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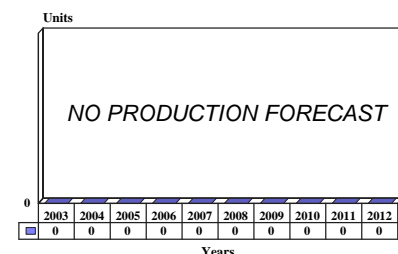
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Skyranger - Archived 11/2004

Outlook

- Pakistan most likely to choose the FIAR Gribo radar over the Super Skyranger for its new FC-1/ Super-7 multirole fighters
- No new contract information about the Skyranger has been detected
- Barring any new information, this report will be archived in the near future

10 Year Unit Production Forecast
2003 - 2012



Orientation

Description. I-band airborne ranging radar.

Sponsor

BAE Systems

Crewe Toll

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Edinburgh EH5 2XS

United Kingdom

Tel: +44 131 332 2411

Fax: +44 131 343 3011

Web site: www.baesystems.com

Contractors

China National Electronics Import & Export Corp

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Hangzhou

Zhejiang

China 310003

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Web site: <http://www.catichz.com>

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(Type 226 Skyranger production)

BAE Systems

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Tel: +44 131 332 2411

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Web site: www.baesystems.com

(Prior Skyranger [Type 225] production, Super Skyranger/Blue Hawk development)

Licensee. With the end of production of the Skyranger radar in the U.K., the previous licensee, China National Electronics Import & Export Corporation, became the main contractor for this program.

Status. In service.

Total Produced. Approximately 404 Skyranger radars were produced through 2002.

Application. Skyranger is designed to provide high-accuracy range and range-rate information for both gun and missile armaments for fighter aircraft.

Price Range. The price of the Skyranger is indeterminable from published information.

Technical Data

	<u>Metric</u>	<u>U.S.</u>
Characteristics		
Range in gun mode	max 5 km; min 300 m	max 3.1 mi; min 984 ft
Range in missile mode	max 15 km; min 150 m	max 9.3 mi; min 492 ft
Relative velocity bracket	500 m/sec to +1000 m/sec	1,640 ft/sec to +3,280 ft/sec
Frequency range	I-band, 5% pulse-to-pulse agility	
Power supplies	27 V DC less than 50 W; 115 V 400 Hz phase less than 400 VA	
Dimensions		
Antenna	360 x 675 mm	14 in x 26.5 in
Transmitter/receiver	460 x 412 x 160 mm	18 in x 16 x 6 in
Signal processor/power supply	390 x 315 x 150 mm	15 in x 12.5 in x 5.9 in
Weight		
Antenna	4 kg	8.8 lb
Transmitter/receiver	25 kg	55 lb
Signal processor/power supply	8 kg	17.5 lb

Design Features. Skyranger is a simple, compact and lightweight ranging radar. It consists of three line-replaceable units – an antenna, transmitter/ receiver, and signal processor/power supply. It is said to be highly maintainable at flight-line level. The radar has separate gun and missile modes and incorporates 5 percent frequency agility. Key features include pulse-to-pulse random frequency agility, dual-width beam, diagnostic built-in test equipment, and a fault memory system.

Reconfigurability is one of the attractions of the Skyranger radar. It stems from the modular design, which has been established at printed circuit-card level.

This allows the cards to be packaged into custom-built housings and mounted in any available space.

Operational Characteristics. Operating in the I-band (8 to 10 GHz), Skyranger accepts discrete digital commands from a control panel mounted in the cockpit, and provides output data in the form of an ARINC 429 digital serial link to a head-up display and weapon-aiming computer system. Mean time between failures is 200 hours. Beamwidth varies according to which mode is used: 18 degrees in the gun mode, or 6 degrees in the missile mode.

Variants/Upgrades

U.K. and Chinese nomenclatures. In Chinese service, U.K.-produced Skyranger radars are designated Type 225, while the Chinese-produced version is Type 226. The differences between the two groups, if any, are not known.

Super Skyranger. Developed by GEC-Marconi Avionics, Super Skyranger is a look-down, shoot-down multimode radar designed to replace Skyranger in new airborne applications such as the F-7MG follow-on, and as a low-cost retrofit to F-7 and MiG-21 aircraft. Its planar array antenna scans +/-30 degrees in azimuth, and an ARINC 429 serial link enables the radar to provide target range, range rate, and line-of-sight data to the aircraft's avionics system. Linkage to a MIL-STD-

1553 databus is optional. Test flight of the new radar aboard a modified F-7M Airguard occurred mid-1996.

Blue Hawk. Unveiled in August 1992, Blue Hawk is an I-band, multirole, pulse Doppler radar system developed by GEC-Marconi Avionics. It exploits the experience gained with the Blue Vixen development program and combines it with the Skyranger project. It consists of a planar array antenna, high-power transmitter, two-channel microwave receiver/exciter, and digital processor. It weighs a total of 107 kilograms (236 lb). Medium-range air-to-air missile control is accomplished by an optional continuous-wave illuminator. Other features include MIL-STD-1553B databus compatibility, monopulse operation, ECCM, extensive built-in test equipment, and a predicted MTBF of 250 hours.

