

# MPN-25(V) (MACS)

## Outlook

- Mobile Approach Control System (MACS) portion of ATCALs program canceled due to cost, schedule, and technical issues
- GCA-2000/MPN-25 family of air traffic control and surveillance radar has seen moderate success since the start of operation in the late 1990s
- No production of the MPN-25 is expected over the next 10 years

## Orientation

**Description.** The GCA-2000 is a family of precision approach radars. The MPN-25 is part of the Mobile Approach Control System (MACS). MACS is an all-weather, day/night system that combines terminal approach and terminal surveillance systems with a precision landing capability.

**Status.** In production. Ongoing logistics support.

**Application.** Air traffic/precision landing control.

**Price Range.** The cost of a unit ranges from \$3.2 to \$5 million, depending on installation and ancillary needs.

### Sponsor

U.S. Air Force  
Electronic Systems Center  
ESC/GA  
Joint Program Office  
Hanscom AFB, MA 01731-5000  
USA  
Tel: + 1 (617) 377-5191  
Web site: <http://www.hanscom.af.mil>

## Contractors

### Prime

**ITT Electronic Systems, Radar Systems - Gilfillan**

<http://www.ittgil.com>, 7821 Orion Ave, Van Nuys, CA 91409 United States,  
Tel: + 1 (818) 988-2600, Fax: + 1 (818) 901-2435, Prime

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**MPN-25(V) (MACS)****Technical Data**

	<u>Metric</u>	<u>U.S.</u>
<b>Characteristics</b>		
<u>ASR</u>		
Range	48 km	30 mi
Azimuth	360 deg	
Update Rate	Every 5 sec @60 rpm	
Altitude Coverage	3,050 m	10,000 ft
<u>SSR</u>		
Range	96.5 - 402.25 km	60 - 250 nm
Azimuth	360 deg	
Update Rate	4.8 sec @12.5 rpm	
<u>PAR</u>		
Range: Normal/(Rain Mode)	32 km (24 km )	20 nm (15 nm)
Altitude Minimum	100 ft above Ground Intercept Point	
Coverage	30 deg approach azimuth -1 deg to +7 deg elevation	
Update Rate	1 per sec	
Runway Coverage	Up to 6 touchdown points, change in 1 min	
PAR Targets	50 plots/scan in azimuth 22 plots/scan in elevation	
ASR & SSR Targets	250 plots/scan	
Radar Cross-Section	1 m <sup>2</sup> to 1,000 <sup>2</sup>	
Fluctuation Model	Swerling I	
Velocity		
PAR	± 40 to ± 250 kt	
ASR	± 40 to ± 400 kt	
Weather Processing	3 levels, entire radar coverage area	
MTBF	2,212 hr	
MTTR	0.25 hr	
Scheduled Maintenance	Once per quarter, 2 hr	
Transport	1 C-130	
Truck		
Set-up (forward deployment)	< 90 min	
Features	Stabilized for windy conditions FAA certified ICAO compliant (OAP 8200.1 ICAO Annex 10)	

**Design Features.** The MPN-25(V) is a mobile version of the GCA-2000, a compact airport surveillance radar (ASR) and precision approach radar (PAR) system designed to control the immediate area around an airport or airbase. The system also includes a secondary surveillance radar (SSR). It replaces non-standard, large-footprint mobile radar approach systems with a common, easily transportable system for use by both the Air National Guard and active-duty Air Force.

In addition to the features of the PAR-2000, the system offers area surveillance coverage for an extra margin of safety in the airport traffic area. It is the latest-generation all-weather surveillance and landing system, designed to assist lower-density airports in meeting increased air traffic safety demands.

This solid-state system is fully ICAO (International Civil Aviation Organization) compliant, and provides remotely controlled multi-runway coverage and height-finding capabilities in both commercial and military applications. Based on active array architecture using gallium arsenide (GaAs) transmit/receive modules, the MACS offers simplified operation and improved reliability over previous systems.

