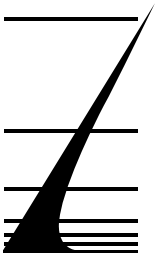
The Market for Airborne Electro-Optical Systems

Product Code #F633

A Special Focused Market Segment Analysis by:



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Analysis 1
The Market for Airborne Electro-Optical Systems 2011-2020

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PROGRAMS

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Airborne Reconnaissance Low (ARL)
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Panoramic Night Vision Goggles
PIRATE
TADIRCM (Tactical Aircraft Directed IRCM)
TIALD

Introduction

Optics is the study of the electromagnetic spectrum that covers visible, infrared, and ultraviolet light, as well as X-rays and microwaves. An electro-optical system refers to an electronic device that emits, modulates, transmits or senses light. Electro-optical systems feature different levels of complexity and associated costs.

Some electro-optical systems are very complex. For example, the Airborne Laser (ABL) program funded the development of an airborne chemical oxygen-iodine laser (COIL) with an air-based boost missile-defense capability to equip a modified Boeing 747.

Other devices feature simpler technology. Night vision goggles collect available visible and near-infrared light (450-950 nanometers), then use an image intensifier tube to electronically multiply the light to present the user with an intensified image in low-light situations. According to officials at the Army's Night Vision and Electronic Sensors Directorate (NVESD), night vision technology began in earnest during World War II when the U.S., Great Britain and Germany developed a "rudimentary infrared sniper scope." The scope used near-infrared cathodes coupled to visible phosphors to provide a near-infrared image converter to begin night-fighting efforts.

Defense Departments and the companies that support them pursue new developments in EO technology to obtain an advantage for the warfighter. Each U.S. service branch funds EO-related research, and many other nations also fund EO research.

The Air Force Research Laboratory (AFRL) Sensors Directorate contains separate technology branches to study EO sensors, EO combat identification measures, EO threat and target detection measures, and EO countermeasures. One component of the AFRL, the Air Force Office of Scientific Research (AFOSR) Physics & Electronics Directorate (RSE) hosts research in three primary areas, one of which includes the study of optics, electromagnetics, communications, and signal processing.

Under the U.S. Army Research, Development and Engineering Command (RDECOM) is the Communications-Electronics Research, Development and Engineering Center (CERDEC). CERDEC is home to several directorates, including the NVESD. The NVESD - Aviation & Netted Sensors division develops rotorcraft and UAV sensor systems to acquire and target enemy forces and to make piloting safer at night and under adverse weather and battlefield conditions.

The Army Research Laboratory (ARL) Sensors program studies EO/IR, non-imaging, and electronics technologies. The EO/IR area conducts basic and applied research of electro-optic and photonic devices, including passive sensors, active sensors, multispectral/hyperspectral (MS/HS) imagers, visible and IR solid- state and fiber lasers/sources, UV detectors/emitters, electronic warfare technologies, and target signatures. The scientists transition these technologies in support of Reconnaissance, Intelligence, Surveillance, and Target Acquisition (RISTA), fire control, guidance, survivability, mobility, and lethality applications.

The U.S. Naval Research Laboratory (NRL) - Material Science and Component Technology Directorate - Materials & Sensors Branch conducts basic and applied research to determine the interrelationships between the processing, properties and performance of advanced materials for electronic, magnetic and sensor device applications. Its Electronic and Optical Materials and Devices section researches many complex areas, including nanoclusters for optoelectronics, thin films of electronic and optical materials, and refraction materials and devices.

The Defence Science & Technology Laboratory (Dstl) is the key focus for science and technology within the U.K. Ministry of Defence. Dstl's ISTAR (intelligence, surveillance, target acquisition and reconnaissance) and Sensors area advances scientific understanding and develops technology for sensing, situational awareness, and the production of intelligence across maritime, land, air and space environments.