Program Review

Background. In 1980, the China National Aero-Technology Import and Export Corporation (CATIC) ordered a range of avionics equipment and support services for the F-7M Airguard from Marconi Avionics. The value of the order was placed at US\$85 million (GBP55 million) and included the Skyranger radar. It was not until 1984, however, that the aircraft was unveiled. The F-7M is a modified version of an early model MiG-21, a small number of which were acquired from the Soviet Union before the political break. Chinese production of the enhanced MiG-21, designated Xian J-7, continued intermittently. The F-7M Airguard is the export designation of the most capable of the Chinese MiG-21 variants and is equipped with Western-designed avionics.

In 1986, GEC Avionics (now BAE Systems) won a repeat order for avionics and support worth about US\$45 million; a similar repeat order followed in 1989.

U.K. production of the Skyranger radar concluded with a final production batch ordered in January 1989. Following the Tiananmen Square massacre in July 1989, the British government embargoed deliveries of the Skyranger. In mid-September 1989, this embargo was lifted in order to permit the delivery of F-7M Airguard aircraft to Pakistan. Production for this order concluded in 1991.

In mid-1992, the Skyranger was designated Type 225 in Chinese service. Shortly afterward, a similar radar was revealed, designated Type 226. This is the Chinese-produced version of Skyranger, which was believed to remain in production after the cessation of U.K. Skyranger manufacture at the end of 1991.

GEC-Marconi Avionics (now BAE Systems) announced in August 1992 the development of the new Blue Hawk radar, a light- and medium-weight pulse Doppler radar capable of being installed in very restricted spaces. Effectively, Blue Hawk is a Skyranger replacement that offers much greater performance and substantially improved cost-effectiveness.

During mid-1993, the Russian Phazotron Design Bureau announced that it had entered the MiG-21 upgrade

industry with the Kopyo radar. This draws on experience gained with the design of the Zhuk radar used in the MiG-29 to produce a small yet capable radar suitable for installation in the nose cone of a MiG-21. This radar and associated avionics upgrade were selected for the Indian MiG-21 upgrade. Finally, FIAR entered this market with versions of the Grifo optimized for the MiG-21 and MiG-23.

The Chinese purchased a significant number of Zhuk and Kopyo radars in 1996. The Zhuk systems appear to have been intended for the J-8-II naval fighter to make up for shortfalls in the delivery of the original Israeli-designed radar. The Kopyo radars were purchased in smaller numbers for an unspecified aircraft.

The passing of the Pressler law by the US Congress in October 1989 allowed the Bush Administration to block the supply of 71 F-16 fighters to the Pakistani Air Force. This measure forced Pakistan to look to other suppliers for new fighters to replace its aging Chinese-built F-6 fighters. Pakistan chose to work with China on purchasing a Super Skyranger equipped variant of China's F-7 fighter. An MoU was signed in February 1998 for the design and joint development leading to manufacture of a multirole fighter aircraft for the Pakistan Air Force, the F-7MG. In the following year, 1999, a contract was signed for the detailed design and development of the F-7MG aircraft during the Pakistani Prime Minister's second visit to China.

There was a delay in the completion of Pakistan's order due to a prolonged decision on a new radar system. The main candidates included BAE Systems' Super Skyranger (SSR) pulse-Doppler version of the earlier Marconi Skyranger range-only radar, or a development of the Alenia/FIAR Grifo 7. The Grifo had the advantage of being produced under license at Pakistan's Kamra aircraft factory, but BAE Systems' proposal included an air data computer, head-up display, and hands-on throttle and stick system, plus a Vinten video recording system. However, in the end it appears that the Grifo system will be fitted on the Pakistani fighters.

Funding

GEC-Marconi Avionics (now BAE Systems) funded the development of Skyranger as a company private venture. Specific figures have not been identified.

Recent Contracts

No recent contracts have been identified.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1980	Skyranger ordered by China
Feb	1986	Repeat order for Skyranger from China
	1988	Blue Hawk development started
Feb	1989	Repeat order for Skyranger from China
Jul	1989	Skyranger deliveries stopped by embargo
Sep	1989	Delivery embargo lifted
Late	1991	Skyranger production ceased in UK
	1992	Production believed to have begun in China
Aug	1992	Blue Hawk unveiled
	1993	Blue Hawk flight trials
Late	1996	Super Skyranger and Blue Hawk offered in competition for FC-1
	2002	Super Skyranger loses bid for Pakistan's F-7MG fighter aircraft radar system

Worldwide Distribution

Skyranger has been produced for customers of the Chinese F-7 varieties of MiG-21 aircraft, particularly the F-7M Airguard and F-7P (formerly called Skybolt). Although the F-7s were primarily intended for export, China may also have acquired Skyranger radars for its air force.

Forecast Rationale

Recent reports indicate that the Super Skyranger has lost its bid to be fitted to Pakistan's new FC-1/ Super-7 multirole fighters. While the first prototype of the FC-1 will be equipped with the Israeli EL/M-2032 fire control radar system, the production variant for Pakistan will most likely be carrying the FIAR Grifo S-7 radar.

Although it was reported that BAE Systems was supplying the Super Skyranger to China for their F-7MG fighters, this report has not yet been confirmed. Apart from the possible sale of the Skyranger to Pakistan, there has been very little press on this system. Barring any new information this report will be archived in the near future.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Designation	Application	<u>High Confidence Level</u>					<u>Good Confidence Level</u>			<u>Speculative</u>			Total 03-12
		Thru 02	03	04	05	06	07	08	09	10	11	12	
SKYRANGER	Prior Prod'n:	404	0	0	0	0	0	0	0	0	0	0	0