

# ARCHIVED REPORT

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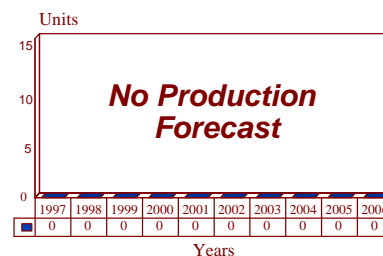
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## Skyguard - Archived 8/97

### Outlook

- Out of production
- Existing contracts have expired with no new orders to replace them
- Much of the market is being absorbed by shoulder-fired missiles

10 Year Unit Production Forecast  
1997 - 2006



### Orientation

**Description.** Search, acquisition and target designation anti-aircraft fire control radar system for airborne targets flying at medium, low and very low altitudes.

#### Sponsor

Contraves-Italiana SpA  
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**Licensee.** No production licenses have been granted.

**Status.** In service.

**Total Produced.** A total of 468 systems were built through 1994.

**Application.** Skyguard is deployed in a self-contained unit mounted on a two-wheeled trailer.

**Price Range.** The estimated cost of a Skyguard radar system is approximately US\$3.5 to US\$4 million.

### Technical Data

#### Characteristics

	Metric	US
Operating frequency:	I/J/K-band	
Scan rate:	60 rpm	
Azimuth accuracy:	0.5 deg	
Maximum range:	17-25 km	10.5-15.5 mi

**Design Features.** Skyguard is the designation for the miniaturized fire control system developed by Contraves to replace the Super-Fledermous. Skyguard is equipped with two radar for search and track. It also uses a digital computer instead of the earlier analog equipment. The search radar is a fully coherent pulse Doppler system. It utilizes a common transmitter in tandem with the acquisition radar. Operating in the I/J band and attaining a peak power of 200 W, it offers fast frequency change and fast PRF change facilities with a choice of pulses. A cosecant-squared antenna with integrated IFF uses a horizontal beamwidth of 1.7 degrees and a 55 degree beam in elevation. The scanner rotates at a rate of 60 rpm. The receiver has range gated Doppler filters and offers an MTI improvement factor of better than 50 dB. The PPI display features switched ranges and can present simultaneously processed MTI video and raw video. Radar range is 20 km, and range resolution is 160 m.

Special features of the search radar include automatic target alarm, automatic lock-on and computer controlled symbol markers on the PPI. The tracking radar is also a

fully coherent monopulse antenna with a 24 degree beamwidth. Signal processing circuits provide 80-m acquisition gates around the tracking gate (all having Doppler filters), while the total acquisition range is 1140 m. The display is an R-trace, displayed on the TV monitor for tracking supervision and ECM monitoring. Target acquisition and tracking is automatic and includes memory tracking and automatic alarm facilities. Special features include fast target exchange and automatic noise jammer tracking. The acquisition radar operates in the K-band. Skyguard is deployed either with AA gun systems or AA missile systems and is commonly used with the Aspide or Sparrow missile.

**Operational Characteristics.** Skyguard was developed to act as either an autonomous anti-aircraft fire control radar aboard a vehicle, a separate trailer-mounted unit or as an element within an air defense system. The equipment is designed for short-range acquisition of targets down to and including ground level. Particular emphasis has been placed on the ability to detect hovering low-level helicopters.

## Variants/Upgrades

The Skyguard system has been upgraded during the course of its career and continues to be so modified.

**Skyshield.** A modular fire control radar developed from Skyguard and optimized to work with the new Ahead 35 mm revolver cannon produced by Oerlikon.

## Program Review

**Background.** Skyguard was developed by Contraves as a private venture to replace the Super-Fledermous fire control system. It has been in production since its introduction in 1977. Since that time Skyguard has been exported to 25 countries, including Argentina, Austria, Canada, Egypt, Germany, Greece, Iran, Italy, Malaysia, Pakistan, Spain, Switzerland, Thailand, Turkey and United Kingdom.

In the late 1980s, Kuwait ordered 11 batteries of Aspide missiles controlled by Skyguard radars. Five of these batteries had been delivered by the time of the Iraqi invasion of Kuwait and were removed by the Iraqi forces. These have never been recovered and are believed to have met with an explosive demise. A sixth battery was in Egypt at the time of the Second Gulf War and was delivered to Kuwait after the cessation of hostilities. Kuwait has indicated that it intends to confirm its order for the remaining five batteries when financial considerations permit.

In 1990, the Malaysian Army ordered a battery of six 35 mm Oerlikon AD guns controlled by a Skyguard radar system for airfield defense. It is understood a second order

is likely. It is believed that this order replaced the Malaysian order for Rapier anti-aircraft missiles originally planned under the terms of the UK/Malaysian defense procurement package.

Also, in 1990 the Royal Air Force started to use some of the Skyguard radars captured from Argentina for surveillance purposes. This follows numerous complaints about aircraft flying below the minimum altitude limits and the loss of several Tornado aircraft in low-flying accidents. The radar are installed in undisclosed locations and used to monitor the altitudes flown by aircraft performing penetration training missions.