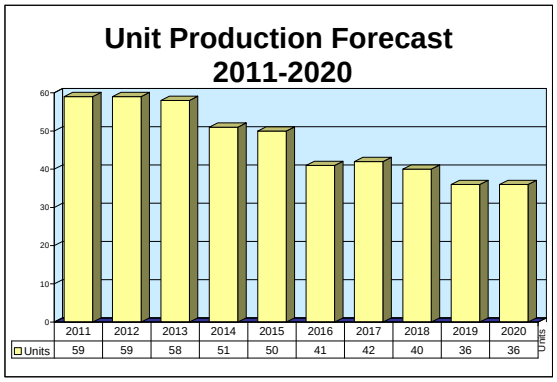
Industry has developed electro-optical systems for military missions that take place under the sea, on land, in the air and in space. This analysis focuses on programs and systems related to airborne applications only.

* * *

PIRATE

Outlook

- The PIRATE IR surveillance system should be produced steadily over the next 10 years for application on the Eurofighter Typhoon
- Production of Tranche 2 Typhoon aircraft is well under way for Germany, Italy, Spain, and the United Kingdom



Orientation

Description. Passive Infrared Airborne Track Equipment (PIRATE).

Sponsor
Eurofighter Jagdflugzeug GmbH
AM Soldermoos 17
D-85399 Hallbergmoos
Germany

Status. In initial production and service.

Total Produced. An estimated 358 PIRATE systems are believed to have been produced through 2010.

Application. Eurofighter Typhoon.

Price Range. A rough estimate, based on a comparison with the system upon which PIRATE was derived (the ADAD system), puts the price at $1.5 million.

Contractors

Prime

SELEX Galileo SpA	http://www.selexgalileo.com, Via Albert Einstein, 35, Campi Bisenzio, 50013 Firenze, Italy, Tel: + 39 055 89501, Fax: + 39 055 8950600, Email: galileoavionica@galileoavionica.it, Prime
Thales	http://www.thalesgroup.com, 45, Rue de Villiers, Neuilly-sur-Seine, 92526 France, Tel: + 33 1 57 77 80 00, Fax: + 33 1 57 77 86 59, Consortium Member

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Design Features. PIRATE is installed as a one-piece unit. The roughly wing-shaped body contains a scan converter, control processor, data and track processor, detection processor, power-supply unit, and detector and actuator electronics. The detector, mirrors, telescope, external dome and window, and cryogenic system are held in a conical protrusion. The technology for PIRATE's signal processing is based on the Air Defense Alerting Device (ADAD) manufactured by Thales Optronics.

PIRATE

Operational Characteristics. PIRATE passively detects and tracks the infrared signatures of multiple targets from long range and with a wide field of regard. It can also be used as a thermal imager with a cueing system for air-to-ground or air-to-air targets.

PIRATE can be used either as a traditional forward-looking infrared (FLIR) system, or to deliver a high-resolution image to facilitate target identification. In adverse weather, the system can aid in navigation / terrain-avoidance.

EF-2000 Eurofighter Typhoon

Source: Royal Air Force

Program Review

Background. Following several years of meetings and discussions aimed at a common fighter design for the air arms of France, Italy, Germany, Spain, and the United Kingdom, the British, Germans, and Italians launched a tri-national European Fighter Aircraft (EFA) project in August 1985. France opted to go its own way with Dassault-Breguet's Rafale demonstrator; Spain joined the Eurofighter consortium in September 1985 but did not sign the Memorandum of Understanding until 1988.

The aircraft, now called the Eurofighter Typhoon, is an advanced-technology, twin-engine, air superiority combat fighter aircraft. Notwithstanding program changes, the Eurofighter remains one of the Western world's three most important advanced-technology, high-performance air superiority fighter programs; the others are the U.S. Air Force's F-22A Advanced Tactical Fighter (ATF) and France's Rafale.

U.K.-based Thorn-EMI (now Thales) teamed with Italy's FIAR and Spain's Eurotronica to develop PIRATE as a proposal for the Eurofighter infrared search-and-track (IRST) system. The EuroFirst consortium then consisted of Italy's FIAR, the U.K.'s Pilkington Optronics, and Spain's Tecnobit.

Corporate Mergers Boost PIRATE's Prospects in Europe

In 1998, the trend toward corporate mergers overtook the PIRATE program when Thomson-CSF acquired Pilkington Optronics. Within two years, the larger, ever-growing French company would change its name to Thales.

