



## Land Based Tactical Radar – The Business Case for Upgrading vs. Replacement

TSS Solutions has been an integral part of national defense, homeland security and counter-drug and counter-terrorism initiatives for almost 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 upgrade and reengineering technology sharing and leveraging our expertise with customers across the globe.

- Leveraging the capabilities of your radar system: No OEM support required
- Proven enhancements replace obsolete software & hardware to modernize system
- Significant reduction in operating and maintenance costs quickly recaptures the cost of upgrade, adding dramatic improvements in capability

Radar systems are often kept in service well beyond their originally intended service life. TSS Solutions' proven Radar Upgrade Solution provides an extremely cost competitive alternative to provide Service Life Extension Programs that extend life and significantly reduce ongoing operating and maintenance costs while eliminating Diminished Manufacturing Supply (DMS) availability issues with the OEM. TSS Solutions has unrivaled experience operating, repairing, reengineering and upgrading military and civil radar systems globally.

TSS Solutions' Radar Upgrade Solution provides field-proven hardware and software upgrade technologies that bring your existing radar systems up to current new radar capabilities.

The entire Solution has been designed to meet and exceed current and known future operational requirements while providing a cost-effective alternative to purchasing new, over the entire extended life cycle.

### Upgrade or Replace?

Land-based tactical radar systems, specifically the TPS-43, TPS-63, TPS-70, and TPS-75, among others, originally manufactured by Westinghouse/Northrop Grumman, Lockheed, Raytheon, SAAB, Thales, and many others, have been in service as early as 1968 after completing development in 1963. These systems are aging; some are more than 50 years old. These aging systems can impact reliability, safety, effectiveness and cause other losses. Whatever the age of a radar system, reliable performance and proper maintenance are now more critical than ever.

Maintaining 30-50-year-old radar systems can be challenging, especially when the OEM no longer provides support or parts and DMS has eroded the ability to source parts from third parties. Stakeholders must decide when it's time to upgrade or replace aging radar. What drives this decision? It may be safety, rising maintenance costs, functionality, part DMS or any combination of these.



Fig. 3: TPS-43

A conflict exists between the older radar technologies that are in place and radar capabilities that are evolving at a much faster rate. Most land-based tactical radar systems were designed with a 20-year life span. However, budget constraints and the cost of new systems have forced today's military and civil authorities to maintain their operation for 30 – 50 years and beyond. A typical new tactical radar system can cost anywhere from \$18 million to \$40 million plus, as well as the cost of parts, spares, training, and maintenance.

The central question is how to modernize an older system and ensure reliability. Each agency must evaluate these factors:

- Spare parts availability/DMS
- Maintenance costs
- The degree of equipment wear
- Urgency or timeline (new OEM radar systems, in addition to being expensive, can have a very long lead time for delivery—in many cases a few years.)
- Criticality of the need
- Funding – capital expense for a new radar versus operational expense for an upgraded system.

In most cases, there is no need to rip and replace, and decommission all the equipment currently deployed. An upgrade solution is the least disruptive to your mission and the most time- and cost-effective. The advantages of upgrading include:

- DMS issues eliminated with ongoing support and parts availability
- Asset optimization, thus extending equipment lifespan and increasing its capabilities
- Minimal downtime, which lessens the effect on the mission
- Improved budgeting process by scheduling the upgrade over time and out of operating budget
- Significantly improved capabilities for a much lower price than purchasing new
- Substantial reduction in ongoing maintenance costs
- Minimal retraining costs compared to new systems

The most significant benefit of upgrading rather than replacing your tactical radar system is the exceptional cost savings in terms of equipment, time, labor and training. As a bonus, TSS Solutions leverages the expertise of its people with manufacturer experience to deliver tested and proven solutions to give customers peace of mind in planning and executing radar upgrade projects.

TSS Solutions typically upgrades the following components:

- Transmitter (much higher reliability, MTBCF up to 10X over OEM)
- Display System (digital, flat screen with internal signal processing capabilities and significantly greater MTBF)
- Frequency Generator

- Rotary Joint (Mode 5 & S ready)
- Heat Exchanger
- Antenna Components such as the LNA
- IFF
- L-band transmitter/receiver (dual-band radar)
- Processor Tracker System
- RF Driver
- Processor Hardware & Software
- IF Receiver

TSS Solutions delivers fully upgraded radar systems that meet or exceed available new radar systems for about 10%-20% of the cost to purchase a new system. Upgrading eliminates the DMS issues associated with the lack of OEM manufacturer support for these installed and proven radar systems. All of this equates to lower sustainment costs, less frequent failures, and modular enhancements that can deliver up to a 90% reduction in operation and sustainment costs over the extended life of the system.

