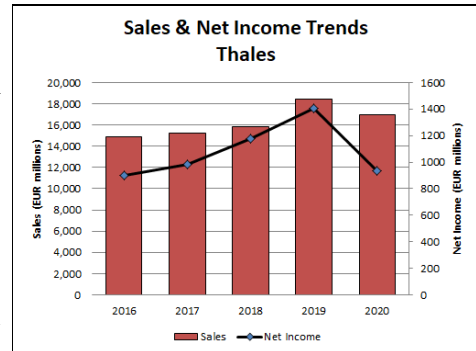


Thales

Outlook

- For 2020, Thales reported sales of EUR17.0 billion, down 7.7 percent from EUR18.4 billion in 2019
- Thales posted net income of EUR937 million, compared with net income of EUR1.4 billion in 2019
- The company weathered the crisis thanks to strong government support and success in the space and defense markets
- Early in the crisis, the French government responded with EUR15 billion in stimulus to help firms considered national assets



Headquarters

Thales
Tour Carpe Diem
31 Place des Corolles – CS 20001
92098 Paris, La Defense Cedex
France
Telephone: + 33 1 5777 8000
Website: <https://www.thalesgroup.com/>

Thales is one of the world's largest defense electronics corporations. From its origins as a defense supplier for the French armed forces, Thales has expanded aggressively to become the largest non-U.S. defense electronics manufacturer worldwide, with a broad and extensive product line that spans numerous international markets.

Although the company's roots go back to the early 1900s, its current corporate structure was established in 1968, when Thomson-Brandt, an industrial and military manufacturer, merged with Compagnie Generale de TSF (CSF) – an electronics concern with broad expertise in electronic components, semiconductors, communications, and radar systems – to create today's Thales.

Thales' subsidiaries manufacture a wide range of electronic components for military and commercial

applications. The firm also supplies civil markets with products such as electronic flight instrumentation, simulators, and air traffic control systems. The company's aerospace sector is a major international source for a variety of systems and capabilities, including airborne radars; electro-optics; simulators; air defense systems; submarine electronics; weapon electronics; air traffic control systems; battlefield surveillance systems; naval combat electronics; communications, identification, and navigation information technology; specific components; and logistical support.

In 2000, the company changed its name from Thomson-CSF to Thales following its GBP1.3 billion acquisition of Racal Electronics of the United Kingdom. The acquisition was aimed at strengthening system capabilities across the whole spectrum of defense electronics and expanding the company's geographic footprint into the U.K. market.

Currently, Thales' shareholding is 49 percent open market, 25 percent Dassault Aviation, and 26 percent the French State.

Thales

Structure and Personnel

Executive Committee

Patrice Caine
Chairman and CEO

Pascal Bouchiat
Senior Executive Vice President,
Chief Finance Officer

Pascale Sourisse
Senior Executive Vice President,
International Development

Clément de Villepin
Senior Executive Vice President,
Human Resources

Isabelle Simon
Group Secretary & General Counsel

Philippe Keryer
Executive Vice President, Strategy,
Research, and Technology

Jean-Loïc Galle
Senior Executive Vice President, Chief Operating
Officer and Chief Performance Officer

Millar Crawford
Executive Vice President,
Ground Transportation Systems

Marc Darmon
Executive Vice President,
Secure Communications and Information Systems

Alex Cresswell
Chief Executive Officer and Chairman, Thales UK

Yannick Assouad
Executive Vice President, Avionics

Philippe Duhamel
Executive Vice President, Defense Mission Systems

Philippe Vallée
Executive Vice President, Digital Identity and
Security

Hervé Derrey
Executive Vice President, Space

Christophe Salomon
Executive Vice President, Land and Air Systems

Product Area

Thales Group is an OEM and Tier 1 provider of systems and services for the aerospace, defense, transportation, and security markets. Thales' divisions are in charge of defining business strategies and priorities in the areas of research and development, product policy, and industrial policy worldwide. Thales' operations are believed to be managed as follows:

1. Aerospace
 - 1.1 Avionics
 - 1.1.1 Air Traffic Management
 - 1.1.2 Flight Avionics
 - 1.1.3 Training and Simulation
 - 1.1.4 Inflight Entertainment Systems and Connectivity - IFE&C
 - 1.1.5 Electrical Systems
 - 1.1.6 Support & Services
 - 1.1.7 Navigation
 - 1.2 Space
 - 1.2.1 Thales Alenia Space (67 percent)
 - 1.2.2 Telespazio (33 percent)
2. Defence & Security
 - 2.1 Secure Communications and Information Systems
 - 2.1.1 Radio Communications
 - 2.1.2 Network and infrastructure Systems
 - 2.1.3 Protection Systems
 - 2.1.4 Critical Information Systems and Cybersecurity
 - 2.2 Land and Air Systems

- 2.2.1 Air traffic Control
- 2.2.2 Radars
- 2.2.3 Weapon Systems
- 2.2.4 Optronics
- 2.2.5 Armored Military Vehicles
- 2.3 Defence Mission Systems
 - 2.3.1 Electronic Combat Systems
 - 2.3.2 Intelligence, Surveillance and Reconnaissance (ISR) Systems
 - 2.3.3 Surface Naval Warfare
 - 2.3.4 Underwater Warfare
3. Transportation
 - 3.1 Mainline Signaling
 - 3.2 Maintenance
 - 3.3 Ticketing
4. Digital Identity and Security
 - 4.1 Mobile
 - 4.2 Software Monetization
 - 4.3 Banking & Payment
 - 4.4 Enterprise & Cybersecurity
 - 4.5 Government
 - 4.6 Internet of Things (IoT)

Aerospace. This segment includes the Avionics and Space business units.

Avionics supplies onboard and ground systems for the civil aerospace market. Products include avionic suites for flight control, navigation, communication, and surveillance; cabin systems; electrical power generation and conversion systems; air traffic radars and air traffic

Thales

management (ATM) systems; flight management systems, Global Positioning Systems, flight controls, and integrated flight displays; VHF data radios, radar altimeters, and multimode receivers; and simulation-based training systems.

Space. This sector is led by Thales Alenia Space (owned 67 percent by Thales, 33 percent by Leonardo) along with Telespazio (33 percent Thales, 67 percent Leonardo), jointly known as the Space Alliance. Thales Alenia Space focuses on the design, development, and manufacture of space systems, satellites, payloads, orbital infrastructures, space transportation instruments, and associated ground systems for civilian and military applications.

Defence & Security. This division supports military and security forces.

The Secure Communications and Information Systems sector focuses on radio communications, IP networks, protection systems, critical information systems, and cybersecurity. Products include radios, tactical communications systems, electronic warfare systems, IFF systems, radio navigation equipment, and secure infrastructure and telecommunication networks. This sector also makes C4ISR systems as well as other protection systems such as identity management, border control, and surveillance. This unit also provides cybersecurity solutions and digital transformation services.

Land and Air Systems provides air traffic control (ATC) systems ranging from conventional navigational aids to radar and air traffic control centers, surveillance systems, and satellite navigation and airport management solutions. For land forces, Thales provides infantry systems, helicopter systems, force protection and border surveillance systems, weapons systems and munitions, C4ISR systems, and optronic systems. For air forces, the company provides combat systems, command and control centers, defense onboard electronics, mission and surveillance systems, radar and sensors, weapon and missile systems, unmanned air

vehicles (UAVs), and C4ISR systems. This unit also offers a range of weapon systems for medium-range (SAMP/T), short-range (Crotale and RAPIDDefender), and very short-range (RAPIDFire cannon and RAPIDRanger missile system) markets. The group specializes in multirole weapon systems based on the new lightweight multirole missile (LMM) family. In optronics, Thales designs and manufactures components and systems for day and night surveillance, reconnaissance, protection, threat detection, and target acquisition on all types of land, sea (surface and subsurface), and air platforms. Finally, this sector is active in the military vehicle market, manufacturing vehicles such as the Hawkei and Bushmaster APCs.

Defence Mission Systems focuses on airborne combat, intelligence, surveillance, and reconnaissance as well as naval surface and underwater combat systems. The unit produces radar systems for the Rafale and Mirage 2000 fighters as well as electronic warfare systems. For the ISR market, Thales provides a range of solutions for the naval, ground, and air domains, including surveillance radars, acoustic subsystems, and measurement and datalink equipment. For naval forces, the unit provides C2 systems and anti-air warfare systems; radars, optronics, communications, and electronic warfare equipment; sonars; anti-submarine warfare systems; mine countermeasures; torpedoes; and communication, identification, and navigation systems. Thales also maintains and upgrades warships.

