

TOP SECRET

UNITED STATES AIR FORCE



DEDICATED TO STRIKE FORCE SURVIVABILITY

EF-111A

Multi-layered enemy air-defense networks pose a formidable threat to the survivability of our strike aircraft. Our forces must be capable of penetrating and/or suppressing an enemy's air defenses if we are to anticipate mission success.

For the conceivable future, early-warning radar networks and radar-controlled weapon systems will continue to comprise the bulk of enemy defenses, so our forces must be capable of employing electronic countermeasures (ECM) to counter the radars. However, since a strike aircraft cannot carry enough ECM gear to jam all the types of radar, dedicated support jamming aircraft are required.

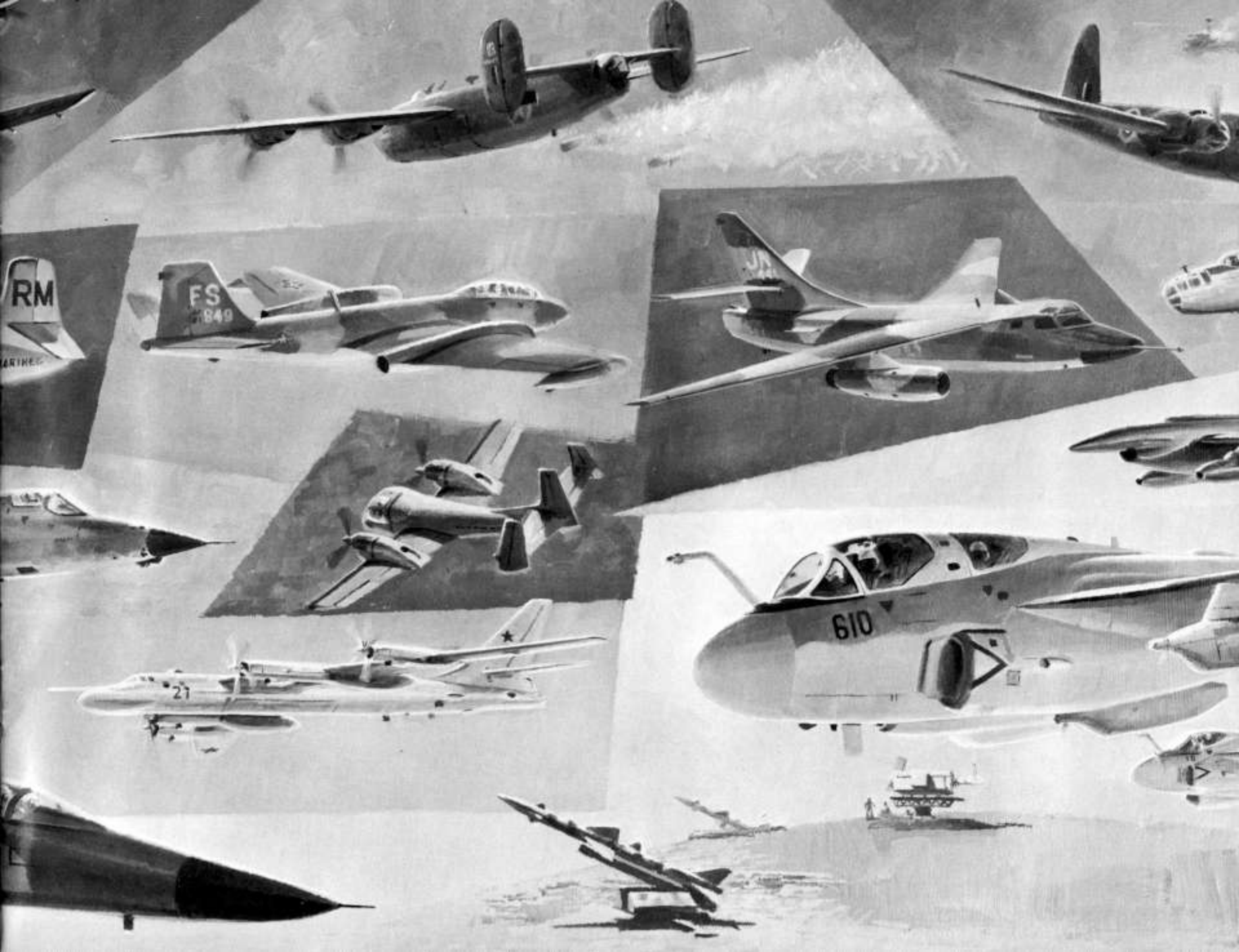
The new EF-111A Tactical Jamming System, born of this need, is the first U.S. Air Force tactical aircraft system designed specifically for ECM. It is also the only aircraft that can provide coverage throughout the entire spectrum of tactical missions. . .

