



# TPS-70

Modernization



## AN/TPS-70 at a Glance

### Description:

Long-range, tactical air surveillance radar designed for both early warning and target acquisition.

**Frequency:** S-band

**Range:** Up to 250 miles.

**Mobility:** Designed to be highly transportable, the radar can be airlifted by cargo aircraft and rapidly set up or torn down in the field.

**Functionality:** Offers 3D surveillance, providing range, azimuth, and elevation information on detected targets; equipped with advanced signal processing for enhanced target detection and clutter suppression.

### Modernization imperative:

The evolving threat landscape necessitates that the AN/TPS-70 not only maintain its current capabilities in order to ensure Agile Combat Employment, but also adapt to address emerging peer and near-peer adversaries.

# Modernizing a front-line sensor

TSS Solutions has reimagined the TPS-70 to meet today's challenges

**T**SS Solutions is the recognized leader in supporting and modernizing radar systems around the world. This guide details TSS Solutions' modernization of the **AN/TPS-70 Radar System**, resulting in substantial improvements in performance, reliability, maintainability, and operability.

The TPS-70 was developed as a successor to earlier systems like the AN/TPS-43 and in conjunction with the AN/TPS-75, the current front-line sensor of the USAF. It incorporated more advanced technology and improvements based on operational experience. Over the years, the TPS-70 has seen service with various branches of the U.S. military and has been exported to several allied countries. Its durability and reliability have made it a mainstay for tactical air surveillance operational theaters, from desert operations to tropical deployments. It has been integral, for example, as the front-line radar for counter-narcotics operations in Latin America.

**Modernization:** To ensure the radar's continued relevancy, updates and upgrades have been introduced over the years, addressing everything from component obsolescence to enhancements in its signal processing capabilities.

**The additional enhancements offered by TSS Solutions include** a refreshed Signal Processor, Frequency Generator, RF Driver, and Array Signal Amplifiers, making the TPS-70 far more capable and maintainable than ever. With our upgrades, the system is fully modernized for today's threat scenarios.

The TPS-70 has proven itself in various scenarios and conditions worldwide, underscoring its adaptability and the importance of having robust, mobile air surveillance capabilities in dynamic operational environments. For about half the cost of a Programmed Depot Maintenance cycle, the TPS-70 will be ready for deployment and employment for the next 30 years and beyond.



### TSS Solutions has delivered TPS-70 Modernization upgrades to:

Canadian Armed Forces

Acquisition Management and Integration Center (AMIC)

Colombian Air Force (FAC)

## TPS-70 MODERNIZATION

### REPLACED/UPGRADED

- Display
- Processor
- Transmitter
- Rotary Joint
- Frequency Generator
- RF Driver
- IFF/SIF

### ADDITIONS

- UPX-44 secondary radar
- Processor Tracker Server
- Array Signal Amplifier

## DISPLAYS

Legacy displays will be replaced with our new touchscreen LCDs to deliver significant usability enhancements, including software that provides superior tactical interfaces for operators. All tracked and untracked videos are output from the video processor as ASTERIX Ethernet signals in CAT-240. The additional capabilities added to the AN/TPS-70 signal and post-processing functions include ADS-B data incorporated and available at the output and on the display. Legacy maintenance display functions can optionally be integrated into and handled by the TSS PPI display. A 3D Tracker is also an available option.



Upgraded PPI Display

## PROCESSOR

The new processor includes IF receiver, signal/data processing, Radar control, self-test/monitoring and Frequency Generator functions while retaining the functionality of the legacy processor. Improved system characteristics include:

### Pulse Correlator

Adaptable pulse compression technique ensures optimal S/N while maintaining sufficient range resolution

### Dual Beam Processing or Vertical Clutter Canceler (VCC)

Improved clutter mitigation and interference suppression

### Median Filter

Interference suppression and improved detection performance

### Doppler processing

Improved target detection and false target processing over legacy MTI processing

### CFAR/clutter maps

High-resolution clutter maps and CFAR processing for each Doppler filter

### Slow Clutter Canceler (SCC)

Enhanced Anomalous Propagation performance

### Plot Extractor

Improved positional accuracy (in both range and azimuth) and false target mitigation

## TRANSMITTER

The TSS transmitter incorporates the new TSS solid-state RF driver. The solid-state modulator has scalable output modulator power. This allows the modulator to decrease the brute force pulsing that was required in the past, adding the benefits of redundancy and longevity as a result of reduced pulse intensity. The output can be adjusted as a portion of the total in increments, which allows even degraded systems to continue to operate.

