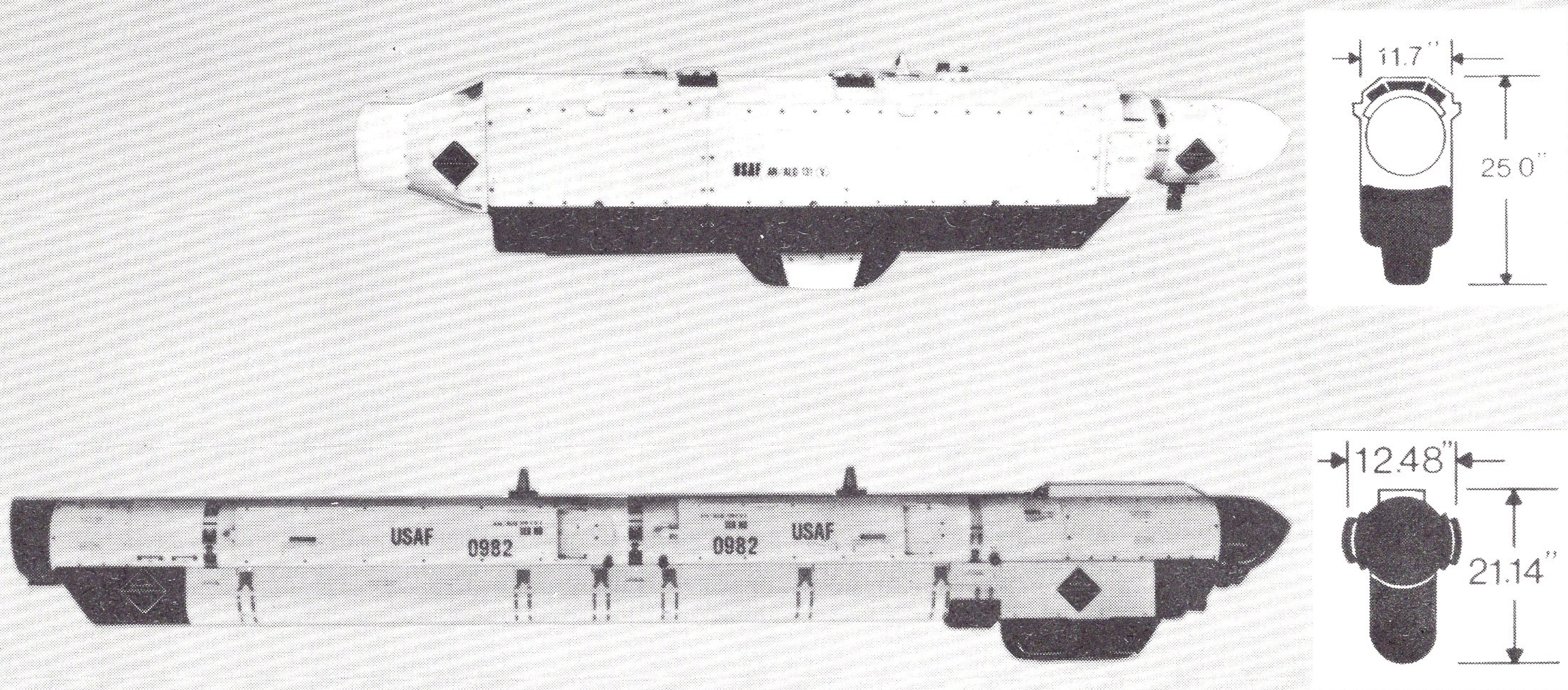
The modular design of the pod structure and electronic assemblies, plus its computer control architecture make the AN/ALQ-131(V) system adaptable to a broad spectrum of electronic warfare applications.

For those applications requiring selected frequency coverage at minimum weight and/or drag, the pod offers frequency band partitioning by module and assembly configurations of up to five frequency bands. With incorporation of an internal receiver processor (R/P), the system provides power management capability. For applications where aircraft prime power is either limited or lacking, the pod can obtain all required electrical power from the RATG.

For flexibility in mounting the several pod configurations on different aircraft and aircraft stations, mounting lugs can be varied in 2-inch increments. In addition, the pod umbilical assembly is configured for use with all pod lengths.

For applications where the use of an externally mounted pod is not feasible, the modular design permits packaging of the electronic modules inside the aircraft.