In the spring of 2000, the PIRATE system began appearing among the specifications for the Typhoon in published reports about the aircraft. The Eurofighter Typhoon was on schedule to begin rolling out production aircraft. Deliveries of the planes began in late 2002, but service entry (at least for the U.K. Royal Air Force) was delayed until July 2003. Deliveries of the PIRATE system reportedly began in conjunction with this activity.

In June 2002, flight tests of PIRATE's air-to-ground modes were conducted on the Eurofighter. The Eurofighter prototype, DA7, and a modified Dassault Falcon 20 were also used in earlier tests.

Austria joined the list of Typhoon customers in July 2002 with its order for 24 units.

A significant contract for an undisclosed sum was signed by Thales Optronics and EADS in December 2003. Acting with the EuroFirst consortium, the company signed a series production contract for PIRATE systems for installation on Tranche 1 Typhoon aircraft. An estimated 148 fighters were to be delivered through 2006.

The EuroFirst consortium, now with Galileo Avionica in the lead, was awarded a production contract for PIRATE in August 2006. Under the $151.3 million order, 200 PIRATE units will be produced for the Eurofighter Typhoon Tranche 2 production line.

Eurofighter Begins Flight Testing Tranche 2 Avionics

The first test flight of Tranche 2 fighter avionics on a production model of a Eurofighter Typhoon took place in November 2007.

In July 2010, Italian Defense Minister Ignazio La Russa announced that Italy would be cutting its order for the third tranche (Tranche 3B) of 46 Eurofighter Typhoon jet fighters as part of a national debt reduction plan.

Funding

No annual funding figures for PIRATE are available. Total development costs for the Eurofighter Typhoon are estimated at $15.2 billion.

Timetable

Month	Year	Major Development
Aug	1985	EFA launched by Germany, Italy, and U.K.
Sep	1985	Spain joins EFA consortium
Nov	1988	Full-scale engineering development contracts signed for EFA
Mar	1994	First EF2000 prototype flown
	1998	Thomson-CSF takes over Pilkington Optronics
	2000	Thomson-CSF becomes Thales
Late	2001	Production of Typhoon commences
	2002	Flight tests of PIRATE on Typhoon
Late	2002	Initial deliveries of Typhoon
July	2003	U.K. RAF Typhoon service entry
Dec	2003	Thales/EADS sign production contract for Tranche 1 aircraft
Late	2005	Saudi Arabia orders initial 24 Typhoons
Aug	2006	Production contract awarded for PIRATE
Nov	2007	First flight of Tranche 2 avionics
	2011-2020	Full production of Typhoon and PIRATE

Worldwide Distribution/Inventories

PIRATE is designed to equip Eurofighter Typhoon aircraft to be acquired by **Austria**, **Germany**, **Italy**, **Spain**, the **U.K.** and, as of December 2005, **Saudi Arabia**.

Forecast Rationale

The next 10 years should see steady production of the Passive Infrared Airborne Track Equipment (PIRATE) for its primary platform, the Eurofighter Typhoon. Work is proceeding under a major production contract recently awarded to the EuroFirst consortium, with Galileo Avionica acting as prime contractor. Under the $151.3 million contract, 200 PIRATE units will be produced for Tranche 2 Eurofighters.

PIRATE provides detection and tracking of the infrared signatures of multiple targets from a long range and

PIRATE

with a wide field of regard. It also features a thermal imager with a cueing device for air-to-ground or air-to-air targets.

Production of Tranche 2 Typhoon aircraft is well under way for Germany, Italy, Spain, and the United Kingdom. There is a slight degree of uncertainty as to how many aircraft will be ordered under Tranche 3

In July 2010, Italy announced that it would be cutting its order for the third tranche of 46 Typhoons as part of a national debt reduction plan.

Other nations in play as potential Typhoon buyers include Austria, Romania, and Saudi Arabia.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program		**High Confidence**				**Good Confidence**			**Speculative**			
	Thru 2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
SELEX Galileo SpA												
PIRATE <> Air Force <> Worldwide												
	358	59	59	58	51	50	41	42	40	36	36	472
Total	358	59	59	58	51	50	41	42	40	36	36	472

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