TSS SOLUTIONS

TPS-75

Modernization

AN/TPS-75 at a Glance

Description: The USAF's premier tactical, transportable 3D Radar system, designed to detect, identify, and track airborne targets.

Range: Capable of detecting aircraft at ranges of up to 240 nautical miles.

Mobility: Fully transportable by air, land, or sea, with rapid setup and teardown capabilities.

Reliability: Designed for minimal maintenance and high operational availability, even in harsh environments.

Modernization imperative: The evolving threat landscape necessitates that the AN/TPS-75 not only maintain its current capabilities in order to ensure Agile Combat Employment, but also adapt to address emerging peer and near-peer adversaries.

Evolution meets innovation

How TSS Solutions matches emerging tech to modern defense needs

The AN/TPS-75 is the primary and only transportable Aerospace Control and Warning (AC&W) Radar used by the United States Air Force. For decades, the "75" has been the cornerstone of tactical air operations, serving both domestic and overseas missions.

While the TPS-75 has a proven track record of excellence in safeguarding our skies, the rapid pace of technological advancement – and the changing dynamics of aerial threats – make modernization essential to ensuring the system's optimal performance in an evolving threat landscape.

TSS Solutions meets these challenges head-on, leveraging our extensive experience working with the TPS-75 and the industry-leading expertise of our engineering team to deliver a system that is more capable, maintainable, and robust than ever.

In 2018, the Project Management Office (PMO) at Hill AFB began exploring obsolescence mitigation for the TPS-75. The PMO was granted an Unfunded Request for $4.2M in order to complete a DMSMS mitigation effort comprising several "refreshed" technology insertion subsystems within the 75. The PMO contracted with TSS Solutions to produce and install these subsystems.

Modernizing the TPS-75 ensures:

- Enhanced detection ranges and accuracy.
- Improved resistance to jamming and electronic warfare tactics.
- Seamless integration with contemporary defense systems and networks.
- Extended service life and reduced maintenance burdens.

With the addition of the new Signal Processor, IF Receiver, Frequency Generator, RF Driver, and Array Signal Amplifiers, the TSS Solutions system is fully modernized for today's threat scenarios.

By investing in the TPS-75 Modernization, the USAF ensures that this pivotal Radar system remains a robust, adaptive, and sustainable asset, ready to tackle the challenges of today and tomorrow.

TPS-75 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-75 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-75 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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RADAR
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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.

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