### Extended Service Life

The new Klystrons deliver improved performance and system longevity using only 2.8 MW power output

### Redundancy

Solid-state modulators allow full power operation with one modulator failure and reduced power operation with two failed modulators

## RF DRIVER

The new TSS solid-state RF driver reduces the cost of future repairs and delivers several performance benefits. The increased phase stability of the output pulses allows better MTI performance on the receiver side. The TSS RF driver is part of the TSS transmitter but is also available in a FFF chassis to upgrade OEM RF drivers in the AN/TPS-43, 70, 72, and 75 Radars. This design eliminates DMS issues.

## ROTARY JOINT

The proprietary design of the TSS Solutions high-power Rotary Joint utilizes Carbon Seals, Fiber Bundle Technology and a fully pressurized housing for longer service life and better system

### Enhanced Service Life

We pressurize the entire Rotary Joint, including the slip ring package, significantly extending service life by keeping out contaminants and moisture.

### Enhanced S-Band Channel

As part of the TPS-70 upgrade, we have implemented a more robust high-power S-Band channel. Our design exceeds the power requirement by a significant margin.

### Mode S and Mode 5 Support

An added L-band circuit allows for the seamless integration of Mode S and Mode 5 to your system.

### Fiber Bundle Technology

The fiber brush slip ring is a bundle of conductive micro-fibers that are arranged to maintain electrical contact with a rotating metal ring. As the ring spins, the fibers move and flex, allowing for continuous conductivity without the

friction and wear that traditional slip ring contacts experience. Fiber brush slip rings also have several other advantages over conventional slip ring contacts, including: low contact force per fiber, low noise, and low electrical and contact wear rates. The fiber brush slip rings do not require lubrication and produce virtually no wear debris.

### Fiber Optic Channel

We have added a fiber optic channel to the Rotary Joint to support future high-bandwidth technology advancements and decrease susceptibility to electromagnetic interference and data loss.

### Slip Ring Power Capacity

We have doubled the capacity of the power slip ring to support future technology advancements. This works in conjunction with the Fiber Optic Channel, allowing for upgrades and reducing Rotary Joint obsolescence risk.

## IFF

The TSS Solutions IFF Mode 5 and Mode S upgrade incorporates AN/UPX-44A, which is the first IFF interrogator to achieve the more stringent test requirements of the new "B" level AIMS certification. The first AN/UPX-44A IFF production system has been delivered to JASDF U.S. The AN/UPX-44A is DoD AIMS program office certified. The TSS IFF upgrade requires the capabilities of the TSS rotary joint and makes antenna system modifications to support Mode 5 and Mode S.

## FREQUENCY GENERATOR

We offer two solid-state Frequency Generator upgrade options to enhance reliability and stability:

### OEM Upgrade

Our design incorporates 16 synthesized protected oscillators, which output the full suite of TPS frequencies typically selected by processor settings. This design eliminates frequency drooping at the upper and lower frequency bands that was inherent in the older technology.

### Processor Upgrade

The new processor includes IF receiver, signal/data processing, Radar control, self-test/monitoring, and Frequency Generator functions while improving the functionality of the legacy processor.

## ARRAY SIGNAL AMPLIFIER

TSS Solutions' array signal amplifiers (ASA's) increase antenna gain while lowering the noise floor.

### Solid-State Receiver Protection

TSS ASA's incorporate Solid-State Receiver Protection, which helps compensate for degrading gas tube protectors in the waveguide system and provides a test signal input. This gives the Radar extensive control of the video processor tracker, working on a higher signal amplitude above the inherent noise floor.

### Enhanced Processing

The design works in conjunction with modern high-performance TSS IF receivers, allowing additional processing after detection and throughput to the new TSS video processor.



## IF RECEIVERS

The TSS Solutions IF receivers upgrade the legacy receivers, eliminating DMS issues. Enhanced gain and noise floor performance adds stability under temperature variations and is a form-fit-function replacement for the older units.

## PROCESSOR TRACKER

Our video tracker software adds multiple video post-processing enhancements to the display system, allowing the operator to deal with clutter areas in the environment of the sited Radar.

## DATA DELIVERY

All tracked and untracked videos are output from the video processor as ASTERIX Ethernet signals in CAT-240 and CAT-48. Data delivery via Ethernet. The upgrade delivers full Radar remote capability (except for power up/down) for transmitter, processor, display, and IF.



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**TSS Solutions** has been integral to national defense, homeland security, and counter-drug and counter-terrorism initiatives for more than 30 years.

**We have established a reputation as a proven and capable business partner,** integrating our engineering, manufacturing, service, and operational expertise to benefit the customers we serve.

**We are at the cutting edge of Radar and SATCOM modernization technology,** sharing and leveraging our expertise with customers across the globe.

**Contact  
Our Team**

Tel: 321.242.0000  
Radar.sales@TSSsolutions.com  
SATCOM.sales@TSSsolutions.com  
Depot.repair@TSSsolutions.com

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**World Headquarters**  
7800 Technology Drive  
Melbourne, FL 32904

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