

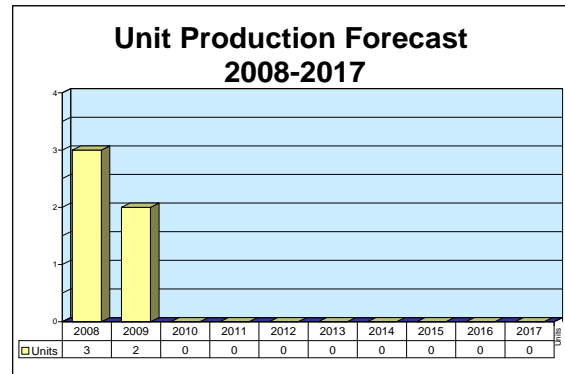
# ARCHIVED REPORT

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## Kestrel

### Outlook

- No new orders for the Kestrel ESM system have been made public in some time
- Last known work – for Canadian Navy – likely completed in mid-2008
- Barring any significant new activity, this report will be archived in 2009



### Orientation

**Description.** An electronic intelligence-gathering system designed for all scales of electronic intelligence (ELINT) operations.

**Licensee.** No production licenses have been announced to date.

**Status.** In production and service.

**Total Produced.** An estimated 32 current variants had been produced through 2007.

**Application.** Airborne electronic support measures are tasked with gathering information on hostile radar. Their deployment and movement are at long range, so they do not face the hazards encountered using other reconnaissance techniques.

**Price Range.** A past order for Kestrel systems indicated a unit cost of approximately \$1.2 million. This price includes systems and support and was derived from contract cost averaging. However, as this order was one of the last to be made public, this price should be considered speculative.

### Contractors

#### Prime

<b>Thales</b>	<a href="http://www.thalesgroup.com">http://www.thalesgroup.com</a> , 45, rue de Villiers, Neuilly-sur-Seine, 92526 France, Tel: + 33 1 57 77 80 00, Fax: + 33 1 57 77 86 59, Prime
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## Kestrel

## Technical Data

**Characteristics**

Frequency coverage  
Azimuth coverage  
Elevation  
Bearing accuracy  
Frequency accuracy  
Radar store capacity  
Processing time  
Shadow time  
Weight

**Parameter**

C- to J-bands (U.S., 0.6 to 18 GHz)  
360 deg  
 $\pm 45$  deg  
7 deg rms  
5 MHz rms  
50 modes  
1 s max  
Less than 200 ns  
55 kg (U.S., 110 lb)

**Design Features.** The Kestrel system is basically a major enhancement of the combat-proven MIR-2 (Orange Crop) system deployed on board U.K. Royal Navy Lynx HMA.Mk 8 helicopters. Kestrel uses the same antenna system as the earlier set linked to Racal's (now Thales) powerful SADIE (Segregation, Association, De-interleaving and Identification Equipment) processor. It occupies little additional space and costs only marginally more than the earlier system. Kestrel receives and processes radar emissions over C- to J-bands. The system is composed of highly sensitive receivers that carry out intercepts over the 600-MHz to 18-GHz range.

**Operational Characteristics.** The system can intercept, analyze, record, and provide an instant digital bearing over an azimuth coverage of 360 degrees. At the same time, a frequency measurement receiver provides instantaneous digital frequency data. The pulse-by-pulse digitized information is then passed to a processor which separates the overlapping pulse trains from different radar and derives their pulse repetition, frequency agility, and scan type. The system uses microprocessors for efficient, speedy signal comparison and analysis before presenting non-ambiguous displays to a single operator. Digital information can be recorded and displayed, and transmitted to ground stations.



Merlin HM1

Source: U.K. Royal Navy

## Variants/Upgrades

**SLQ-504.** Canadian Navy nomenclature for Kestrel 242.

**ELINT Defender.** A Pilatus Britten-Norman Turbine Islander equipped with the Kestrel system. Very few, if any, have been procured.

**Kestrel 242.** Surface ship version of Kestrel for Canadian Navy.

**Orange Reaper.** U.K. Royal Navy designation for the Kestrel system installed on the Lynx HMA.Mk 8 and to be installed on the Merlin HAS.1.

## Program Review

**Background.** The Kestrel ESM system was developed in the early 1980s by Racal Radar Defence (now Thales). Kestrel has a dual peacetime/wartime role as an electronic intelligence system. This capability was developed in response to a request from Kestrel's launch customer, the Royal Danish Navy. The system is particularly suitable for electronic surveillance and reconnaissance, and for gathering information on threat potential, deployments, and possible new threats.

The system entered production in 1987 to fulfill an order from the Royal Danish Navy. This was followed by the U.K. Royal Navy's selection of the Kestrel system in 1988 for installation on its version of the EH101. Designated Orange Reaper, Kestrel is tasked with both offensive and defensive electronic support measures (ESM) operations. The integration of the avionics packages within the Merlin HAS.1 airframe was the responsibility of IBM-ASIC (Aerospace Systems Integration Corp), the prime contractor.

In September 1989, Racal announced the introduction of the SADIE compact signals analysis architecture. SADIE is used in Orange Reaper, the Danish Navy Sabre system, and the German Navy FL-1800S Step II. It provides four main processing functions: pulse segregation, known-emitter monitoring, new emitter analysis, and ESM processor control.

