TLS[®] TRANSPONDER LANDING SYSTEM

ADVANCED NAVIGATION & POSITIONING CORPORATION





The Transponder Landing System (TLS) is a technology breakthrough with unprecedented capability to improve airport safety and accessibility

INTRODUCING TLS

ANPC is the world's only supplier of the Transponder Landing System (TLS).

The TLS is a precision landing system for use at airports where terrain or land constraints make Instrument Landing System (ILS) installation infeasible or cost-prohibitive. ANPC's patented transponder tracking technology provides highprecision aircraft positioning in real-time for area surveillance and all-weather precision instrument approach to airports and landing areas worldwide.

Based on transponder multilateration, the TLS is a performance-based system that complies with ICAO standards and recommended practices (SARPs) for ILS, secondary surveillance and precision approach radar (PAR).

The TLS tracks aircraft using their Mode 3/A and Mode S transponders to provide practically any airport a precision ILS approach.

TLS APPLICATIONS

Precision approach for terrain-challenged airports with:

- Short runways that cannot comply with ILS localizer siting standards
- Runways ending at a body of water
- Terrain upslope under the approach path that would prevent an ILS glide slope transmission from passing flight inspection

Single system solution to deploying radar and ILS capability with lower initial costs and lower operating costs than purchasing those systems separately

Terminal area surveillance for ATC to monitor the approach and provide radar control services

Tactical ATC solution for expeditionary forces

GCA capability without the need for a separate, expensive precision approach radar (PAR)

Approach and landing on oil rigs

Quickly deployable for disaster recovery and emergency services



TLS PRODUCT OVERVIEW

The TLS is a precision approach guidance and surveillance system designed to provide all-weather airfield access and situational awareness for improved airport accessibility and safety. The TLS provides the capabilities of an ILS where traditional ILS equipment cannot be sited due to rugged terrain or limited property. In a transportable configuration, the Transportable TLS (TTLS) is a highly mobile, rugged, and quickly deployable ATC solution for expeditionary forces during contingency operations. Both TLS and TTLS provide approach guidance and terminal area surveillance.

The pilot training and airborne equipment required for TLS approaches are identical to that for traditional ILS or precision approach radar. Any aircraft equipped with an ILS localizer and glide slope receiver, Horizontal Situation Indicator (HSI) or Course Deviation Indicator (CDI), and a Mode 3/A or Mode S compatible transponder can fly a TLS approach. The guidance is presented to the pilot just as it would be for an ILS approach.

For Ground Controlled Approach (GCA) operations, the TLS provides controllers with secondary radar display of area aircraft traffic. For landing multiple aircraft using precision approach radar consoles, up to four individual PAR consoles can be used for controllers to work independently guiding up to four aircraft simultaneously.



[FEATURES + BENEFITS]

Precision approach guidance

- Provides a stabilized ILS glide path, the single most important safety improvement at terrain challenged landing areas
- Provides precision ILS Localizer to align the aircraft with the runway centerline for every landing

PAR operator console for military operations

An offset approach can be configured where required by PANS-OPS analysis

Marker tones are provided over the localizer audio so that no remote markers need to be installed

Allows achieving the proper precision tailored threshold width even on short runways or runways with obstacles where traditional ILS localizer equipment would be installed

Uses standard IFR avionics - no aircraft modifications required

Configurable approach paths, linear, curved and segmented

Multilateration update rate provides superior aircraft positioning accuracy to a traditional radar

Inherently high signal strength operates in a GPS denied environment



[HOW THE TLS WORKS]

The TLS uses ground-based sensors to determine the aircraft's three dimensional position from signals transmitted by the aircraft's transponder. Localizer and glide slope signals are generated based on the aircraft position relative to ILS approach and are transmitted to the aircraft to guide the pilot to the runway threshold. The pilot can then fly a precision approach to the minimum decision heights, just like flying an ILS.



The minimum decision height for a given approach procedure is determined using PANS-OPS and will also be affected by the planned runway markings and approach lighting.

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The Transportable TLS (TTLS) can be deployed and made operational in less than 6 hours with 3 trained personnel. The system's placement on the airfield is flexible and is easily customized to mission requirements. Components can be placed entirely on one side of or astride a runway or helipad. Once deployed and calibrated, the TTLS is ready to support flight operations.

TTLS can be uninstalled and packed for shipment in less than 2 hours by 3 personnel.





