

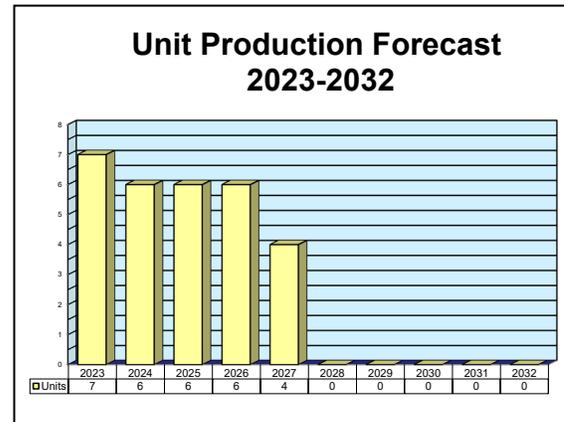
ARCHIVED REPORT

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Sky Guardian

Outlook

- Sky Guardian's inclusion as a component of a major EW suite helped drive production in previous years
- Forecast period may see limited production of newer iterations of Sky Guardian outside this application, but for the most part the system has been overtaken by newer variants
- Ongoing support for previous installations



Orientation

Description. Radar warning receiver (RWR) for helicopters and fixed-wing aircraft.

Sponsor

Ministry of Defence
 Procurement Executive
 Main Bldg, Whitehall
 London SW1A 2HB
 United Kingdom

Licensee. No production licenses have been granted.

Status. In service.

Application. Fixed-wing aircraft and helicopters or as a stand-alone RWR. In addition, it can be integrated into a multifunction system such as the Helicopter Integrated Defensive Aids Suite (HIDAS).

Price Range. The unit price of a Sky Guardian system varies according to capability level and installation. For the purposes of this report, however, a cost of \$170,000 has been derived based on the estimated costs of comparable systems.

Contractors

Prime

BAE Systems plc	http://www.baesystems.com , 6 Carlton Gardens, Stirling Sq, London, United Kingdom, Tel: + 44 1252 373232, Fax: + 44 1252 383991, Prime
Leonardo SpA	http://www.leonardo.com , Piazza Monte Grappa, 4, Rome, Italy, Tel: + 39 06 324 731, Fax: + 39 06 320 8621, Co-producer

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; rich.pettibone@forecast1.com

Sky Guardian

Technical Data

Sky Guardian 200

Frequency coverage	E-J bands (2-20 GHz); C, D, K bands optional
Azimuth coverage	360°
Response time	<1 sec
Emitter library	400+ emitters with 2,500 modes
Power consumption	400 W
D/F accuracy	Better than 10°

Sky Guardian 2000

Frequency coverage	E-J bands (2-20 GHz); C, D, K bands optional
Azimuth coverage	360°
Response time	<1 sec
Emitter library	4,000+ expandable
Power consumption	150 W
D/F accuracy	Better than 10°

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Sky Guardian 200		
Weight	17 kg	37.4 lb
Antenna diameter	52mm	2 in
Sky Guardian 2000		
Weight	13 kg	31 lb
Antenna diameter	52mm	2 in

Design Features

Sky Guardian 200. Sky Guardian 200 detects pulse, continuous wave (CW), and interrupted CW radars. It incorporates an electronically erasable programmable read-only memory (EEPROM) threat library and is capable of initiating defensive measures, including onboard and podded jammers and chaff dispensers. Four broadband antennas provide directional finding accuracy to less than 10°. Additional antennas can be provided for more precise direction finding.

The basic system uses broadband crystal video receivers and three computers: one measures signal parameters, the second sorts signals and provides initial analysis, and the third arranges signals into individual emitter tracks and compares them with the threat library. Total multiprocessor memory is 500 K (RAM, PROM, and EEPROM) operating at 5 MOPS with 100 percent growth capacity. Sky Guardian can be reprogrammed with new threat libraries in less than 60 seconds, with the operation taking place on the flight line.

The main display is a high-brightness 3-inch cathode ray tube (CRT) compatible with night vision equipment. It shows up to 15 emitters with identity, status, and pseudo-PPI bearing. There is an alternative tabular format showing parameters such as the frequency band and pulse repetition frequency. The CRT display image is persistent to show fleeting contacts. The system output can also be passed to the pilot's head-up

display (HUD) – as in the Sea Harrier FA.2 – or to a secondary display in the pilot's cockpit – as in the Buccaneer S.2B. In addition to the visual display, the pilot is provided with a continuous audio alarm at pulse repetition frequencies and a synthetic alarm tone.

Sky Guardian 2000. Sky Guardian 2000 can either operate as a stand-alone RWR or be integrated with jammers, laser warning receivers, and decoy dispensers to provide a complete, integrated defensive aids system. Key features of the Sky Guardian 2000 include emitter identification with selectable display formats, built-in recording for post-flight analysis, a low-band targeting option, and a higher-frequency extension option to meet future threats. It intercepts pulse, pulse-Doppler, and CW emissions over a wide dynamic range.