Physical Comparison-Terminal Threat Configuration



	AN/ALQ-131(V)	[illegible]
Length	111in	[illegible]
Weight	689lb	[illegible]
Prime Power	8.2/KVA	[illegible]

OPERATIONAL FLEXIBILITY — Terminal Threat Configurations

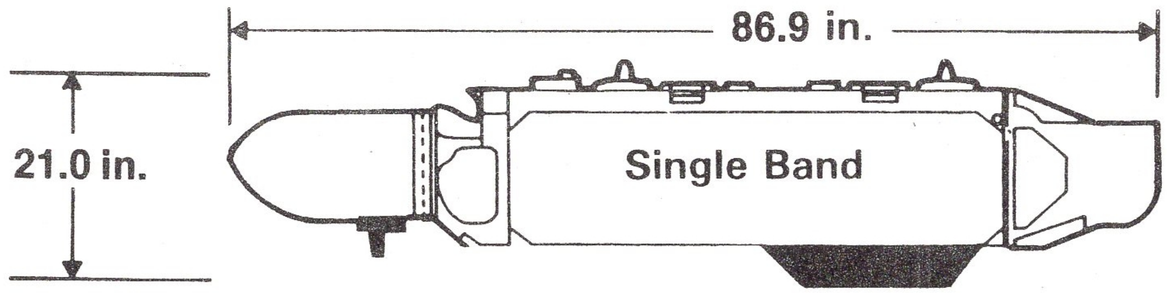
The AN/ALQ-131(V) terminal threat configurations are candidates for applications requiring electronic countermeasures against threats in the frequency bands 3, 4, and 5. The terminal threat pod can be assembled in either a 1½-canister, deep (111 inches long) or a long, shallow (133 inches long) configuration, with or without the full automatic, computer-controlled, power management capability provided by an R/P.

For packaging convenience, band 5 is shown here split into two half-size modules designated bands 5A and 5B.

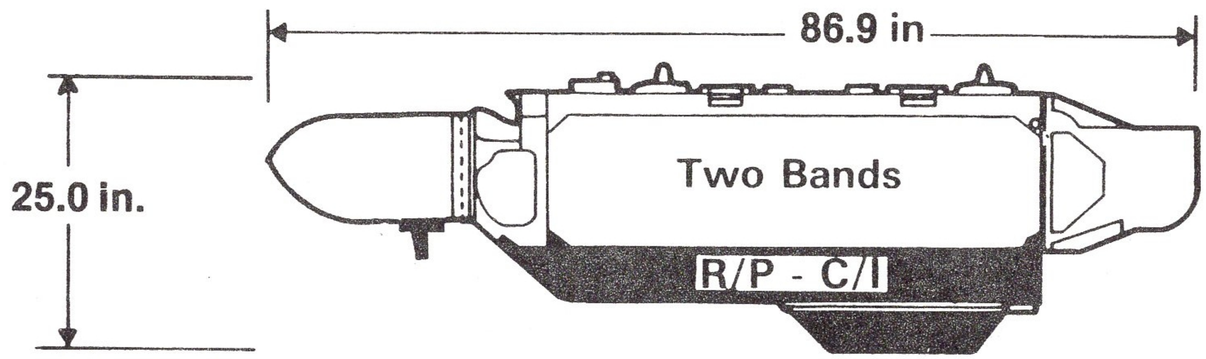
Each configuration will accommodate a RATG for applications where aircraft power is not sufficient.

The 1½-canister deep configuration is shown with a half-module R/P and a half-module of undesignated growth space.

