

SPE-3000



System Lifespan

The Watchman is a 60 nmi, S-Band Air Traffic Control radar that was designed some 25 years ago. Though an excellent system, it is in need of a technical refresh to enable superior performance for the next 15 years, or more.

Common Deficiencies

When extending service life and desired performance, operators need to consider the near-term and long-term system deficiencies inherent with aging technology. Specifically, the following challenges are common:

- Increasing cost of ownership associated with obsolescence – for example, there are severe maintenance and support issues with both the radar and its data extractor (Plessex) created by obsolete components and long lead times for spare circuit boards.
- Increasing cost of maintenance associated with performance deficiencies – aligning the system to achieve specified performance is a difficult process and adds to maintenance costs.
- Decreased system availability – due to component failures and downtimes for maintenance, the system has less operating and performance time.
- Rising system failure rate – once again, it is difficult to align the system to achieve desired or specified performance, and failures can be frequent.
- Inability of the radar to adequately detect targets in clutter – this situation is primarily a result of unacceptable system stability.

Upgrade Goals

A desirable upgrade concept must address the common system deficiencies while delivering comparable radar detection and performance. Additionally, it should offer a service life extension program that provides for continued low cost operation for at least the next 15 years.

The SPE-3000

Sensis Corporation has developed a commercial-off-the-shelf (COTS) S-Band Receiver/Exciter and Signal Processor Replacement that accomplishes desired upgrade goals with a lower purchase cost than other replacement alternatives. In a single cabinet, the SPE-3000 replaces:

- S-Band Receiver
- S-Band Up-Converter
- Waveform Generation
- Signal Processor
- Stable Local Oscillator (STALO)
- The Correlation and Communications Processor (Plessex)

By utilizing COTS computing platforms and operating systems, the SPE-3000 ensures long-term maintenance support and low cost of ownership today and in the future.



Benefits

15 years (minimum) of system supportability and elimination of parts obsolescence through the use of an all COTS architecture

Significant reduction in operating costs

MTBCF of >15,000 hours

Elimination of the need for a separate SR and SSR reinforcement and communication system

Signal to clutter improvement of 5-7db (site-specific)

Adaptable output data formats and protocols

Adaptable to various SSR, MSSR, Mode-S and super Mode-S transponders

Compliance with EUROCONTROL data communication standards

Fielded product with EUROCONTROL SASS-C exceeds pre-upgrade performance

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SPE-3000 System Features

- S-band Receiver and Exciter – Replacement of the existing exciter with a digital frequency synthesizer for the generation of all required Local Oscillators (LO) and the generation of the drive signal for the system transmitter
- Transmit waveform generation
- Replacement of the existing receiver to include a digitally controlled (8 bit) sensitivity time control (STC)
- 14 bit A/D conversion
- Digital pulse compressor
- New system timing and mode controls
- Primary search radar (SR) digitization/target extraction and the introduction of a new enhanced doppler based signal processor
- Enhanced detection through the implementation of an all cell clutter map
- A new, sophisticated constant false alarm rate (CFAR) processor
- Correlation of existing digital MSSR/SSR data with the SR data
- Same-scan processing to reinforce primary and secondary radar reports
- Correlation and track processing of primary and secondary radar reports to further filter radar false reports attributed to clutter and slow-moving vehicles
- Programmable I/O processor that can accommodate the Asterix data format and standard UAP or other user defined formats
- Time stamping of the MSSR/SSR/SR and the data reported to the operations center using dual redundant GPS antennas and receivers
- Support of the addition of a redundant signal processing channel from the digital baseband capture point through to the communication lines to the operations center

SPE-3000 Specifications

Characteristic	Performance
Operating frequency band	2.75 to 3.05 GHz (S-band)
Waveforms	
Long range	20 µsec, 5.0 MHz LFM
Short range	0.4 µsec simple pulse
Number of available operating frequencies	Unlimited
Min/Max detectable aircraft velocity settings (typical)	10 kts / 1500 kts
PD on a 1.0 m2 target, Pfa of 10-6 for the coverage volume of the radar	90%
Sector blanking capability	
Sector blanking increment	Selectable on ACP boundary
Minimum sector blanking increment	1 beam width
Number of available blanking sectors	Unlimited
Maximum target load over one 360° scan	1200
Range accuracy	12 m (standard deviation)
Azimuth accuracy	Better than 0.3° (standard deviation)
GPS time accuracy	+/- 10 msec
Target report delay	< 0.8 sec

While every effort is made to ensure data accuracy, please note that data may be subject to change.

Sensis Global Headquarters 85 Collamer Crossings East Syracuse, NY 13057 USA
 Phone: +1 315 445 0550 Fax: +1 315 446 2209 www.sensis.com email: info@sensis.com