Transportation. This unit provides rail signaling technology, urban transportation solutions, and electronic ticketing systems for highways.

Digital Identity and Security. This unit was formed following the 2019 acquisition of Gemalto, an international security company. The division focuses on markets aimed at the Internet of things, big data, artificial intelligence, and cybersecurity. Specific areas of interest Thales cited include unmanned air traffic management, data and network cybersecurity, airport security, and financial transaction security.

Facilities

The majority of Thales' manufacturing facilities are located in France and neighboring European countries. Additional manufacturing capacity is situated among foreign-based subsidiaries. Thales' international presence is supported by marketing and sales offices across the globe. Major locations of defense and aerospace activity are listed below.

For a listing of all of Thales' companies, please use the following link:

<https://www.thalesgroup.com/en/views/address-book>

AEROSPACE

Thales Aerospace Division, website:

<https://www.thalesgroup.com/en/aerospace>

Thales Avionics Electrical Systems SA, 41 boulevard de la République – BP 43, 78401 Chatou, France. This unit designs and manufactures specialized equipment for aircraft electrical power systems. Products include

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starter generators for fixed- and rotary-wing aircraft, alternators, generators, motors, converters, power supplies, and variable-speed constant-frequency systems.

Thales UK Ltd, Manor Royal RH10, Crawley, West Sussex RH10 9HA, United Kingdom. This unit produces helicopter avionics and communication / surveillance systems, and provides integration services.

SPACE

Thales Alenia Space, 5 Allée des Gabians, 06150 Cannes, France. Telephone: + 33 0 4 92 92 70 00. Thales holds 67 percent and Leonardo 33 percent of this joint venture.

Website: <https://www.thalesgroup.com/en/space>

DEFENCE AND SECURITY

Thales Defence and Security Division, website: <https://www.thalesgroup.com/en/markets/defence-and-security>

Thales Air Systems, 3 Place d'Armes, 83000 Toulon, France. This unit develops and supports air security systems. Products range from advanced sensors and identification systems to air command and control systems as well as battlefield radars and fire control and coordination systems for very short-range, short-range, and medium-range air defense.

Thales UK, Alanbrooke Rd Castlereagh, Belfast, Northern Ireland BT6 9HB. Thales purchased Bombardier's entire stake in Shorts Missile Systems in 1999. Current products include the Starstreak and Starburst VSHORAD missile systems, the Aspic automatic fire control system, and the SAMANTHA and CLARA command and control systems.

Thales Underwater Systems, 525 route des Dolines, BP 157, 06903 Sophia, Antipolis, France. This former joint venture between Thales and BAE Systems is one of Europe's principal ASW and naval systems manufacturers. Thales acquired BAE Systems' stake in the venture in September 2001.

Website: <https://www.thalesgroup.com/en/activities/defence/naval-forces/underwater-warfare#overview>

Thales Nederland BV, Haaksbergerstraat 49, PO Box 42, 7550 GD, Hengelo, the Netherlands. This operation is a major European supplier of defense systems in the fields of naval combat, radar, weapon control, electro-optics, sonar, computers, displays, C4I, and communications for naval and land-based applications.

Website:

<https://www.thalesgroup.com/en/countries/europe/netherlands>

Thales Six GTS France, 6 rue du Lieutenant-Colonel Laporte 19311 Brive Cedex, France. This unit develops and manufactures strategic, tactical, and mobile telecommunications networks and command and information systems.

Thales Defense & Security Inc, 22605 Gateway Center Dr, Clarksburg, MD 20871. Telephone: + 1 (240) 864-7000. Produces secure tactical, handheld, and miniature radio equipment.

Website: <https://www.thalesdsi.com/>

Thales UK, 1 Linthouse Rd, Glasgow, G51 4BZ, Scotland, United Kingdom. This unit produces optronic masts and periscopes for submarines, surveillance and search-and-track equipment, and land-based fire control systems.

Thales Optronique SAS, 2 Avenue Gay-Lussac, Centre Guynemer, 78995 Élancourt, France. Development and manufacture of thermal viewing and light intensification devices, laser designators, and laser rangefinders for airborne, ship-based, and land-based applications.

TDA Armements SAS, route d'Ardon, 45240 La Ferté Saint-Aubin, France. TDA is a major manufacturer of armaments and munitions, including aircraft armament, anti-runway munitions, standoff tactical submunitions, fuzing devices, missile warheads and motors, precision-guided munitions, mortars, artillery, and mortar projectiles. The unit operates under Air Defense. This was a joint venture between Thales and EADS Deutschland GmbH (now Airbus Group). Thales is now the sole owner, having acquired EADS' 50 percent stake in October 2005.

Forges de Zeebrugge SA, 63 rue en Bois, B-4040, Herstal, Belgium. A subsidiary of TDA specializing in aircraft/helicopter armament systems, including rocket systems, launchers, warheads, and related equipment.

Website: <https://fz.be/>

Thales Training & Simulation France, Zi Les Beaux Soleils, 1 Rue Du Gen De Gaulle, Osny, France. This unit provides a diversified product line that includes commercial and military full-flight simulators, operational flight trainers, cockpit procedures/systems trainers, maintenance trainers, and combat training simulators for land- and sea-based systems.

Thales**DIGITAL IDENTITY AND SECURITY**

Gemalto AG, a Thales company, Hintere Bahnhofstrasse 12, 5000 Aarau, Switzerland. Telephone: + 41 0 62 832 00 00. This company, acquired in 2019, provides digital security services to governments, cities, and corporations.

Website:

<https://www.thalesgroup.com/en/markets/digital-identity-and-security>

Australia

Thales Australia 7 Murray Rose Ave, Sydney Olympic Park NSW 2127, Australia - Sydney. ADI was 50-50 owned by Thales and Transfield Holdings until October 2006, when Thales acquired Transfield's stake. The firm is now 100 percent owned by Thales. ADI joins the other fully owned Thales subsidiaries – Thales Underwater Systems, Thales Air Traffic Management, and Thales Training and Simulation – trading under the single name of Thales Australia.

Website:

<https://www.thalesgroup.com/en/countries/asia-pacific/australia>

Canada

Thales Systems Canada, Defence & Security Division, 1 Chrysalis Way Ottawa, ON K2G 6P9. Telephone: + 1 (613) 723-7000. Established in 1984, Thales

Systems Canada provides systems management services to the Canadian armed forces. The subsidiary has established expertise in systems engineering, systems integration, program management, and software development as well as computer simulation, modeling, and analysis.

Website:

<https://www.thalesgroup.com/en/americas/canada>

United Kingdom

Thales Holding UK plc, 350 Longwater Avenue, Green Park, Reading, RG2 6GF Tel: + 44 0 118 943 4500. This is the headquarters for Thales' U.K. operations.

Website:

<https://www.thalesgroup.com/en/countries/europe/united-kingdom>

United States

Thales USA, Inc., 2733 South Crystal Dr, Suite 1200, Arlington, VA 22202. Telephone: + 1 (703) 838-9685. This is the primary U.S. subsidiary for business development and communications, serving as Thales' contact with the U.S. media and industry. It also provides project management for U.S.-based company programs.

Website:

<https://www.thalesgroup.com/en/countries/americas/united-states>

Corporate Overview

Thales is Europe's third-largest defense contractor, behind BAE Systems and Airbus. The company provides systems and services for the aerospace, defense, transportation, and security markets.

New Products and Services

NASA Rapid IV. In March 2021, Thales Alenia Space's ELiTeBUS and PRIMA platforms were added to NASA's Rapid Spacecraft Acquisition IV contract. Rapid IV is a multiple-award, indefinite delivery/indefinite quantity contract that allows the U.S. federal government to place firm-fixed-price delivery orders for spacecraft and related services. The platforms NASA selected are the ELiTeBUS and PRIMA platforms, which will be manufactured respectively at Thales Alenia Space facilities in France and Italy.

SonoFlash. In March 2021, the French defense procurement agency (DGA) awarded Thales a contract to develop, qualify, and manufacture the SonoFlash air-droppable sonobuoy. Today's sonobuoys are either passive or active. By contrast, the SonoFlash buoy offers both modes, combining a powerful, optimized

low-frequency transmitter with a high-directivity passive receiver. With the combination of these two capabilities, and the added advantage of long endurance, the SonoFlash buoy is suitable for a wide array of deployment scenarios, the company said.

Galileo 2nd Gen. In March 2021, Thales Alenia Space signed a EUR772 million EUR contract with the European Space Agency (ESA) to provide six satellites as part of the second generation of the Galileo constellation. The new satellites will feature digitally configurable antennas, inter-satellite links, and full electric propulsion systems as well as better interference and jamming resilience. The first satellites of this second generation will be placed in orbit by the end of 2024.