Operational Flexibility — One and Two Band Configurations

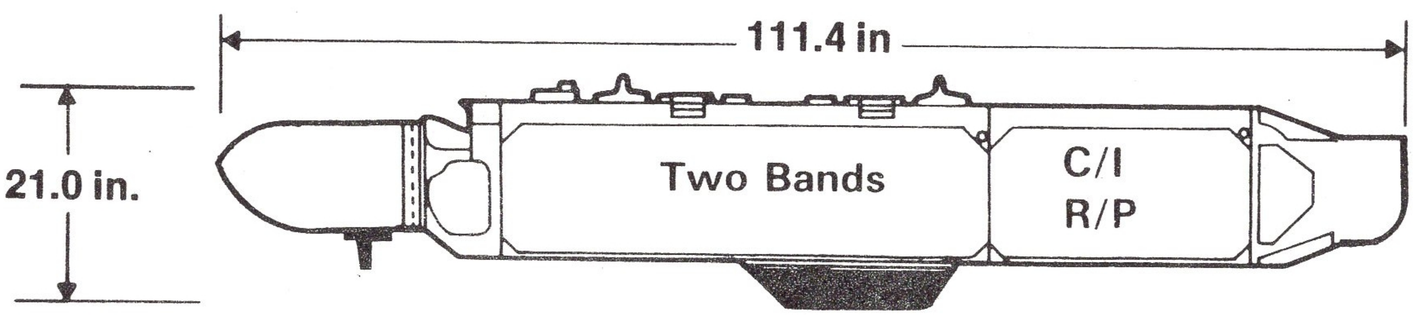


Shallow Configuration: 390 lb



Deep Configuration: 483 lb

523 lb w R/P



Shallow Configuration : 559 lb

599 lb w R/P

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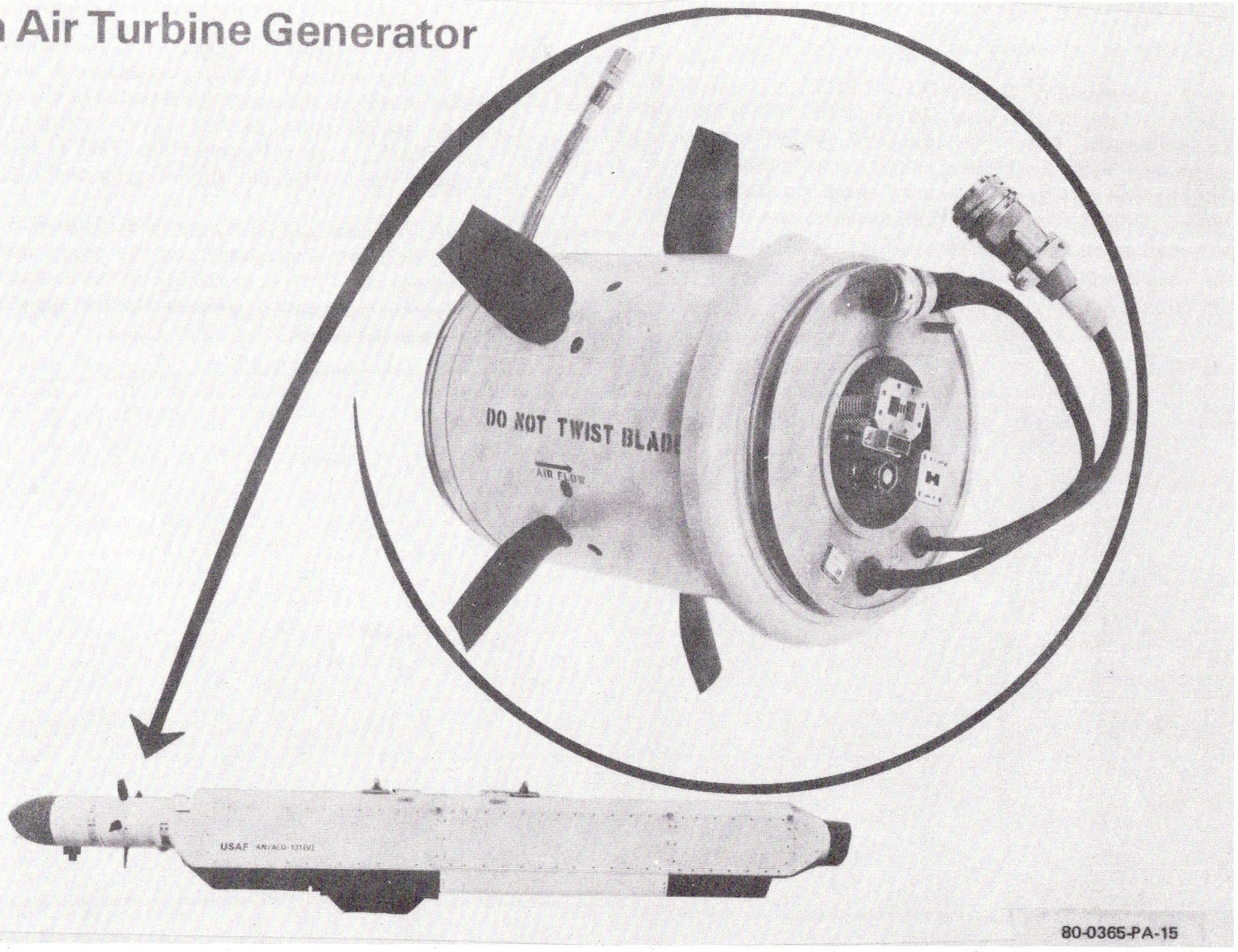
MODULE REPAIR/CITS