- **BARRIER / STANDOFF**
- **PENETRATION / ESCORT**
- **CLOSE AIR SUPPORT**

THE EVOLUTION OF AIRBORNE ELECTRONIC WARFARE (EW) TECHNOLOGY spans more than three decades from its beginnings in the Second World War. Then, as now, the challenge was to keep pace with the growing capabilities of radar and air-defense communications. Today, the proliferation of sophisticated ground-based and airborne radars and air-defense networks demands the ultimate in airborne EW – the dedicated tactical ECM aircraft with automated high-power jamming capability embodied in a supersonic airframe – the Air Force/Grumman EF-111A.

Original painting by Keith Ferris





BARRIER / STANDOFF

In this mission, the EF-111A TJS operates on the friendly side of the forward edge of the battlefield (FEBA), out of range of the adversary's ground-based weapons. Orbiting, several EF-111As use their powerful jammers to create an electronic barrier, screening our own strike aircraft routes and maneuvers from the adversary's radars.

Denied the ability to monitor the airspace on our side of the barrier, the adversary is unable to determine the presence of our strike force, what direction it is taking, its position, number of aircraft, and other essential data. Lacking such information, the adversary is unable to control his own air- and ground-based defense systems effectively, thus giving our strike aircraft a decided survivability advantage.