Lightspeed. In February 2021, Thales Alenia Space signed an agreement with global satellite operator Telesat to be the prime contractor on the construction of Lightspeed, Telesat's advanced LEO network, a multibillion-dollar project initially comprised of a fleet of 298 satellites. Under the estimated \$3 billion contract, Telesat will rely on Thales Alenia Space not

Thales

only to provide the space and mission segments but also for the end-to-end network performance and related specifications of the system. Telesat estimates the total cost of the system at \$5 billion. The first satellites are expected to be ready for launch around 2023.

SSBN Sonar Suite. In February 2021, Thales was selected to provide a new generation sonar suite as part of the French Navy's SNLE 3G program. The SNLE 3G program will build France's third-generation of nuclear-powered ballistic-missile submarines (SSBNs). Thales will provide new-generation flank arrays and bow-mounted sonars, a towed linear array based on optical technology (ALRO), and all the other equipment making up the sonar suite (intercept arrays, echo-sounders, underwater telephones). The new sonar suite will be deployed incrementally, with the first technological building blocks and system versions due to be installed on second-generation SSBNs (SNLE 2G) from 2025 and on the third-generation submarines (SNLE 3G) from 2035.

Javelin Combat Net Radio. In January 2021, Thales introduced the Javelin Combat Net Radio to its family of tactical communications products. The Javelin is a new, rugged, single-channel, small form factor Mobile Ad-Hoc Network (MANET) radio. Javelin uses the TSM waveform, making it interoperable with other radios running the TSM waveform, including the Thales 2-Channel AN/PRC-148C/D systems. This means the radio is capable of maintaining reliable network connectivity in remote, dense, urban, and subterranean environments. Javelin also ensures seamless integration to the U.S. Army's Nett Warrior system. The radio is interoperable with a variety of end user devices and C2 applications such as Android or Windows Tactical Assault Kit systems. Thales is offering the Javelin radio as a non-developmental item that will go into production in 2021.

ATHENA Mirror. In January 2021, Thales Alenia Space signed a contract with ESA worth EUR2.8 million for the study, design, manufacture, and test of the ATHENA Mirror Assembly Module Demonstrator. ATHENA (Advanced Telescope for High ENergy Astrophysics) is the second "Large" mission in the ESA Science Cosmic Vision program, focusing on the hot and energetic processes in the universe by mapping hot gas structures and determining their physical properties as well as searching for supermassive black holes. The system is planned for launch in 2031.

Space Inspire. In December 2020, Thales Alenia Space announced that a major milestone for Space Inspire (INstant SPace In-orbit REconfiguration) development had been achieved by the conclusion of the Preliminary Design Review (PDR). Thales Alenia Space is developing this product line with the aim to

allow seamless telecommunication mission and services reconfiguration, instant in-orbit adjustment to the demand, and flexibility for video broadcasting and broadband connectivity services while maximizing the efficiency and effective use of the satellite resources. Following this PDR, the Space Inspire product line is now entering into final design and qualification phases involving an industrial consortium across Europe.

MKS 180 Frigate Mission and Combat System. In November 2020, Damen Schelde Naval Shipbuilding and Thales signed a EUR1.5 billion contract for the delivery and integration of Thales' Mission and Combat System for the four MKS 180 class frigates ordered by the German Navy. Thales' Mission and Combat System includes the TACTICOS Combat Management System and the AWWs (Above Water Warfare System) Fire Control Cluster. The contract includes four ship systems, logistic services, and multiple land-based test and training sites as well as the option for one or two additional ships. The first ship of the MKS 180 class will be operational in 2028.

Vantis. In November 2020, Thales completed the PDR for the key site implementation of Vantis, the statewide unmanned aircraft systems (UAS) network, for Beyond Visual Line of Sight (BVLOS) UAS operations in western North Dakota. Thales will deploy surveillance and communications infrastructure in the greater McKenzie County area as part of the beyond visual line of sight network. The sensors and communications network will support mission and network operations.

Website: <https://www.vantisuas.com/>

TSA6000. In October 2020, Thales launched the TSA6000, the latest addition to its family of IFF (identification friend or foe) interrogators for French naval vessels. The digital TSA6000 comprises four fixed antenna panels to provide 360° coverage. The TSA6000 will equip the French Navy's future FDI class frigates from 2021 alongside the Sea Fire radar from Thales, which also has a flat-panel array.

Lunar Orbital Platform-Gateway. In October 2020, Thales Alenia Space was selected to develop two key modules for the upcoming Lunar Orbital Platform-Gateway (LOP-G): I-HAB (International Habitat) and the ESPRIT communications and refueling module. The first tranche of I-HAB contract, (worth EUR36 million, with a total value of EUR327 million), has been signed with the ESA. ESPRIT development is also underway. The Gateway is a manned lunar orbital infrastructure. This lunar space station is one of the pillars of NASA's Artemis program, designed to return humans to the moon by 2024. The program is being implemented through international cooperation – currently involving NASA (United States), ESA

Thales

(Europe), JAXA (Japan), and CSA (Canada) – with each partner in charge of the development of complementary elements, to be assembled and operated in lunar orbit from 2024.

AirMaster C. In October 2020, Thales launched AirMaster C, a new surveillance radar with an ultra-compact, programmable 2D active antenna based on SiGe (silicon-germanium) technology. According to Thales, the AirMaster C is 30 percent smaller in size, weight, and power than other radar of its class. The system is currently being integrated on board the Guépard joint light helicopter for testing.

Strategic Domestic Munitions Manufacturing. In June 2020, Thales and the Australian Government signed a 10-year long contract worth more than AUD1 billion for the Australian manufacture and supply of strategic munitions to the Australian Defence Force.

Indonesian Frigate Modernization. In March 2020, Thales and Len Industri signed a contract for the complete modernization of the KRI Usman-Harun multirole light frigate's mission system. The contract will see Len Industri and Thales install the TACTICOS Combat Management System, the SMART-S Mk2 air and surface surveillance radar, the STIR EO Mk2 radar and EO fire control system, and the Vigile Mk2 tactical multipurpose R-ESM system. The upgrade is expected to be completed by the end of 2023. A value was not announced.

Dreadnought Systems. In February 2020, Thales UK was awarded a GBP330 million contract to equip the Royal Navy Dreadnought class nuclear-powered ballistic missile submarines (SSBNs) with the Sonar 2076 system and Combat System Mast.

Cybel Analytics. In January 2020, Thales unveiled its new Cybel Analytics cybersecurity platform. Cybel Analytics uses machine learning algorithms developed by Thales to detect abnormal situations based on huge volumes of data from multiple sources (such as network data, end point analysis, and OT logging), helping to identify attack patterns and discover previously unknown threats.

ARCHANGE. In December 2019, the DGA ordered three Dassault Aviation Falcon 8X aircraft equipped with the Thales new-generation payload CUGE (universal electronic warfare capability) under the ARCHANGE program (Avion de Renseignement à Charge Utile de Nouvelle Génération). The contract covers the first two aircraft on the program. CUGE will ultimately be deployed by three Falcon X aircraft, built by Dassault Aviation, to replace the two Transall C-160 Gabriel aircraft in service with the French Air Force from 2025. A value was not announced.

Ital-GovSatCom. In July 2019, the Space Alliance between Thales Alenia Space and Telespazio signed a contract with the Italian Space Agency (ASI) for the initial development of a satellite system dubbed Ital-GovSatCom (Website: <https://bit.ly/2JVyZvq>). The Ital-GovSatCom program was originally Italy's contribution to a European initiative called GovSatCom. Designed to give Italy a strong position in the governmental communications sector, its aim is to develop and operate a competitive satellite system providing secure, robust, and reliable communication services for several government applications, including civil security, defense, humanitarian aid, telemedicine, and maritime surveillance. Thales Alenia Space in Italy is leading a consortium of Italian space companies that will be responsible for the satellite design and the main satellite subsystems, including the payload. Telespazio will be in charge of the ground system as well as the launch and early orbit phase (LEOP) while also supplying all planned institutional services as part of the GovSatCom system.

Spy'Ranger 550. In June 2019, Thales unveiled its Spy'Ranger 550, a new addition to its range of mini unmanned air systems (UAS) for tactical surveillance and intelligence. The system can be deployed in 20 minutes and can operate autonomously for five hours in demanding conditions. It has a range of 50 kilometers.

IVEN. In June 2019, Thales launched IVEN, a digital marketplace that connects aerospace and defense companies with suppliers of parts and spare parts. IVEN acts as a trusted third party to guarantee end-to-end transaction security and data confidentiality.