Sky Guardian 2000's configuration includes a control unit, a display unit, an Air Transport Racking (ATR) receiver/processor, and four antennas. Radars are detected by a sensitive four-port crystal video receiver unit and measured by dedicated semi-custom VLSI (very large-scale integration) circuitry that continuously samples the environment. The data samples are passed to a 32-bit processor for signal sorting and preliminary analysis. Additional processors then arrange the sorted signals into individual tracks that are identified by comparison with a sectionalized 4,000-emitter-mode (expandable) threat library.

Variants/Upgrades

Sky Guardian 300. Sky Guardian 300 is an electronic support measures (ESM) derivative of the basic Sky Guardian 200, intended to equip helicopters, transport aircraft, maritime patrol aircraft, and high-performance combat aircraft. Covering the C to J (0.5 to 18 GHz) and K (20 to 40 GHz) bands, it detects radar emissions and uses a reprogrammable 400-emitter-mode threat library to identify them. The signals are placed in priority order so that operators can select only those emitters relevant to their responsibilities. The system features a 64-bit multiprocessor that runs Ada software. Horn antennas and instantaneous frequency measurement (IFM) are added to improve the bearing accuracy obtained from the system. The displays are programmable for a variety of graphical and tabular formats. With a datalink, Sky Guardian 300 can be integrated with other sensors to provide a coordinated picture of the environment.

Sky Guardian 350. This variant of Sky Guardian entered the market in 1998 and includes a spinning dish antenna.

Sky Guardian 2500. This variant is an electronic support version of the Sky Guardian 2000. It has been installed on Malaysian Navy Super Lynx 300 helicopters.

Merlin Composer. The Merlin Composer is a software and hardware package that takes chosen radar

data from a master EW library and formats it for use in passive and active EW systems. Existing mission libraries, information from a national EW database, and new intelligence gathered by ESM can be accessed. Information is displayed to the user, who can then select what is needed for a specific mission and add display, electronic countermeasures, and system priority data. This forms the operational library that is transferred to a program loading unit, disk, or cassette ready for transfer to the onboard RWR.

HIDAS. The Helicopter Integrated Defensive Aids Suite is an amalgamation of the AAR-57(V) common missile warning system, the Sky Guardian 2000 receiver, the Vicon 78 Series 455 chaff and infrared flare decoy dispensing system, and the Series 1223 laser warning receiver. Sky Guardian exercises overall system control. An active frequency jammer and the AAQ-24(V) Directed Infrared Countermeasures (DIRCM) system may become available as optional capabilities. In 1998, HIDAS was selected for WAH-64 Apache helicopters entering production with the British Army.

SIIDAS. BAE Systems' Sensor Independent Integrated Defense Aids Suite appears to be an upgraded version of HIDAS. It was selected by Australia as the electronic warfare self-protection (EWSP) suite for its S-70A-9 Black Hawk and CH-47D Chinook helicopter fleets.



HIDAS-Equipped AW159 Lynx Wildcat

Source: British Royal Navy

Sky Guardian

Program Review

Background. In 1997, GEC-Marconi Defence Systems won a \$124 million contract to supply the HIDAS for the British Army WAH-64D Apache helicopter. HIDAS includes the Sky Guardian 2000 and several other subsystems; a missile warning system and countermeasures dispenser system were also included in the contract.

Work toward fulfilling another British requirement (for an improved defensive aids suite to equip RAF EH101 Merlin HC helicopters) began in February 1998 when GKN Westland Helicopters was awarded a \$46.5 million contract. Along with Sky Guardian 2000, the contract specified a Raytheon Optical Systems laser detecting system and the Tracor ALE-47 countermeasures dispensing system.

As scheduled, the Sky Guardian 2000 was tested with HIDAS on board a WAH-64 Apache helicopter in July 2000. Reportedly, the test proved successful and demonstrated that the system could improve the helicopter crew's situational awareness through its choice of automatic, semi-automatic, or manual modes. Along with the Sky Guardian 2000, HIDAS consists of DAS controller/management software, the 1223 laser warning receiver, and the W Vinten Vicon 78 Series 455 countermeasures dispensing system.

Through late 2003 and all of 2004, several orders were placed for the HIDAS/Apache application, which no doubt added equally to the production of Sky Guardian systems. In September 2003, Greece decided to procure 12 HIDAS units under a \$579.6 million contract.

In June 2004, the U.S. ordered 16 HIDAS units for Kuwait. In August 2004, the U.K. awarded a contract for two HIDAS units for a British Army training center. All this activity resulted in the need for 30 new Sky Guardian systems over the next several years.

In August 2005, the U.S. government accepted the first HIDAS-equipped Apache from Boeing for the Kuwait Air Force.

In late 2005, AgustaWestland chose the HIDAS, with the Sky Guardian as its RWR component, for the British Army and U.K. Royal Navy's Future Lynx (now Lynx Wildcat) helicopter program. It was anticipated that 45 to 55 Lynx helicopters equipped with this system would be produced for the Army and approximately 30 for the Navy.