In preparing Canadian auxiliary oil replenishment (AOR) support vessels for the Gulf War in 1991, a hybrid Kestrel/Type 242 system was installed. Designated Kestrel 242, this was basically the Kestrel ESM system linked to a Cygnus jammer via a Type 242 operator's console.

In September 1992, IBM-ASIC placed a contract with Racal for the supply of Orange Reaper ESM systems to equip 44 Merlin HAS.1 helicopters. IBM-ASIC discovered that the Orange Reaper system had performance problems. Problems were also encountered in integrating the system with the tactical processing

system, and in placing the antenna on the Merlin airframe.

Normally, Type 242 is composed of a Cutlass B-1 ESM set and a Cygnus jammer with the Type 242 lightweight control system. In 1993, this system was upgraded with the inclusion of the SADIE processor (in place of the Kongsberg 500 used earlier) and type-classified as the SLQ-504 for Canadian Navy service.

Although the delivery date was delayed in 1999, the U.K. EH101 Merlins were reportedly still fitted with the Kestrel system when delivered. While the U.K. Ministry of Defence committed to the purchase of 44 Merlins equipped with Kestrel, the U.K. Royal Navy requested an additional 46 Merlins sometime after 2000. It was assumed that these new aircraft also included the Kestrel system in order to keep all systems compatible.

### *System Prospers with Link to Lynx Helicopter*

In mid-1999 there were two major orders for the AgustaWestland Lynx helicopter and most likely for the accompanying Kestrel systems as well. South Africa reportedly acquired four Super Lynx 300 helicopters and Germany acquired seven Lynx Mk 88s. Around this time, South Korea purchased 13 Super Lynx helicopters.

The Canadian Navy plans to replace its AOR vessels with four new oilers from 2005 to 2015. Since the current AOR vessels were upgraded to include Kestrel, and because the system was apparently successful, these new AORs will likely be equipped with the system as well.

Through 2002, production of Kestrel variants continued for installation on the U.K.'s Merlin HM1s. Work may have also proceeded on the installation of Kestrel on 16 EH101 Merlins ordered in 2001 by Denmark. Oman ordered 16 Lynx helicopters in 2002 that may also feature Kestrel.

## Kestrel

## Funding

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Initial development was company funded. Subsequent development and production were funded by the U.K. MoD and by other user contracts.

## Contracts/Orders & Options

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No recent contracts have been identified through open sources.

## Timetable

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Apr	1987	Ordered by Royal Danish Navy
	1988	Selected for Royal Navy EH101 Merlin helicopter
Oct	1988	Installation on Danish Lynx
	1994	Ordered for Kingston MCDV
	1996	Systems enter service on UKRN EH101s
	1999	Four Super Lynx 330s ordered by South Africa
	1999	Seven Lynx Mk 88s ordered by Germany
	2000	Denmark upgrades its Lynx helicopters
	2001	Final deliveries of EH101 Merlins with Kestrel system to U.K. Royal Navy; EH101 ordered by Denmark
	2002	Oman orders 16 Lynx helicopters
	2005	Likely end of production for U.K.'s Merlin HM1
	2008	Likely end of production for Canadian Navy

## Worldwide Distribution/Inventories

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Kestrel and its variants reportedly have been or will be sold to the following countries:

<b>Canada</b>	12 on Halifax class frigates. 1 system on a Provider AOR and 2 systems on Improved Provider AORs. The Providers are expected to be replaced with 4 new AORs; the Kestrel (Canadian nomenclature SLQ-504) will probably be on board.
<b>Denmark</b>	8 systems on AgustaWestland's Lynx helicopters.
<b>Germany</b>	24 systems on AgustaWestland's Super Lynx 100 helicopters.
<b>U.K.</b>	44 AgustaWestland Lynx helicopters equipped with Kestrel ELINT upgrades. 44 systems in production for EH101 Merlin HM1.

## Forecast Rationale

Production of the Kestrel electronic intelligence (ELINT) gathering system will likely be winding down within the next few years. Although the system is in wide use on helicopters in a number of countries, news of the system, particularly regarding its production status, has been scarce. There have been no publicly announced orders in some time.

For the past few years, the AgustaWestland Lynx helicopter has been the basis for much of the EW system's production. Some 76 systems have been made for such aircraft in the nations of Denmark, Germany and the U.K. since its introduction.

Kestrel

The U.K. Royal Navy has found major use for the Kestrel system (under the designation Orange Reaper) on its EH101 Merlin helicopter fleet.

ordered by the Canadian Navy for use aboard several oiler vessels. The system has been installed on 12 Halifax class frigates for the service.

Kestrel production is probably complete for four naval-variant systems (under the designation SLQ-504)

Barring any significant new activity, this report will be archived in 2009.

## Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence				Good Confidence			Speculative			Total	
	Thru 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		2017
<b>Thales</b>												
<b>Kestrel &lt;&gt; Canada &lt;&gt; Navy</b>												
	6	1	0	0	0	0	0	0	0	0	0	1
<b>Kestrel &lt;&gt; International &lt;&gt; Multi-agencies</b>												
	26	2	2	0	0	0	0	0	0	0	0	4
<b>Subtotal</b>	32	3	2	0	0	0	0	0	0	0	0	5
<b>Total</b>	32	3	2	0	0	0	0	0	0	0	0	5