The following chart is a matrix of upgrades by a system with specific enhancements and features associated with the upgrade:

Modification	TPS-43E	TPS-70/72	TPS75	TPS-63	Benefit
<b>Antenna:</b>					
Receiver upgrade	X	X	X	X	Lower cost logistics support, More sensitive reception
LNA upgrade	X	X	X		Lower cost logistics support, More sensitive reception
Rotary Joint Replacement	X	X	X	X	Lower cost logistics support, enhanced capabilities, more channels, Greater Height accuracy
Antenna Leg Upgrades	X	X	X		Adds the TPS-78 type leg assembly which enhances mobility and reduces both setup and tear down time
<b>Transmitter:</b>					
High Precision Modulator with Redundant capability and MUCH improved efficiency	X	X	X		Lower cost logistics support, More stable output, greater frequency diversity and lower power usage.
New style Klystron with longer life and Improved output pulse (> 3MW peak @ 7 uS pulse)	X	X	X		Documented lifetimes of > 10 years in TPS Radars
High precision Modulator with new design Klystron (>200 KW peak @ 51 uS Pulse )				X	Replaces Crossfield amplifier and TWT Driver
Solid State 1.6 KW RF Driver	X	X	X		Replaces older, failure prone TWT driver. (Only available with Transmitter upgrade.)
Digital Selftest and Status display	X	X	X		Improved monitoring and troubleshooting capability
<b>Situation / PPI Display:</b>					
New, solid state , computer driven Display. Full Temp. range, completely US designed and manufactured. Available with Analog I/O and Serial Comm. for older Radars, with Ethernet I/O, Asterix for newer designs. The 'A' version can be used to allow an older Radar, (without a Post Processor,) to provide and Display Fused Track information with an Asterix output.	X	X	X	X	Lower cost logistics support, upgraded capability, Reduced Training requirements. Extend the life and useful data output for older Radars. Provides support for ADS-B signal reception and display.
<b>General Upgrades:</b>					
Frequency Generator upgrade/replacement with A-B-C-D frequency group support.	X	X	X	X	More stable transmissions, Greater frequency diversity, Lower cost logistics support
Heat Exchanger	X	X	X	X	Complete Upgrade adds Multi Frequency and Voltage AC input, Greater operating Temperature range
EMI Susceptibility Improvements	X	X	X	X	Added capability upgrades the shelter resistance to Electro Magnetic Interference
Air-compressor/dryer Upgrade	X	X	X	X	Lower cost logistics support, Improved Transmission stability
IFF upgrade	X	X	X		Addition of Mode S and Mode 5 capabilities
Dual Band Transmitter	X	?	?		Better reception in heavy clutter areas, More sensitive reception. (Generally requires TPS-43 style Antenna and Processor upgrade.)
<b>Complete Upgrade:</b>					
<b>Antenna Upgrades:</b>					
<b>Transmitter Upgrades:</b>					
Processor Upgrade. (Only available with Complete Radar upgrade.) Includes IF Receiver upgrade, Dual redundant processors and digitizers, Built In Test Equipment, ('BITE') rack including multi channel digital O'scope, GPS and Weather station.	X	X	X	X	Adds much higher accuracy and faster calculations to Radar data processing. Adds better environmental variables to height and range calculations. Allows ADS-B inputs to be correlated to Radar targets to provide an 'accuracy correction map' to the Radar inputs. This then allows 'unco-operative' targets to be positioned much more accurately.
<b>General Upgrades:</b>					
Power System Upgrades. (Only available with Complete Radar upgrade.)					Allows entire Radar to operate on 120/208 'Y', 47 to 440 Hz AC power.

### Precise Customer Needs

Each radar upgrade is tailored to meet the exact operational requirements. Based on a modular component by component approach, we fully replace critical components of the legacy radar, transforming it into a modern, efficient and cost-effective solid-state system. The net result includes improved Probability of Detection and range/azimuth accuracy and resolution that far exceed the original OEM specifications, and that rivals capabilities of the most modern radar systems available.

## Custom Tailored Upgrades

The adaptability of the TSS Solutions upgrade means we can configure it to meet the requirements of most radars available today, regardless of manufacturer. The modular open system architecture design and the use of standard 19" equipment racks combined with COTS (Commercial Off The Shelf) hardware, TSS Solutions completely redesigns existing OEM electronics and enclosures and eliminates issues of software no longer supported.

## Installation

TSS Solutions tailors each upgrade to meet customer's requirements to ensure the operational capabilities of the upgraded radar is achieved.

## Enhanced Monitoring & Control

Upon completion of the upgrade and depending on the upgraded system, radar technicians can monitor or control the radar onsite or remotely.

## Lower Ongoing Maintenance Costs & Greater MTBF

TSS Solutions' upgrades can offer up to a 90% reduction in the operation and sustainment costs, and in the replacement of Line Replaceable Units in the upgraded radar. Increased solid-state modern components mean higher reliability and lower maintenance costs.

## Preventive Maintenance Services

TSS Solutions offers long-term service contracts or On-Demand Preventative Maintenance Checks & Services (PMCS). Our field-proven technicians would visit your site on a scheduled basis to perform needed critical performance and safety inspections ensuring your upgraded radar continues operating at its peak performance.

For more information, please visit: [www.TSSolutions.com](http://www.TSSolutions.com) or call one of our Solutions Specialists at **877.724.TSSS (8777)**