Website: <https://www.iven-services.com>

Plant Expansion/Organization Update

Thales Alenia Space Expands at Charleroi. In April 2021, Thales Alenia Space set up a new FabLab (fabrication laboratory) at its plant in Charleroi, Belgium. This latest addition is tasked with stimulating innovation and supporting the Charleroi plant's push to spur sustainable growth in Belgium.

Thales Alenia Space Spanish Facility. In October 2019, Thales Alenia Space began construction of a new clean room facility in Spain. The new building expands the company's activities in the domain of integration and testing of large space systems.

Singapore Expansion. In June 2017, Thales consolidated all avionics production and maintenance, repair, and overhaul (MRO) activities at its newly expanded facility in Changi. Thales started its commercial avionics operations in Singapore over

Thales

40 years ago and now produces key systems for the Airbus A320 and A350 and Boeing 787 fleets. Singapore houses one of three avionics repair sites for the group, with the other two located in Chatellerault, France, and Piscataway, New Jersey, USA.

Belgian Solar Facility. In May 2017, Thales Alenia Space announced it would build a new facility in Hasselt, Belgium, dedicated to the automated manufacturing of photovoltaic assemblies (PVA), the electricity generating cells on satellite solar panels. Budgeted at around EUR20 million, this facility is intended to become the showcase of Thales Alenia Space for Industry 4.0 manufacturing. The photovoltaic assemblies will be manufactured in-house at the facility of Thales Alenia Space in Hasselt. The assemblies will then be integrated into solar arrays at the company's site in Cannes, France.

Belfast Space Facility. In October 2016, Thales opened a new Electric Propulsion Manufacturing facility in Belfast. Electric propulsion occurs when electrical energy collected from the sun is converted into thrust by the acceleration of inert Xenon gas ions from an electric thruster. The facility will manufacture around four satellite electric propulsion systems per year, including those for the ESA's Neosat satellite program.

IFE Expansion in Florida. In July 2016, Thales announced plans to expand its in-flight entertainment (IFE) business, called InFlyt Experience, in Florida with a \$20 million investment. The company will build a new facility on Florida's central coast and has plans for future expansion in Orlando.

Mergers/Acquisitions/Divestitures

Steyr Motors Acquired. In July 2019, Thales bought Austria's Steyr Motors, maker of the Hawkei engine, following that company's fall into insolvency. Steyr Motors produces the engine for Thales' Hawkei vehicle. The purchase ensures an uninterrupted flow for Thales supply chain. Details were not reported.

Website: <http://www.steyr-motors.com/>

Psibernetix Acquired. In June 2019, Thales announced it had acquired the artificial intelligence (AI) company Psibernetix for an undisclosed amount. According to Thales, this acquisition allows the company to "create computationally efficient, explainable AI processes for applications in safety-critical environments."

Website: <http://www.psibernetix.com/>

GP HSM Business Divested. In February 2019, Thales agreed to sell its General Purpose Hardware Security Module (GP HSM) business to Entrust

Datacard. The GP HSM business had been operating as a separate, stand-alone business within Thales since January 2019 under the brand "nCipher Security." The sale was undertaken to finalize the acquisition of Gemalto. The deal was completed in June 2019.

Gemalto Acquisition. In December 2017, Thales agreed to buy digital security solutions provider Gemalto in a deal valued at EUR4.8 billion (\$5.6 billion). Gemalto produces SIM cards and near-field communication (NFC) for mobile phones and provides secure transaction solutions to banks, including EMV chip cards, payment terminals, and user authentication systems for online banking. Thales will combine its current digital security operations with Gemalto into a new Digital Security global business unit. The deal faced some delays in obtaining needed authorization but finally closed in April 2019. Gemalto now forms one of Thales' five divisions, Digital Identity and Security (DIS).

Aveillant Acquired. In November 2017, Thales completed the acquisition of Aveillant Ltd, a developer of holographic radar technology. Holographic radars perform by establishing a permanent and complete picture of the total air space volume, which is very different from standard surveillance techniques. This technique is ideally adapted to the growing drone market, enabling the detection, tracking, and classification of very small moving targets, such as UAVs. Terms were not announced.

Website: <https://www.aveillant.com/>

Guavus Acquired. In September 2017, Thales completed its acquisition of U.S. company Guavus, a provider of real-time big data analytics. Headquartered in San Mateo, California, the company employs 250 people. Terms were not announced.

Website: <https://www.guavus.com/>

Identity Management Business Sold. In May 2017, Thales sold its identity management business to Imprimerie Nationale Group for an undisclosed amount. This business designs, develops, and deploys identity management solutions encompassing the collection of biographic data from citizens, biometric enrollment, and the management of identity systems.

RUAG EO Business Acquired. In November 2016, Thales Alenia Space completed its acquisition of RUAG's opto-electronics business line. Based in Zürich, Switzerland, RUAG's opto-electronics and instruments product unit specializes in scientific satellite instruments and equipment for optical communications in space. The firm has 75 employees and recorded sales of EUR16.6 million. The deal was first announced in July 2016. Terms were not announced.

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Vormetric Acquisition. In March 2016, Thales completed its acquisition of Vormetric, a provider of data protection solutions in physical, virtual, and cloud infrastructures, for EUR375 million (about \$400 million). Headquartered in San Jose, California, Vormetric provides data security solutions that protect data at rest across physical, big data, and cloud environments. With a workforce of 200 employees, Vormetric helps over 1,500 enterprises protect their sensitive data from both internal and external threats. The deal was first announced in October 2015.

Omnisys Tech Center. In March 2015, Thales Alenia Space and Omnisys inaugurated a joint Space Technology Center (Centro Tecnológico Espacial) in the São José dos Campos technology park in Brazil. Initially, the Space Technology Center will develop technology partnerships with local Brazilian space companies.

In September 2011, Thales acquired Omnisys, a Brazilian company headquartered in São Bernardo do Campo, near São Paulo. Established in 1997, Omnisys was the first Brazilian electronic engineering company to supply high-tech solutions for civil, military, and space applications. Omnisys had been majority-owned by Thales since 2005. It designs, develops, and manufactures long-range L-band radars under an industrial cooperation agreement. The company has produced more than 26 TRAC L-band radars since 2008. Terms were not disclosed.

Teaming/Competition/Joint Ventures

ACSS. In April 2001, L3 Technologies (now L3Harris) and Thales Avionics, a wholly owned subsidiary of Thales specializing in avionics and aircraft cabin electronics, formed a joint venture company to operate the assets of L3's Aviation Communications & Surveillance Systems. Under the agreement, Thales Avionics purchased a 30 percent interest in ACSS for approximately \$72 million in cash. L3 owns 70 percent and Thales 30 percent of the joint venture. ACSS provides communications and surveillance avionics systems and services for the global aviation marketplace. The enterprise is located in Phoenix, Arizona, with marketing and support personnel stationed around the world.

Website: <https://www.l3harris.com/all-capabilities/airplane-military-and-helicopter-avionics>

AeroThales. In September 2003, Thales and China Spacesat Co Ltd set up a joint venture to develop telematics solutions for the Chinese market. The new entity, called AeroThales, is owned 49 percent by Thales and 51 percent by Aerostrong Technology Co Ltd, China Spacesat's main subsidiary. AeroThales

provides telematics services based on high-precision satellite positioning systems and Global System for Mobile Communications infrastructures. These services include vehicle fleet management, roadside assistance, and stolen vehicle tracking and are aimed primarily at national organizations such as the postal service, fire departments, and oil companies.

Airbus. In October 2019, Airbus CyberSecurity and Thales signed a partnership agreement to offer a solution against cyberattacks. The solution will combine the file analysis system Orion Malware from Airbus CyberSecurity with Thales' intrusion detection system Cybels Sensor. The partnership for the French market aims to help operators of vital importance reinforce cyber protection measures required by ANSSI with the Military Programming Law (LPM).

Aircraft Carrier Alliance. This is a teaming of BAE Babcock, BAE Systems, and Thales UK. In addition, the U.K. Ministry of Defence has a dual role, acting as a member of the alliance as well as the customer. The group's focus is the U.K.'s Future Aircraft Carrier (CVF) project. The U.K. MoD signed a contract for two new aircraft carriers in 2008. The Aircraft Carrier Alliance is now manufacturing the two carriers – named *HMS Queen Elizabeth* and *HMS Prince of Wales*.

AIR Lab. In September 2019, the Civil Aviation Authority of Singapore (CAAS) and Thales established a SGD30 million (EUR20 million) Joint Aviation Innovation Research (AIR) Lab in Singapore to develop new air traffic management (ATM) technologies.