The digital air surveillance radar and tactical shelter make up one part of the system. The Sensor Subsystem equipment group includes the PAR, ASR, and SSR sensors with the associated signal and data processing to extract target and obstruction data from the PAR and weather data from the ASR.

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The Operations Subsystem is housed in separate tactical shelters and provides three air traffic controller positions for the display of extracted data and control of selected functions. There is one supervisor position, and there are six ground-to-air radios and radio antennas. A communications switch, voice recorder, and additional ancillary equipment round out this part of the system. The two systems can be deployed together or separately in fixed, transportable, and mobile versions to satisfy all operational scenarios ranging from the dynamic battlefield to a more benign fixed-base installation.

The system comes equipped with two 15-kW generators for each system, or the equipment can operate from standard three-phase power. A fiber-optic interface includes a fiber-optic Ethernet repeater in the sensor and operations shelters, and 6,000 feet (max) of multimode fiber-optic cable.

The MPN-25(V) is an active aperture radar with the transmitter distributed in the antenna. Key to the design are the Gilfillan GaAs transmit/receive modules. Nearly 200 modules make up the azimuth and elevation antennas. They are air cooled for low maintenance. The GCA-2000 is considered the first, and is currently the only, active aperture landing system in worldwide operation.

The system incorporates redundancies for fail-soft protection and makes maximum use of commercial off-the-shelf (COTS) hardware. Through extensive built-in-test capabilities, fault isolation is provided to the replaceable unit level for ease of maintenance, eliminating the need for external test equipment.

Among the benefits of this system are that it can be maintained and monitored from remote locations, parts

can be ordered on-line from anywhere in the world, and customers worldwide have access to manuals.

**Operational Characteristics.** The MPN-25(V) was selected to meet the needs of the Air Combat Command and the Air National Guard for accurate area surveillance and precision approach landing capability at bases throughout the world.

It is transportable via a single C-130 and can be set up in less than 90 minutes to support rapid-deployment USAF ATC mission requirements. The tactical operations shelter meets controller mission requirements using versatile, multimode digital color displays and a full communications suite. The system provides airport surveillance up to 30 nautical miles and a precision approach range of 20 nautical miles. The secondary surveillance radar provides extended-range coverage out to 250 miles depending on the interrogator selected. This field-proven system operates accurately even in severe environments, such as heavy winds.

The MACS was designed with ease of operation and system maintenance in mind. It increases controller awareness by providing all the needed information directly on the digital color displays. Training on this user-friendly system requires two weeks. User-friendly computer displays ease the transition from the older system currently in use. System maintenance training can also be accomplished in two weeks, as the system detects and isolates its own faults, and repair involves replacing boards instead of components.

The system's compact design and its ability to be deployed rapidly in extreme physical environments enable the Air Combat Command and the Air National Guard to support the homeland defense missions and to provide air traffic control services anywhere in the world on short notice.

## Variants/Upgrades

The **GCA-2000** was the original version of the system. The **MPN-25(V)** is a more transportable, militarized version. This highly mobile configuration can be used for quick deployment in times of crisis and includes

requirements established by the USAF and Air National Guard. Site-specific modifications tailor it to theater commander needs.

## Program Review

In August 1996, ITT Gilfillan introduced two new air traffic control radars, the GCA-2000 and the Terminal Airport Surveillance Radar (TASR). State-of-the-art, solid-state technology was used to develop a system with improved accuracy, higher reliability, and lower cost than the older systems common in the field. The new system was fully ICAO compliant.

### *First PAR-2000 Commissioned*

On June 15, 1998, the Brazilian Air Force formally commissioned the first PAR-2000 landing system, making it the first advanced-technology active aperture radar system in daily operation anywhere in the world. Specially equipped Brazilian Air Force flight-check

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aircraft validated the system's performance to international flight safety criteria, and the PAR-2000 exceeded all key accuracy requirements. The rugged design of this system supports a variety of demanding environmental conditions, including the hot and moist conditions of Brazil.