Maintenance of the AN/ALQ-131(V) is based on the pod's centrally integrated test system (CITS). This system provides a comprehensive functional check of system operation and an automatic fault isolation capability to the module level. CITS can be run in the maintenance shop, on the flightline, or in flight. CITS is run as the final check in the maintenance shop after all maintenance actions affecting the electrical operation of the pod, on the flightline after reprogramming, and as a go/no-go check.

During normal jamming operations, a continuous CITS mode monitors the operational status of the equipment. In this mode, the functions monitored are repeater channel deception modulation, high voltage for the TWT's, noise power output, prime bus voltage, and the integrity of the computer memory.

Pod repair and checkout is facilitated by computer-aided fault isolation procedures and by ready access to electronic components. This accessibility, illustrated here, yields a demonstrated mean-turn-around-time for the system of 2.0 hours.

Ram Air Turbine Generator



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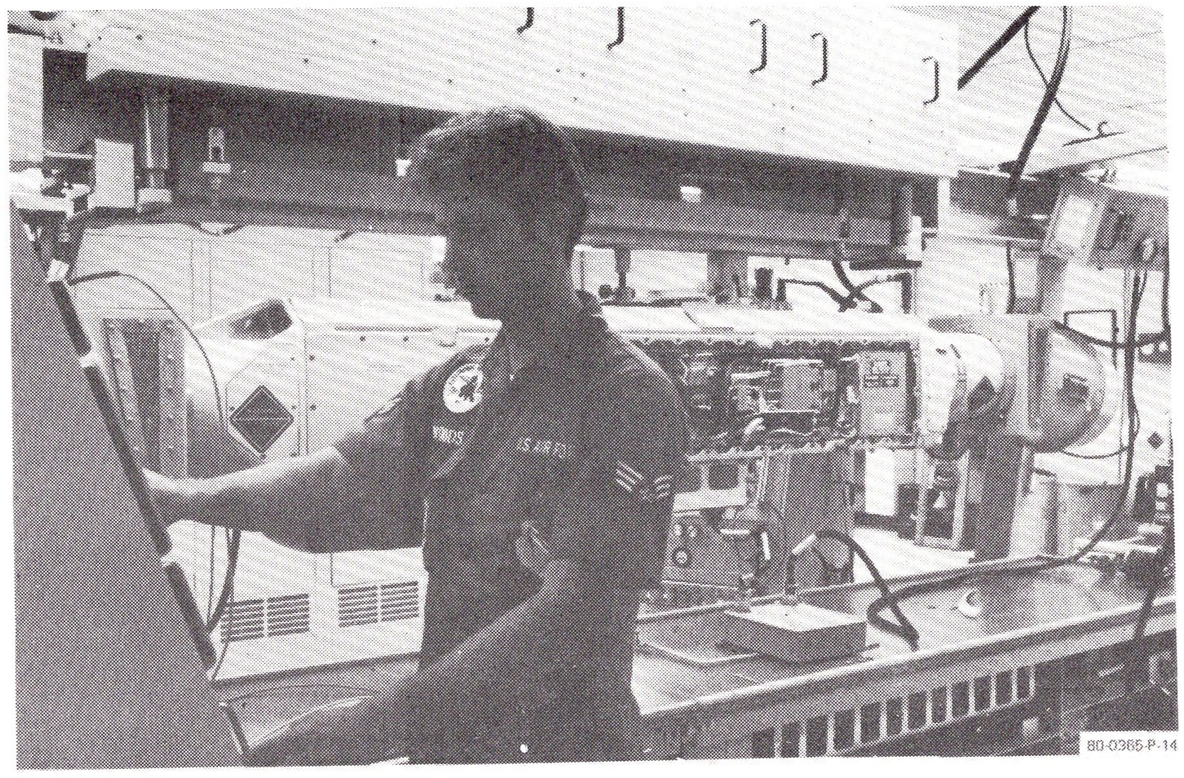
RAM-AIR TURBINE GENERATOR