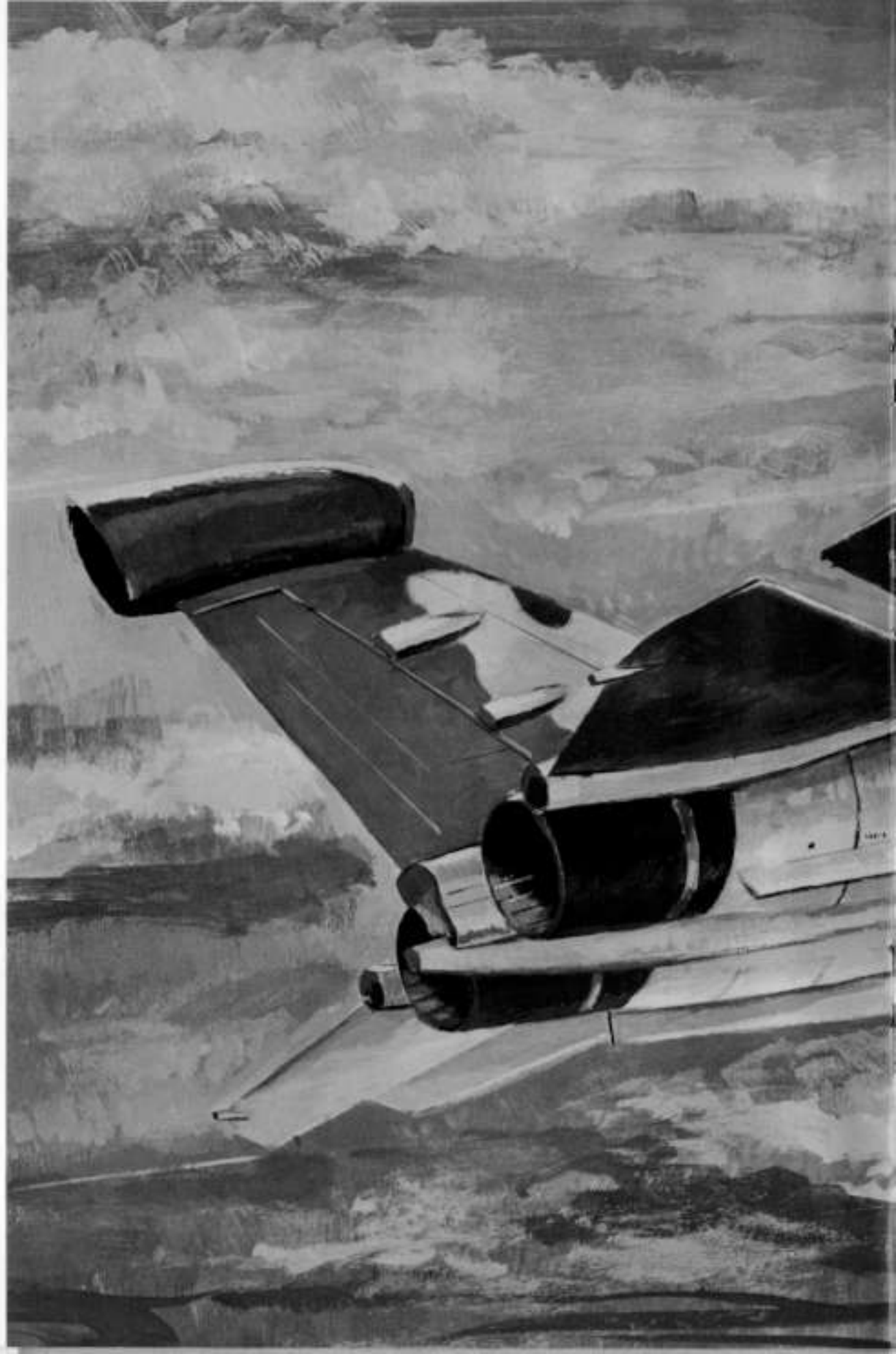


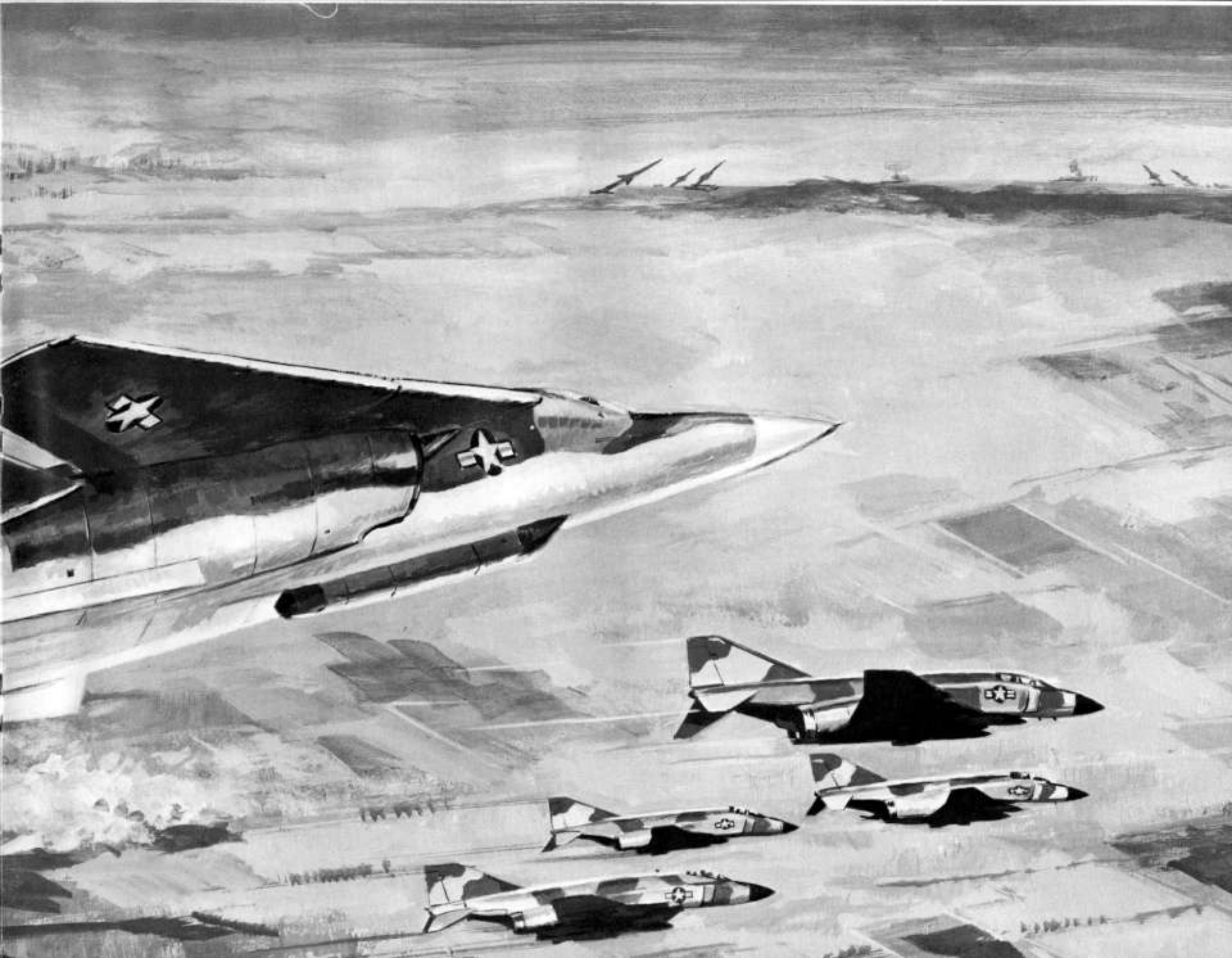


PENETRATION / ESCORT

Deep penetration of enemy airspace poses the greatest threat to our strike forces primarily as a result of their longer period of exposure to enemy air-defense systems over heavily defended areas. The EF-111A Tactical Jamming System reduces this threat to survivability by penetrating along with, or ahead of the strike force, and jamming the radars of the enemy defense network.

The computer-managed jamming resources of the powerful TJS combined with the ECM of the strike aircraft, EW drones, and chaff serve to neutralize the target-zone defenses, affording a high degree of protection to our strike force until it has completed its mission. Then, the EF-111A accompanies the strike force as it departs enemy airspace, providing an electronic shield all the way back to base.