AirTanker. In January 2001, Airbus Defence and Space, Rolls-Royce, Cobham, Thales UK, and the VT Group (which joined in 2004) formed the AirTanker consortium to bid for the U.K. Ministry of Defence's Future Strategic Tanker Aircraft (FSTA) program. The GBP13 billion (EUR19 billion) Private Finance Initiative program will provide strategic air refueling services to the Royal Air Force for 27 years. AirTanker's proposal was based on the latest generation of Airbus widebody aircraft powered by Rolls-Royce Trent engines. Bids were submitted in July 2001. In January 2004, the U.K. MoD announced that AirTanker had been judged to offer the best prospective value for the money for the FSTA program. The MoD then entered into detailed negotiations with AirTanker for the next phase of the program. This effort bore fruit in February 2005, when AirTanker was selected as the preferred bidder for the FSTA.

Website: <https://www.airtanker.co.uk/>

Air Traffic Alliance. In July 2002, Airbus and Thales created an open industry alliance to provide a global solution to radically increase air traffic capacity while

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enhancing safety and security. The Air Traffic Alliance team works to improve the air transport system. It is linked to major initiatives by the EU, Eurocontrol, and European civil aviation authorities. Airbus contributes its airliner expertise; Airbus Defence and Space, its expertise in satellites and other aerospace technologies; and Thales, its experience in air traffic management systems and onboard electronics. As part of its plan, Air Traffic Alliance started SESAME (now known as SESAR (Single European Sky ATM Research), a program that was to implement a new generation ATM system across Europe by 2020.

Website:

https://ec.europa.eu/transport/modes/air/sesar_en

Alcatel-Thales III-V Lab. In July 2004, Thales and Alcatel created a joint research laboratory dedicated to semiconductor technologies, targeting applications in telecommunications, defense, space, and security. The laboratory, known as the Alcatel-Thales III-V Lab, reinforces both companies' expertise in the field of optoelectronic and microelectronic components based on III-V technologies (III-V materials have, respectively, three and five electrons in their last atomic layer; the association of these materials allows for considerable transmission power).

Website: <http://www.3-5lab.fr>

Alliance Future Surveillance and Control (AFSC). In December 2019, the NATO Support and Procurement Agency (NSPA) awarded six contracts for the Alliance Future Surveillance and Control (AFSC) effort, which aims to replace the organization's Airborne Warning and Control (AWACS) aircraft in 2035. The contract winners include the Boeing – ABILITI Consortium (which includes Thales, Leonardo, Indra Systems, and Inmarsat), General Atomics, Lockheed Martin, Airbus, MDA, and the L3Harris Consortium (composed of Musketter Solutions Limited, Vicens Limited, 3SDL Limited, Synergeticon, Hensoldt Sensors GmbH, IBM UK Limited, and Deloitte Consulting & Advisory CVBA). High-level concepts proposed by the six contractors will be assessed by NATO to identify the most promising concepts. In 2021, NATO will launch a call for a second round of more detailed studies to assess the feasibility of the proposed concepts.

Aquila Air Traffic Management Services. In October 2014, the Aquila joint venture of NATS Services and Thales UK signed a contract to deliver Marshall, the U.K. MoD program, to transform terminal air traffic management at military airfields. Under this effort, the U.K. is looking to modernize about 100 of its domestic and international air traffic management installations, including some 60 airfields and ranges.

The contract is valued at around GBP1.5 billion (\$2.4 billion) over the course of its 22-year lifespan. The team will deliver air traffic control and management activities to about 100 U.K. domestic and international air traffic management installations, including some 60 airfields and ranges. Three teams had been shortlisted: Fusion ATM, which is a consortium of Lockheed Martin, SELEX Systems Integration, and Cobham; a BAE Systems-led team also involving Altran Praxis, Indra, and LFV Aviation Consulting; and Aquila ATM Services.

Website: <https://www.aquila-atms.com/>

Artemis. In May 2019, the DGA selected Thales, in partnership with Sopra Steria, to implement the second phase of the Artemis program, which will improve the platform's capabilities and extend its scope of application. Atos was also selected to deliver a prototype. Project Artemis aims to provide France with a bulk data processing capability to enable it to act independently in the fields of military intelligence, operational command, and the digital space. As part of this build phase, Thales will test the solution in the areas of cybersecurity, intelligence, image processing, and maritime situational awareness. This demonstrator includes Big Data processing capabilities and calls for the development of specific processing algorithms and a user interface for presenting the results. It will be rolled out progressively at four sites. Ultimately, the platform will be used by the French border agency, justice system, and homeland security and will be available to other government agencies. The DGA originally launched the project in November 2017.

AVIC. In August 2015, AVIC and Thales held talks to expand collaboration opportunities. Areas of possible cooperation include helicopter avionics systems, head-up display systems, power generation systems, and helicopter simulators.

Babcock Team 31. In March 2018, Thales joined Babcock, BMT, Harland & Wolf, and Ferguson Marine to form "Team 31" to deliver five General Purpose Frigates. Under the U.K. Ministry of Defence's GBP1.25 billion Type 31e general purpose light frigate program, the team is offering the Arrowhead 140 frigate for consideration. Babcock will act as the overall program lead. Thales will be the mission systems integrator for the Type 31 program, delivering the combat system, communications systems, and the navigation and bridge system.

In September 2019, the MoD selected Babcock Team 31 as the preferred bidder to deliver the new warships with their Arrowhead 140 design. A contract was officially signed in November. Competitors for the effort included BAE Systems with a variant of the

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Khareef class corvette and Atlas Elektronik / ThyssenKrupp Marine Systems with the MEKO A-200 frigate. The first Type 31e warship is planned to be delivered in 2023.

Website: <https://www.arrowhead140.com>

BAE Systems. In March 2009, Thales UK's naval business signed a submarine Performance Partnering Arrangement (PPA) with BAE Systems. This arrangement constitutes a commitment between the companies to cooperate on future submarine programs. The goal of the PPA is to provide an affordable and sustainable common combat system across the U.K.'s submarine fleet.

Bell. In October 2018, Bell and Thales announced a teaming agreement for the development of flight control systems for Bell's vertical take-off and landing (VTOL) aircraft and on-demand mobility (ODM) solutions. Bell is focusing on the ODM network for the development of the Air Taxi. Thales will lead the flight controls system technology design and development.

BEL-Thales. In March 2016, Thales and BEL-Thales Systems signed an agreement to jointly develop the PHAROS fire control radar for both gun and missile systems.

In August 2014, India's Bharat Electronics Ltd (BEL) and Thales officially incorporated their joint venture company, BEL-Thales Systems Ltd. Following up on a 2012 Memorandum of Understanding (MoU), this joint venture company will primarily focus on the design, development, marketing, supply, and support of civilian and select defense radars for Indian and global markets. The ultimate objective of the venture is to expand into fields other than radars in the defense electronics domain. In accordance with Indian regulations, Thales holds 26 percent equity (the maximum allowable holding interest by any foreign company in the Indian defense sector) and Bharat Electronics holds 74 percent of the stock.

Website: <https://www.btsl-india.co.in/>

C919 Venture. In November 2010, Thales signed a letter of intent with the Commercial Aircraft Corporation of China (COMAC) and an MoU with China Electronics Technology Avionics, whose parent company is China Electronics Technology Corporation. These arrangements laid the groundwork for the creation of a joint venture company that will integrate the Thales IFE system into the cabin of COMAC's upcoming C919 aircraft.

China Electronics Technology Avionics. In March 2012, Thales and China Electronics Technology Avionics Co Ltd (CETCA) signed a joint venture

agreement regarding the new C919 aircraft. The partnership supports the integration of the Thales TopSeries system into the cabin of the C919. Thales and CETCA established this joint venture to serve as a global center of excellence that provides capabilities covering research, development, production, adaptation, and maintenance for the inflight entertainment market.

Cisco. In October 2016, Cisco and Thales launched a cybersecurity solution to detect and counter cyberattacks more effectively. Their Trusted Anti-Malware Solution provides more effective threat detection and simpler analyses of security incidents for faster attack remediation.

In July 2012, Thales and Cisco agreed to provide equipment, systems solutions, and services to the security, aerospace, and transportation markets. Under the agreement, Thales will develop networking solutions based on existing Cisco technologies to address market opportunities such as mobile routing or broadband evolution of radio markets for defense and security customers.