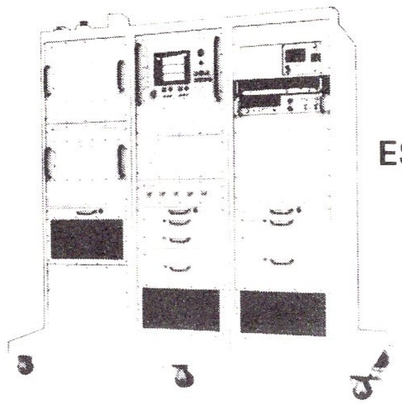
Inclusion of the RATG in the inventory of the AN/ALQ-131(V) equipment augments the available prime power for those system configurations requiring more power than can be supplied by the aircraft alone. At a length of 14 inches, a body diameter of 10 inches, a blade diameter of 19 inches, and a weight of 80 pounds, the RATG can deliver 20 kVA at 115 volts, 400 Hz, 3 phase.

A significant feature of operation of the ALQ-131 is the computer control of the startup procedure in such a way that the prime power transfer switch (RATG on Aircraft) is always initialized in the RATG position. The prime power bus voltage is monitored at startup, and only if a faulty prime power condition, or absence of a RATG, is sensed with the transfer to aircraft power take place.

The RATG was used extensively during the DT&E/IOT&E flight tests at Eglin AFB, Florida, and it functioned properly throughout the testing. A special RATG stall test was conducted, and RATG dropout occurred only when aircraft speed was reduced to 140 knots.

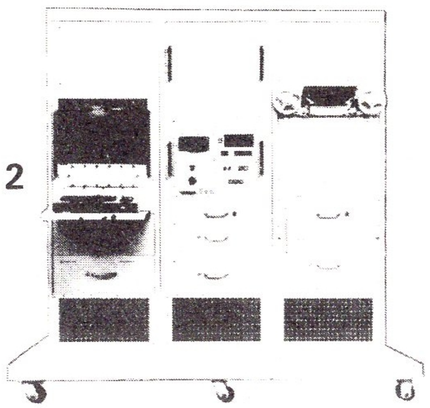


Field Shop AGE

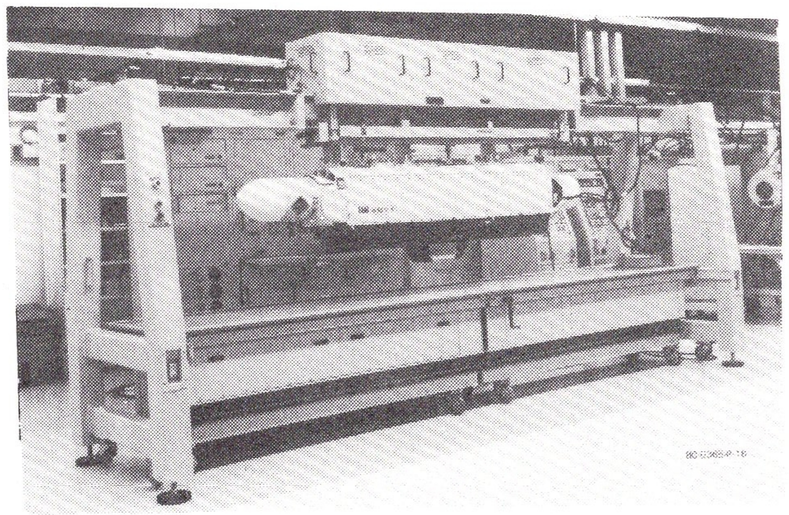


ESTC No 1

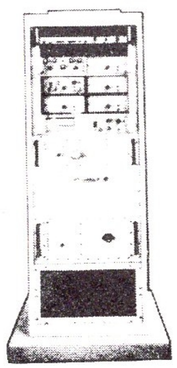
ESTC No 2

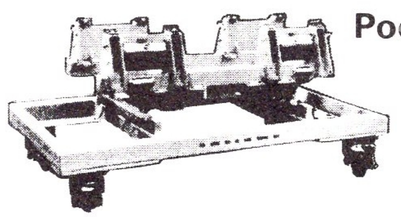


Maintenance Bench



Source Cart

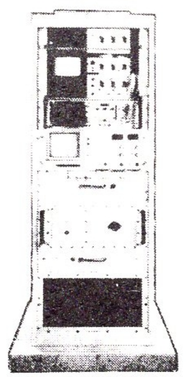




Pod Cradle

Pod Dolly

Monitor Cart



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