It has now been more than five years since an order for the radar has been received, and as the two prime customer prospects, Saudi Arabia and Turkey, have receded sharply, it is unlikely that any more systems will be produced..

In May 1995, Contraves launched an updated and improved version of the 35 mm gun/Skyguard combination. The new system is called Skyshield and uses a modernized version of the Skyguard radar to control a new rapid-fire 35 mm revolver cannon.

## Funding

Development of the Skyguard system was undertaken as a private venture by Contraves.

## Recent Contracts

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Martin Marietta	150.0	1981 - Contraves system development contract.
Oerlikon-Buhrle	300.0	July 1983 - Egyptian MoD contract for Skyguard/35 mm/ Sparrow.
BMARC	17.0	Jan 1984 - UK MoD contract for the repair of five captured Skyguard systems.
Oerlikon-Buhrle	390.0	Feb 1985 - Egyptian MoD contract for Skyguard/35 mm/ Sparrow.
Stabilimenti Meccanici		July 1985 - Italian MoD contract for Skyguard generators.
Martin/Oerlikon		June 1986 - Canadian Skyguard/35 mm contract.
Oerlikon-Buhrle		Nov 1986 - Iranian MoD contract for 20 Skyguard.
Mauser/Oerlikon		July 1987 - Thai MoD contract for Skyguard/30 mm.

## Timetable

	1977	Development of Skyguard completed
	1978	Skyguard in service
May	1982	Skyguard obtained by UK Forces
	1985	Skyguard delivered to Egypt
		Skyguard entered UK service
Jul	1988	Skyguard/Mauser 30 mm delivered to Thailand
Mar	1989	Malaysia ordered Skyguard

## Worldwide Distribution

The following distribution list represents an estimate. All only and includes a number of countries for whom no confirmation is available. Two reported clients with a total of 24 radar are still unaccounted for.

**Austria** (24 linked to 35 mm guns)  
**Argentina** (6 linked to 35 mm guns)  
**Brazil** (6 linked to 35 mm guns)  
**Canada** (10 linked to 35 mm guns)  
**Cameroon** (3 linked to 35 mm guns)  
**Chile** (6 linked to 35 mm guns)  
**Cyprus** (6 linked to 35 mm guns)  
**Egypt** (18 linked to 35 mm guns and Sparrow missiles)  
**Germany** (24 linked to 35 mm guns)  
**Greece** (12 linked to Sparrow missiles)  
**Iran** (20 linked to 35 mm guns - some probably captured by Iraq)  
**Iraq** (a few captured from Iran and five from Kuwait subsequently destroyed by US)  
**Italy** (84 linked to Aspide missiles)  
**Kuwait** (11 radar ordered, six delivered, five of these captured by Iraq)  
**Malaysia** (4 linked to 35 mm guns)  
**Pakistan** (32 linked to 35 mm guns)  
**Singapore** (6 linked to 35 mm guns)  
**South Africa** (6 linked to 35 mm guns)  
**Spain** (64 linked to Aspide missiles)

**Switzerland** (36 linked to 20 mm and 35 mm guns)

**Taiwan** (24 linked to 35 mm guns)

**Thailand** (2 linked to 30 mm guns and Aspide missiles)

**Turkey** (24 linked to 35 mm guns)

**United Kingdom** (5 ex-Argentine linked to 35 mm guns).

## Forecast Rationale

The dearth of orders for the Skyguard system, along with the collapse of SHORAR orders and the serious blows to the Seaguard program, is a cause of great concern for Contraves, the producer of the system. Virtually all the programs that the company was counting on for a steady workload have seen their prospects sharply diminished. The launch of the Skyshield system is perhaps a response to this situation, although this effort is unlikely to change the company's direction or alter its fate in this area. It comes as no surprise, then, that there has been talk that Contraves is looking for a merger or other form of partnership to improve its financial strength.

The overall market for tactical air defense systems has been inundated by a wide selection of short-range missile systems. The range of shoulder-launched missiles has now extended to rival that of gun-based systems. Such missiles can now be purchased for between US\$15,000 and US\$100,000 per copy, making them an easily available, affordable and viable choice for many armed forces.

The guidance systems of these missiles have improved to the point where they can be used effectively with little

training. Target acquisition radar can make these systems an even more attractive choice and are also available at a relatively low cost. Further up the scale, vehicle-mounted weapons, particularly the extremely effective Russian Tungaska combined gun/missile vehicle, are also available at highly competitive rates. As a consequence, most recent procurement attention has been less concerned with gun systems than with missile systems.

The radar/gun system retains a number of advantages over the radar/missile combination, including the vastly greater reliability of guns as compared with missiles, and perhaps most importantly, the fact that a gun without its fire control radar still has considerable value; a missile deprived of its target acquisition and homing systems has little or none.

However, despite this acknowledged advantage, existing Skyguard contracts have expired without any new orders being generated to replace them. At present there appears to be no prospect of additional production in the medium and long term. Production appears to have ceased following the delivery of the final six systems in 1995.

## Ten-Year Outlook

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No production is forecast for this system.