Clean Sky. Launched in 2008, Clean Sky is a European public-private research program focused on developing technology aimed at reducing CO₂, gas emissions, and noise levels produced by aircraft. The Clean Sky 1 effort has six focus areas: Green Regional Aircraft (led by Leonardo and Airbus), Smart Fixed Wing Aircraft (Airbus and Saab), Green Rotorcraft (Leonardo and Airbus), Sustainable and Green Engines (Rolls-Royce and Safran), Systems for Green Operations (Liebherr and Thales), and Eco-Design (Dassault Aviation and Fraunhofer Gesellschaft). A larger Clean Sky 2 program was launched in 2014 and will run through 2024. This phase is studying improvements to Large Passenger Aircraft, Regional Aircraft, Fast Rotorcraft, Airframes, Engines, Systems, Small Air Transport, and Eco-Design.

Website: <https://www.cleansky.eu/>

CNIM Air Space. In June 2017, Thales Alenia Space acquired a minority stake in the French firm CNIM Air Space (formerly Airstar Aerospace), a manufacturer of airships and flexible structures. Through this strategic partnership, the two companies will be able to address certain technological roadblocks on Stratobus, a project to develop an autonomous High Altitude Platform System (HAPS) type airship. In January 2020, Thales Alenia Space signed a contract with the DGA 'to carry out a concept study concerning intelligence, surveillance, and reconnaissance (ISR) applications using a Stratobus type platform to meet French army operational needs.

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COTECMAR. In April 2015, Colombia's COTECMAR and Thales signed a cooperation agreement. Areas of possible collaboration include naval combat systems, command and control systems, information systems, radars, and sonars.

Dassault Systèmes. In December 2010, Dassault Systèmes – a provider of 3-D and product life-cycle management (PLM) solutions – and Thales signed a system integration alliance. Under this strategic partnership, Dassault Systèmes and Thales agreed to jointly develop PLM environments and deploy them to customers in the aerospace and defense, utility, ground transportation, and public sector industries, initially focusing on France.

Diehl Aerospace. In July 2006, Diehl and Thales enhanced their partnership by merging Diehl Luftfahrt Elektronik GmbH and Diehl Avionik GmbH, of which Thales already held a 49 percent share, into a new company, Diehl Aerospace GmbH. Shareholding remained the same in the new venture, with Diehl holding 51 percent and Thales 49 percent. Diehl Aerospace has facilities in Frankfurt, Nuremberg, Überlingen, and Rostock, and in Sterrett, Alabama, USA.

Website:

<https://www.diehl.com/aviation/en/company/profile>

DRS Sonar Systems. In April 2007, DRS Technologies and Thales North America formed a new joint venture company, DRS Sonar Systems LLC. The company manufactures undersea warfare products and systems under license from Thales and serves as the point of contact for sales and support in the United States. It also develops new underwater systems tailored to U.S. Navy requirements by integrating subsystems from other contractors and Thales' extensive product base.

In January 2011, DRS Sonar Systems acquired Advanced Acoustic Concepts Inc, a privately held company headquartered in Hauppauge, New York. AAC specializes in sonar systems, sonar signal processing, acoustic training systems, and open architecture system and software integration. The combined company conducts business as Advanced Acoustic Concepts LLC, a DRS/Thales Company.

Website: <https://advancedacousticconcepts.com/>

École Polytechnique. In March 2015, Thales and École Polytechnique signed a renewable, four-year scientific partnership agreement to develop a new generation of lasers. The research program, known as X-Can, will capitalize on work conducted by École Polytechnique to apply a new scientific concept

developed by several of its research teams and by Thales researchers in Palaiseau.

Elettronica. In July 2016, Thales and Elettronica signed an MoU to strengthen their industrial and commercial operations and relations in the aerospace and defense business. The aim of the agreement is to explore joint initiatives and pursue growth business opportunities in the electronic warfare segment. Thales holds a 33 percent stake in Elettronica SpA.

Website: <https://www.elettronicagroup.com/group>

EROSS+. In January 2021, the European Commission awarded Thales Alenia Space and its partners a preparation project (phase A/B1) for in-orbit demonstration dedicated to in-orbit servicing space vehicles. Thales Alenia Space will lead this new project, called EROSS+ (European Robotic Orbital Support Services). The consortium includes Thales Alenia Space in France, which will supervise the overall system, contributing to the guidance, navigation, and control functions for this new type of mission; Thales Alenia Space in Italy, the mission design; the German Aerospace Center (DLR), the robotics aspects; GMV (Spain), the robotics autonomy systems; PIAP Space (Poland), gripping mechanisms; and SINTEF (Norway), the software architecture. An in-orbit demonstration is expected by 2026.

Website: <https://eross-h2020.eu/>

ESSOR. In December 2008, a joint venture composed of six major European radio communication suppliers – Elektrobit, Indra, Radmor, Saab, Leonardo, and Thales – was awarded the European Secure Software-defined Radio (ESSOR) contract by OCCAR, acting on behalf of Finland, France, Italy, Poland, Spain, and Sweden. This four-and-a-half-year R&D program, valued at EUR100 million, will define a normative referential for software-defined radio applications in Europe and could become the international standard for radio communications interoperability in coalition operations.

Website: <http://www.occar.int/programmes/essor>

Euro-Art. Formed in 1989, the Euro-Art consortium of Thales, Hensoldt (formerly part of Airbus), and Lockheed Martin is producing the Counter Battery Radar (COBRA) system.

Eurofighter Simulation Systems GmbH. In January 2000, a joint venture company was formed to provide simulation and training for the Eurofighter aircraft. Eurofighter Simulation Systems GmbH is owned by Thales UK, Indra of Spain, CAE GmbH, and Rheinmetall Defense Electronics (formerly STN Atlas Elektronik) of Germany, and Leonardo. The company

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is producing the Eurofighter Aircrew Synthetic Training Aids system, which includes full mission systems, interactive pilot stations, cockpit trainers, and deployable cockpit trainers for the partner nations.

Euromids SAS. This joint venture between Indra, Hensoldt, Leonardo, and Thales designs, develops, and produces radio terminal units. Notable products include the Multifunction Information Distribution System-Low Volume Terminal (MIDS-LVT).

Website: <https://www.euromids.com/>

Eurosam. Eurosam was established in June 1989 by three major European aerospace companies (Aerospatiale, Alenia, and Thomson-CSF – now MBDA and Thales). Eurosam was tasked with developing a naval point defense system and ground-launched air defense system known as the Medium-Range Surface-to-Air Missile, based on common components derived from the MBDA ASTER 15 and ASTER 30 missiles and Thales' Arabel and Alenia's EMPAR radars.

In March 2021, a contract for the development of the SAMP/T NG (New Generation) for France and Italy was signed with Eurosam. The program will provide an enhanced missile to enlarge the ASTER family: the ASTER Block 1 NT (new technology). The missile includes a new seeker and computer able to face emerging threats, an upgraded launcher featuring new electronic equipment, a new multifunction rotating active electronically scanned array radar, a command and control module based on upgraded open command and control software architecture, and enhanced connectivity.

Website: <https://www.eurosam.com>

EuroTorp. The EuroTorp consortium markets MU-90 Impact lightweight torpedoes and A-244/S lightweight torpedo systems in France and Italy as well as internationally. These systems have been selected for French and Italian ships, helicopters, and maritime patrol aircraft. France, Germany, and Italy have jointly ordered some 800 MU-90 Impact torpedoes. The three partners in EuroTorp are Leonardo (50 percent stake), Naval Group (26 percent), and Thales Underwater Systems (24 percent).

Furuno Electric. In July 2008, Thales and Japan's Furuno Electric signed an agreement to develop and market hybrid surveillance systems designed to detect and track small surface targets. Thales and Furuno Electric jointly introduced a new radar, Coastwatcher 10, which provides a high-performance, low-cost solution for short-range maritime surveillance. Coastwatcher 10 combines a standard Furuno FAR-2157 navigation radar with Thales' small target post-processor.

Future Combat Air System. In February 2020, France and Germany awarded Dassault Aviation, Airbus, together with their partners MTU Aero Engines, Safran, MBDA, and Thales, the initial framework contract (Phase 1A), which launches the demonstrator phase for the Future Combat Air System (FCAS). This EUR155 million framework contract covers a first period of 18 months and initiates work on developing the demonstrators and maturing cutting-edge technologies, with the ambition to begin flight tests as soon as 2026.

This phase will, in a first step, focus on the main technological challenges per domains:

- Next Generation Fighter (NGF), with Dassault Aviation as prime contractor and Airbus as main partner, to be the core element of Future Combat Air System,
- Unmanned systems Remote Carrier (RC) with Airbus as prime contractor and MBDA as main partner,
- Combat Cloud (CC) with Airbus as prime contractor and Thales as main partner,
- Engine with Safran and MTU as main partner.