In October 1999, Gilfillan was awarded a contract for several GCA-2000 systems for the Turkish Air Force. This was the first international sale of this version of the solid-state tactical landing system.

In October 2000, the company announced that it had been awarded a contract by Airport Operations and Aviation Industries, Istanbul, Turkey, to provide the surveillance radar and landing system for the newly built Sabiha Gokcen Airport, near Istanbul, by 2001. The GCA-2000 would enable both the control of civil traffic and the support of military aircraft using the airport. The GCA-2000 was chosen because of its flexibility, while providing support commonality with radars already delivered to Turkey.

In April 2000, the MPN-25(V) tactical precision approach landing system passed formal flight check by the Federal Aviation Administration at Dover Air Force

Base, Delaware. This supported the acceptance of two additional systems.

In October 2000, the Air Force awarded a contract for the provision of MACS. The contract could potentially be worth more than \$80 million if all options are exercised. The first three systems were to be delivered in 18 months.

### *Multi-Option U.S. Contract*

In January 2002, the USAF awarded ITT a contract for production of the Mobile Approach Control System Precision Approach Radar (MACS PAR). The contract is worth in excess of \$40 million should all options be exercised. The first MACS PAR system was to be delivered in 18 months.

In April 2003, Poland ordered three transportable GCA-2000 systems.

The FY03 budget request included funds for installing two radars and shelters in FY03.

In 2006, the Swedish Defense Materiel Administration awarded a contract worth \$5 million (SEK33.6 million) to ITT Corp for one transportable GCA-2000 ATC radar system. The radar was delivered in 2007.

## Funding

According to FY09 U.S. Defense Budget documents, PE#0305114F, Air Traffic Control/Approach/Landing System (ATCALS), includes funding for the Mobile Approach Control System (MACS); however, the program was canceled in May 2007 due to cost, schedule, and technical issues.

## Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
ITT Gilfillan	13.3	Jan 2002 – FFP contract for five PAR units applicable to the MACS. Completed Dec 2004.
ITT Gilfillan	9.0	Aug 2004 – FFP contract for two mobile Ground Control Approach systems, with spares and support; FMS to Poland. Completed Sep 2005. (F19628-04-C-0004)

## Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Aug	1996	GCA-2000 and TASR introduced
1Q	FY00	MACS acquisition strategy approved
2Q	FY00	MACS contract award, RFP for ASR and operations
4Q	FY00	MACS RFP for PAR
1Q	FY01	ASR/OPS contract award
2Q	FY02	PAR contract award
Jun	FY03	MACS contract award

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
2Q	FY03	ASR/OPS operational testing
3Q	FY03	PAR operational testing
2Q	FY06	MACS ASR, PAR development, Milestone C completed
3Q	FY07	MACS Initial Operational Capability

## Worldwide Distribution/Inventories

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The GCA-2000 is in use by the **United Kingdom, Brazil, Bulgaria, Canada, Turkey, Poland**, and the **Romanian Air Force**. **Sweden** will take delivery of a GCA-2000 in 2007. The **United States** plans to procure 18 to 26 units. Further FMS could be limited due to competition from other systems.

## Forecast Rationale

The MPN-25 and GCA-2000 have been produced for countries worldwide. The systems provide advanced-technology air traffic control solutions for both military and civilian agencies. The U.S. Department of Defense had included the radars in its ATCALs program, but cost overruns and technology concerns prompted the Air Force to cancel the program.

That decision, along with the delivery of the last radar to be ordered to Sweden, appears to have been the final

blow to the MPN-25/GCA-2000 program. No new radar systems are expected to be produced, and there appears to be little interest in upgrade or maintenance programs. If the radars continue to meet the needs of the nations that use them, an interest in upgrades could surface. However, countries may instead decide to purchase entirely new systems to take advantage of improved reliability and more advanced technology. Barring further developments, this report will be archived in 2009.

## Ten-Year Outlook

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No production of the MPN-25 is expected over the next ten years. Barring any further developments, this report will be archived in 2009.

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