[TRANSPORTABLE SETUP AND OPERATION]









[TLS COMPONENTS]

• Dual rack computers

• Management console

• Guidance transmitter

• Backup batteries

(CAL / BIT) Assembly

Interrogation antennas

ILS guidance antennas

Antenna support structures

Controller Console

• Interrogation transmitter

equipment:

The TLS is comprised of the following

Base Station Electronics Rack including:

• Uninterruptable Power Supply (UPS)

• A secondary electronics rack is optional

Elevation Sensor Assembly (ESA)

Azimuth Sensor Assembly (ASA)

Alternate time of arrival (ATA) antenna

Calibration and Built-in-Test Equipment

Ethernet network fiber-optic cabling

[KEY PRODUCT FEATURES]

Industry leading multipath mitigation technology for use at terrain challenged airports

Virtual approach corridor technology always allows localizer alignment with the runway

ILS guidance and up to four simultaneous PAR displays

PAR display provides three dimensional aircraft position information in graphical azimuth and elevation format

Area surveillance using transponder multilateration

Supports offset and segmented approach profiles

Remote Status and Control Unit

No new aircraft equipment (uses existing aircraft IFF transponder, ILS receiver)

Uses standard ILS flight procedures for straight-in approaches

Standard marker tones on localizer audio at programmable ranges from threshold make it unnecessary to install physical marker beacons

Fully ICAO compliant

TLS precision instrument approach design using PANS OPS or ILS TERPS criteria



TRANSPORTABLE-TRAILER-BASED

- independent trailer
- Environmentally controlled operator and maintenance shelter provided on trailer
- Quickly deployable antenna structures



- Rugged transit cases for all components
- · Base station electronics housed in NATO shelter (pictured) or trailer
- Rugged cables and connectors

[DEPLOYMENT CONFIGURATION OPTIONS]

• All equipment, power, and infrastructure self-contained on vehicle-



NON TRANSPORTABLE

- Environmentally controlled Base Station shelter
- Maintenance technician workstation and tool storage



[TRANSPORTABLE-RUGGEDIZED]



[TACTICAL-HMWWV-BASED]

- Environmentally controlled operator/ maintenance shelter
- Infrastructure and power on self-contained trailer
- Transportable by single C-130 or equivalent, Chinook helicopter, or railcar

SURVEILLANCE TECHNICAL CHARACTERISTICS					
TLS provides multilateration surveillance					
Aircraft capacity		Max 100			
Probability of detection		>99%			
False targets		<0.1%			
Service volume	Range	60 NM			
Accuracy	100 meter footprint	2 deg azimuth			
Altitude		Mode C			

PRECISION APPROACH RADAR TECHNICAL CHARACTERISTICS					
TLS provides a PAR display					
Aircraft capacity		Max 4 on independent consoles			
Probability of detection		>99.99%			
False targets		<1X10 ⁻⁷			
Service volume	Range	60 NM			
	Azimuth	70 deg centered on runway centerline			
Accuracy	Elevation	0.02 deg			
	Azimuth	o.o2 deg			
Frequency		1030 MHz Interrogation / 1090 MHz Transponder reply			

ILS TECHNICAL CHARACTERISTICS						
TLS provides ILS localizer and glide slope						
System		Localizer	Glide Slope			
Coverage	Course	25 NM/±10°	12 NM/±8° azimuth			
	Clearance	17 NM/±35°				
Course width		2° to 6° adjustable				
Glide angle		2° to 4° adjustable				
Transmitter frequency	Range	108 to 112 MHz	328 to 336 MHz			
Nominal сѕв power output	Course	15 W ±4%	3 W ±4%			
	Clearance	7.5 W ±4%	0.3 W ±4%			
Monitoring						
RF-level measurement stability		±2.0%	±2.00%			
DDM measurement accuracy		±0.002 DDM	±0.003 DDM			
SDM measurement accuracy		±1.0%	±2.0%			
Environmental conditions						
Indoor		Outdoor				
Ambient temperature	-10°C to 55°C	Ambient temperature	-50°C to +70°C			
Relative humidity	Max 90%	Relative humidity	Max 100%			
		Wind	Operational up to 160 km/h			
			Survivability 200 km/h			
		lce	Up to 1.25 cm			
			Heated antenna option			
Power supply						
Input voltage		85 -265 vac, 47 to 63 Hz				
Power consumption		3 kW				
Battery voltage		24 V				
Safety						
Mean time between outage		9,000 hours	9,000 hours			
Integrity		1 X 10 ⁻⁸	1 X 10 ⁻⁸			
Continuity of service		2.5 X 10 ^{.7}	2.5 X 10 ^{.7}			
Availability		99.999%	99.999%			

ANPC