The program was formally begun in February 2019, when France and Germany awarded a two-year, EUR65 million (\$74 million) Joint Concept Study (JCS) contract to Dassault Aviation and Airbus for FCAS, which is known in France as the Systeme de Combat Aerien Futur, or SCAF). Spain joined the program later in the month. The three partners aim to develop the sixth-generation fighter as a long-term replacement for the lead combat aircraft in the French, German, and Spanish air forces between 2035 and 2040. This aircraft will replace the Dassault Rafale and Eurofighter Typhoon fighters currently in service.

The New Generation Fighter (NGF) is to operate in conjunction with a swarm of drones that will serve as both weapons platforms and advanced sensors. These two systems, which are to function together, are collectively referred to as the Next-Generation Weapon System (NGWS). The FCAS program envisions a UCAV operating in conjunction with next-generation combat aircraft as a "loyal wingmen."

The foundation of the partnership was laid in June 2004, when Airbus and Dassault Aviation signed an initial agreement for the joint development of Europe's future combat air system capability. This partnership was further solidified in April 2018 when Airbus and Dassault agreed to develop a successor to Germany's Eurofighter and France's Rafale fighters. Missing from the partnership was BAE Systems, which had been

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working with Dassault on a UCAV feasibility study – also named FCAS (see entry above) – since late 2014. Currently, a BAE Systems-led team is researching the Tempest, a proposed stealth fighter aircraft aimed at replacing Eurofighters for the Royal Air Force (see Team Tempest entry below).

In November 2020, FCMS, Indra, and Thales were given the go-ahead to start designing the sensor suite for the FCAS. France's DGA, on behalf of Germany, Spain, and France, signed the contract with Indra as leader of the consortium in order to incorporate the sensors as part of the Phase 1 contractual framework.

Future Combat Air System (UCAV). This was an Anglo/French effort focused on development of a future unmanned combat air system (UCAS/UCAV). In March 2016, the next phase of this program was launched under a GBP1.5 billion (\$2.2 billion) agreement between France and the U.K. The FCAS built on the U.K.'s Taranis unmanned combat air vehicle program and the pan-European Neuron UCAV project led by Dassault Aviation. The Anglo/French companies involved – BAE Systems, Dassault, Leonardo, Rolls-Royce, Safran, and Thales – have completed work on a two-year cooperative FCAS Feasibility Phase study under a EUR150 million contract awarded in November 2014. As part of the feasibility phase, Thales and Leonardo defined the multifunction sensor suite and communications subsystems. Rolls-Royce and Safran evaluated the aircraft's propulsion system.

In April 2018, France and Germany gave the go-ahead to develop a new manned fighter aircraft as part of the Future Combat Air System (FCAS) program. With the formation of this effort (detailed below), British and French sources said in November 2018 that all work on a joint UCAV had stopped. Work on this program will likely be rolled into the new FCAS program as this effort envisions a UCAV operating in conjunction with the new fighter aircraft.

FüWES K13. In June 2018, this consortium of Atlas Elektronik and Thales Deutschland was selected to deliver the combat system of the German Class K130 Corvette. Atlas Elektronik is responsible for the operational software and Thales for the IT secure combat system infrastructure. The order comprises five corvettes as well as the Test and Training Centre (EZ/BUZ) in Wilhelmshaven.

General Dynamics. In February 2011, Thales Australia and General Dynamics Ordnance and Tactical Systems (GD-OTS) signed a long-term strategic agreement to cooperate on the Australian ordnance market. Under the 10-year agreement, General Dynamics will transfer technology to Thales in Australia, and Thales will "leverage its U.S. partner's

expertise to focus on delivering maximum value to Australian defense through its existing munitions contracts."

In 2018, Thales Australia became a part of the GD-OTS international supply chain, enabling coproduction and technology transfer for a variety of critical munitions products.

In June 2019, GD-OTS was awarded a \$15 million contract for the prototype and process development of a 155mm XM1113 Rocket-Assisted Projectile Round.

Gibson Dunn. In April 2018, Thales and Gibson Dunn announced they would be combining their technical and legal expertise in a new partnership designed to help businesses and other organizations to meet their data security and protection challenges more effectively. Gibson Dunn is a business law firm with an in-house Digital & Innovation practice experienced in data protection and cybersecurity. Tailored to the new European General Data Protection Regulation (GDPR), both parties will help businesses and other organizations become compliant with the new regulation. GDPR provides a strict framework designed to enhance peoples' rights and provide them with better visibility of and control over their personal data and how their data is collected and used.

Gryf Program. This is a Polish program to procure an armed UAS capability for Poland's armed forces. In September 2015, Thales teamed with Poland's WB Electronics to offer a system based on the Watchkeeper system. The WB Electronics/Thales solution will integrate a surveillance capability with the strike capability of the Thales FreeFall Lightweight Multirole Missile (FFLMM) on a single platform. The Polish Armament Group with Elbit Systems is offering a competing bid featuring the Hermes 450. Poland is looking to acquire 12 Gryf systems, each with four aircraft and a ground control station.

GTDAR. The GTDAR consortium – composed of Leonardo, Airbus, and Thales – produced the Active Multirole Electronically Scanned Array Radar (AMSAR).

Hellenic Space Agency. In July 2019, Thales Hellas, Thales Alenia Space, and the Hellenic Space Agency (HSA) signed an MoU covering space cooperation. This MoU will focus on Earth observation. The objective of this MoU is to foster cooperation between HSA, Thales Alenia Space, and Thales in the context of national, European, and international space programs, with a view to maximizing the role of Greece's industry and scientific community.

Indonesian Digitized Armored Vehicle. In November 2016, Thales, PT Pindad, and PT Len

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partnered to develop a C5I vehicle mission system. The three firms will combine their respective expertise in vehicles, tactical communications, and command and control, as well as electronic equipment and systems integration, to develop a new vehicle information system designed for combat.

Inzpire. In July 2016, Inzpire and Thales signed an MoU to deliver joint mission training services to international air forces. Under the teaming arrangement, the companies will be pursuing new business opportunities in the U.K. and on the international market.

Israel Aerospace Industries. In April 2021, Israel Aerospace Industries (IAI) and Thales UK joined forces to offer Sea Serpent anti-ship missile for the Royal Navy's Type 23 frigates. The U.K. Ministry of Defence is looking for a system to fulfill its ship-launched Interim Surface-to-Surface Guided Weapon (I-SSGW) requirement.

ISS Reshetnev. In February 2013, Thales Alenia Space and ISS Reshetnev signed an agreement for the creation of a joint venture between their two companies. The new company, incorporated under Russian law and with ISS holding a majority stake, will be based in Krasnoyarsk, Russia. It marks the first phase of the bilateral collaboration targeted by the MoU the companies signed in November 2011. The jointly owned company will initially focus on the production of equipment for use on Russian telecommunications satellites. It will then work on the development of new products for satellites, enabling it to more completely address the requirements of both Russian and international markets. Russian Satellite Communications Company (RSCC) ordered two satellites, Express-80 and Express-103, from the joint venture in December 2016. The satellites were launched in July 2020.

Joint Fires Synthetic Training. In March 2018, Thales and Cubic Global Defense (CGD) teamed to bid for the U.K.'s Training and Simulation Systems Programme (TSSP) Joint Fires Synthetic Training project. JFST looks to improve training capabilities delivered to the British Army by providing an immersive Joint Fires (JF) solution to train JF integrators in both mounted and dismounted roles – across land, littoral, and air domains at the individual and collective levels. The U.K. selected Elbit Systems UK's wholly owned subsidiary, Ferranti Technologies, for the JFST program in August 2019.

Junghans Microtec GmbH. In June 2006, Diehl and Thales formed Junghans Microtec GmbH. The joint venture (Diehl 55 percent and Thales 45 percent) focuses on precision mechanics, electro-mechanics,

electronics, and pyrotechnics as well as materiel technologies in the areas of fuzes and ignition systems. Junghans T2M is a French subsidiary of Junghans Microtec.

Kalyani Group. In April 2019, Thales Australia and India's Kalyani Group teamed to pursue an Indian requirement for close-quarter battle (CQB) carbines. The companies will offer a variant of Thales' F90 assault rifle, which will be built in India by the Kalyani Group if the bid is successful. The long-delayed Indian requirement is reportedly for around 350,000 rifles, to be delivered over five years.

LAND 159/LAND 4108. In December 2019, Thales signed MoUs with Australia's AMOG Consulting, GRA, and Eclipse as part of its bid for the LAND 159/LAND 4108 Program. This program is for the acquisition and through life support of small arms (LAND 159) and direct fire weapons support systems (LAND 4108). Other Thales partners include Belgium's FN Herstal. Competitors reportedly include NIOA and Babcock Australia. NIOA won the first stage of the LAND 159 Lethality Systems Project in mid-2020.