CLOSE AIR SUPPORT

In this role, the EF-111A flies along with our strike aircraft to the vicinity of the target area, where it commences jamming of the enemy's ground-based radars to screen our attacking aircraft. The EF-111A's higher-power and more sophisticated jamming systems supplement the self-protection ECM equipment carried by our attack aircraft, greatly enhancing their ability to avoid the enemy's anti-aircraft artillery and surface-to-air missile (SAM) systems.

Enemy radar operators are harrassed or confused by the EF-111A's electronic wizardry. They are unable to bring anti-aircraft weapons into play until it is too late. Our strike aircraft make run after run on enemy tank and transport columns, fuel depots, and fortified positions — clearing the way for our advancing ground forces.





THE AIRPLANE

The addition of the ALQ-99 Jamming Subsystem to the F-111A has done little to change the operational characteristics of the basic airframe. The minor modifications required do not degrade its high performance. The F-111A can range more than 2,000 miles. It can loiter for standoff jamming longer than any other ECM aircraft. The variable-sweep-wing aircraft can penetrate deep into enemy territory (which no other USAF ECM aircraft could do), cruise at roughly 480 knots, and fly at up to more than twice the speed of sound when necessary. Its speed and maneuverability are totally compatible with those of the strike aircraft it must protect.

THE SYSTEM

The ALQ-99 is the most effective multi-purpose electronic countermeasures system in the sky.

It is being further improved for:

- Greater speed to pick up and identify enemy transmissions.
- More automation and less reliance on human involvement and manual operations.
- Extended computer functions to provide more sophisticated and flexible jamming modulation.
- More independent jamming signals in a wider range of frequencies.

THE RESULT

This multi-purpose system is readily programmable to counter future threats with high powered smart jammers in a high performance aircraft. With its unmatched ECM power and versatility, the USAF/Grumman EF-111A TJS increases strike force effectiveness and survival in sophisticated electronic warfare environments – today's and tomorrow's.



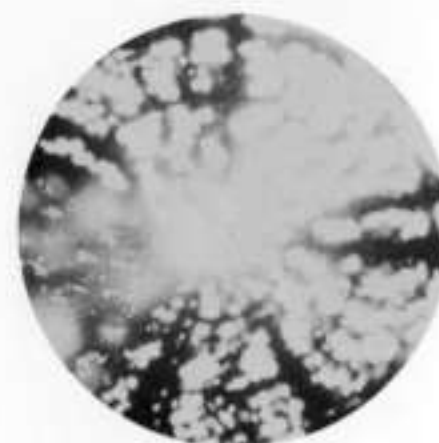


PROGRAM ACHIEVEMENTS

- 1 **EARLY VEHICLE FLIGHT TEST** — A series of 21 flight tests proved that the aircraft's aerodynamic and engine-inlet performance are unaffected by the installation of the EF-111A weapons bay radome.
- 2 **ANTENNA PATTERN TESTS** — A salvaged F-111A aircraft has been mounted on a pedestal at the Rome Air Development Center for full-scale antenna pattern measurements. This will verify the performance of the EF-111A antenna configuration.
- 3 **EMC TESTS** — Full scale tests in DOD's shielded anechoic chamber (the world's largest) located at Grumman-Calverton verified the engineering estimates of electromagnetic compatibility of the EF-111A TJS components.
- 4 **TJS COCKPIT MOCKUP** — In a joint effort USAF and Grumman used this EF-111A mockup to optimize the cockpit for effective operation by a two man crew, one pilot and one electronic warfare officer.
- 5 **NUCLEAR HARDNESS MEASUREMENTS** — A salvaged F-111A airframe was mounted on a wood frame at Kirtland AFB and was used to assess EF-111A vulnerability to nuclear (electromagnetic pulse) effects. The same facility was used for evaluation of new Grumman antenna designs.
- 6 **SYSTEMS INTEGRATION TEST STATION** — The complete EF-111A electronic warfare system was assembled in this Grumman facility. All EF-111A avionics components (hardware and software) are being integrated and checked out prior to installation in the aircraft.
- 7 **ELECTRONIC WARFARE TEST RANGE** — At Grumman Flight Development Center, Calverton, N. Y., seven search/track radars, five RF emitters, and a height finder radar provide on-site test capability throughout the EF-111A development.
- 8 **WEAPONS BAY RADOME TESTS** — Electrical characteristics of this 17 foot radome were measured at the Grumman - Bethpage radar range.
- 9 **REDCAP** — The Calpan Corporation facility at Buffalo, N. Y. will be used to test EF-111A/ALO-99 response to simulated threat emitters. Actual ALO-99 hardware and software will operate against realistic RF simulation of an air defense network including trained radar operators and command/control personnel.



EF-111A
FOR ADDED STRIKE
FORCE SURVIVABILITY





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