By late 2009, Boeing had completed delivery of 16 AH-64Ds for the Kuwait Air Force and 12 AH-64Ds (dubbed AH-64DHAs) for the Greek Army.

As part of an upgrade for 28 of the Royal Air Force's Puma helicopter fleet, in November 2009 the RAF selected the Defensive Aids Suite (DAS) produced by SELEX Galileo. The upgrade, based on HIDAS technology, included a separate DAS controller and multifunction color display that warns crews of threats, increases situational awareness, and has the ability to record mission data for post-flight analysis.

In June 2010, SELEX Galileo was awarded a contract to supply its DAS for mounting on the Royal Air Force's Chinook Mk 2 and Mk 3 helicopters to meet an Urgent Operational Requirement.

In November 2010, SELEX Galileo demonstrated a new RWR, designated Seer, on a Hawk aircraft of the Royal Malaysian Air Force. SELEX Galileo was expected to receive a contract to retrofit the Seer RWR aboard the RMAF's 14 single-seat Hawk 208 light attack aircraft and possibly its six Hawk 108 two-seat trainers. The Seer would replace the company's Sky Guardian 200 RWR on the RMAF Hawks.

SELEX Galileo announced in July 2012 that it had entered into a joint venture with Kuwait's Al Safwa Security and Defence Systems Co. The two companies would provide defense services to the Kuwait armed forces, initially in the field of electronic warfare.

In July 2013, members of the Kuwait Air Force completed a six-month training course at the Electronic Warfare Operational Support (EWOS) facility of Selex ES. The course transferred the essential knowledge and skills that would allow the Kuwait Air Force to get the most out of the HIDAS electronic warfare equipment installed on the country's Apache helicopters.

South Korea ordered eight AW159 Lynx Wildcat helicopters in January 2013. They are likely equipped with HIDAS.

In March 2013, Leonardo was awarded a contract valued at over EUR100 million to supply the Philippine Navy with two AW159 helicopters. Deliveries began in 2018.

In April 2018, Leonardo announced it had been contracted by the U.K. Ministry of Defence to provide a defensive aids suite for the British Army's new fleet of Apache AH-64E helicopters. All 50 helicopters being procured by the MoD will be capable of operating with the integrated defensive aids suite.

Funding

Development of the original Sky Guardian was funded under U.K. MoD contracts. Sky Guardian commercial developments were funded by GEC-Marconi Defence Systems (now BAE Systems), with the adoption of the related upgrades by the British armed forces funded by the MoD. Specific figures have not been provided.

Worldwide Distribution/Inventories

The following list of users is neither complete nor comprehensive; because of confidentiality requirements, many users of the system have never been identified.

Austria	Sky Guardian 200 on J-35 Draken
Greece	Sky Guardian 2000 on Apache HIDAS systems
India	Sky Guardian on Sea Harrier Mk 51 and possibly Jaguar
Indonesia	Sky Guardian 300 on CN-235 MPA
Kuwait	Sky Guardian on Apache HIDAS systems
Malaysia	Sky Guardian 2500 on Super Lynx 300 helicopters
Oman	Sky Guardian 200 on Hawk 100/200
Philippines	Sky Guardian-equipped HIDAS possibly on 2 AW159 helicopters
Spain	Sky Guardian 200 on Matador
United Arab Emirates	Sky Guardian on Hawk 100
United Kingdom	Royal Air Force: Sky Guardian on Jaguar, VC-10, and Chinook HC-2; Royal Navy: Sky Guardian 200 on Sea Harrier FRS.1 and FA.2; British Army: Sky Guardian 200 and Sky Guardian 2000 on Lynx Mk 7 and Apache HIDAS systems

Forecast Rationale

The Sky Guardian 2000 radar warning receiver has been a key part of the Helicopter Integrated Defensive Aids Suite. HIDAS is installed on the U.K.'s AW159 Lynx Wildcat helicopters. The forecast period will see ongoing support for previous installations, and may see limited production of newer iterations of Sky Guardian outside this application, but for the most part the system has been overtaken by newer variants.

Meanwhile, HIDAS prime contractor Leonardo has entered into a joint venture with Kuwait's Al Safwa Security and Defence Systems Co. The two companies will provide defense services to the Kuwait armed forces, initially in the field of electronic warfare.

In April 2018, Leonardo announced it had been contracted by the U.K. MoD to provide a defensive aids suite for the British Army's new fleet of 50 Apache AH-64E helicopters.

Sky Guardian

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program		High Confidence				Good Confidence			Speculative			Total
	Thru 2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
BAE Systems plc												
Sky Guardian <> Armed Services												
<small>Note: Worldwide</small>												
	1,592	4	4	4	3	2	0	0	0	0	0	17
Sky Guardian 2000 <> United Kingdom <> Armed Services <> AH-64 D WAH-64												
	264	3	2	2	3	2	0	0	0	0	0	12
Subtotal	1,856	7	6	6	6	4	0	0	0	0	0	29
Total	1,856	7	6	6	6	4	0	0	0	0	0	29