Lockheed Martin. In April 2021, Lockheed Martin and Thales Australia finalized a teaming agreement advancing the delivery of an Australian guided weapons manufacturing capability in support of a sovereign national guided weapons enterprise. The agreement will see Lockheed Martin and Thales Australia cooperate in the design, development, and production of Lockheed Martin's Long Range Anti-Ship Missile – Surface Launch (LRASM SL) variant, with a specific focus on booster and rocket motor technologies.

Lynred. In June 2019, Sofradir was merged with Thales' Ulis subsidiary to form a new company, Lynred. Sofradir, formed in December 2012, has been a joint venture between Safran and Thales, which are equal (50/50) shareholders. According to the company, Lynred was created to respond to a need for an all-inclusive infrared (IR) product offering to the global aerospace, defense, industrial, and consumer markets. Lynred is a supplier of IR detectors to the optronics industry. Its technologies are used for a wide range of commercial and military applications, particularly night vision equipment.

Website: <https://www.lynred.com>

Maritime Airborne Warfare System (MAWS). This is development program, set to be undertaken jointly by France and Germany post-2025, with an eye on achieving a new maritime patrol capability by 2030. The two countries signed a letter of intent (LOI) to develop this capability at the ILA exhibition in Berlin in April 2018, and they have already agreed to award

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manufacturers with a two-year common requirements study determining the technical and financial elements involved. The partner nations plan to select a European platform for MAWS in 2023. Airbus is planning to offer the A320neo as the platform. The effort will also likely include participation from Dassault, Hensoldt, Safran, and Thales.

Microsoft. In June 2018, Thales and Microsoft announced a preferred partnership for the development of a common Defence Cloud solution for armed forces. The solution that will be jointly developed is based on the Microsoft Azure Stack platform, a services-oriented and flexible hybrid cloud environment that will be fully cyber-secured and adapted to military resilience constraints by Thales.

Mitsubishi Heavy Industries. In March 2021, Thales and MHI joined forces to develop a dual frequency sonar demonstrator to be evaluated at sea both in Japanese and French waters. Thales will provide its expertise in sonar processing as well as its latest generation high frequency synthetic aperture sonar, SAMDIS, with multiaspect capability. MHI will provide its low frequency synthetic aperture sonar and the OZZ-5 Autonomous Underwater Vehicle (AUV). This agreement begins a five-year project for design, development, and integration of the dual frequency synthetic aperture sonar processing and at-sea experiments.

MKU. In April 2018, Thales and MKU Limited signed two MoUs for strategic cooperation in the development and production of optronic devices and an F90 close quarter battle (CQB) rifle for soldiers. Thales and MKU will codevelop the optronic devices. Both the optronic devices and the F90 rifles will be manufactured in India at MKU's facilities in Kanpur, Uttar Pradesh.

MSubs. In December 2018, Thales and MSubs teamed to develop autonomous underwater systems. The agreement follows Thales' October opening of a new U.K. maritime autonomy center in southwest England. Thales has invested GBP1 million in the Turnchapel Wharf facility to build its position in the emerging autonomous systems market.

Nammo. In June 2011, Thales Australia and Nammo signed a long-term strategic agreement to cooperate in the ordnance market. The 10-year agreement expands on many years of cooperation between the two companies and builds on a 2010 commitment the firms made to work together on ammunition for the F-35 fighter program – particularly on the Armor Piercing Explosive (APEX) Norwegian ammunition concept. The agreement also covers Nammo's Reduced Ricochet Risk training round and Thales' armor-piercing fragmenting and incendiary ammunition round.

Naval Group. In December 2011, Thales exercised its option to increase its participation in the capital of Naval Group (then called DCNS) to 35 percent. Thales has had this option since it acquired a 25 percent stake in Naval Group in 2007. According to the company, this decision followed on the increasingly close partnership between the two companies since 2007 as well as the successful cooperation between Thales and Naval Group in France and in export markets.

Under the original March 2007 agreement, then-DCN acquired Thales' naval businesses in France (with the exception of its naval equipment businesses) and became the sole shareholder of Armaris and MOPA2, the prime contractor for France's PA2 future aircraft carrier program. In return, Thales received a 25 percent stake, with an option to increase its stake to 35 percent over the following two years, which it executed. Today, Naval Group's capital is held by the French state (62.25 percent), Thales (35 percent), current and former staff (1.88 percent), and the company itself (.86 percent).

Website: <https://www.naval-group.com>

NCOIC. In October 2004, Thales became a member of the Network-Centric Operations Industry Consortium. NCOIC serves as an industry-wide collaborative forum to help systems and platform developers integrate sensors and communications and information systems within a global network-centric environment. In addition to Thales, founding members of NCOIC include Airbus Group, BAE Systems, Boeing, CACI International, Carrillo Business Technologies, Cisco Systems, EMC, Ericsson, Factiva, Finmeccanica (now Leonardo), General Dynamics, Hewlett Packard, Honeywell, IBM, Innerwall, L-3 Technologies, Lockheed Martin, Microsoft, Northrop Grumman, Oracle, Raytheon, Rockwell Collins, Saab, SAIC, Smiths Aerospace, and Sun Microsystems (now Oracle).

Website: <https://ncoic.org>

NEHS Digital. In October 2020, Thales and NEHS Digital joined forces to speed up the hospital admissions process during the COVID-19 crisis with new technology. The partners will develop an AI-based solution to analyze CT imagery of the chest and lungs. As soon as the images are taken, the AI service will make an initial recommendation, including a preliminary diagnosis and assessment of the level of criticality of any lung damage, so medical staff can effectively triage the patient.

Nexter. In October 2020, Thales and Nexter were selected to equip future French naval ships with its RAPIDFire system. The system consists of a remote-controlled turret armed with the stabilized CTAI 40mm

Thales

Cased Telescoped Armament System (CTAS) developed by CTAL, the international subsidiary of Nexter Systems and BAE Systems. First delivery is scheduled for 2022.

OEM Defence Services. In June 2009, Diehl Aerospace, Liebherr-Aerospace, Safran, Thales, and Zodiac Aerospace (since acquired by Safran) officially opened OEM Defence Services, which was formally registered in France in October 2008. OEM Defence Services represents an alliance of major European equipment manufacturers that provides integrated industrial support solutions to meet the specific needs of national armed forces. According to the partners, OEM Defence Services was initially designed to provide innovative support contracts for a wide range of equipment and systems on board the NH90 and Tiger helicopters and the A400M military transport aircraft.

Website: <https://www.oemds.com/>

Optrolead. In July 2012, Safran Electronics & Defense and Thales created Optrolead, an equally owned optronics joint venture. The new company is focused on several major programs, including the optronic payload for the planned upgrade of the French Navy's Atlantique 2 (ATL2) maritime patrol aircraft; the imaging system for the future French-British medium-altitude, long-endurance (MALE) drone; modular optronic systems for Army combat vehicles; and optronics for upcoming helicopter programs. The formation followed the signing of an MoU between the two firms in December 2011. This transaction is part of the optronics partnership between Safran and Thales that was also signed in December 2011.

PT Len. In April 2019, Thales and PT Len signed an MoU to jointly support air defense radars used by the Indonesian Air Force.

Reliance Defence. In June 2017, Thales and Reliance Defence Limited announced plans to form an Indian joint venture (JV) with a shareholding of 49 percent and 51 percent, respectively. The new venture will be the focus of Thales' offset commitment as part of India's Rafale contract, which is intended to develop Indian capabilities to integrate and maintain radar and electronic warfare sensors. India approved the venture in February 2018.

Rheinmetall. In January 2020, Rheinmetall Waffe Munition and Thales teamed to provide 70mm (2.75") rocket systems for the German market. The team groups will initially propose capabilities for the Tiger MK3 attack helicopter program.

Safran. In June 2005, Thales and Safran Electronics & Defense signed a preliminary agreement to create an equally owned joint venture for Dassault combat

aircraft, excluding the Mirage 2000 and Rafale. Thales agreed to provide expertise in onboard radars, electronic warfare, communications, and laser designation pods. Safran Electronics & Defense would add its expertise in navigation and mission planning systems, mission computers, mission software and integration, and new-generation weapon deployment. Opportunities exist for upgrading several dozen earlier-generation Mirage aircraft from various nations' air forces. The partnership is known as the ASTRAC (Association Sagem Thales pour la Rénovation d'Avions de Combat) consortium. ASTRAC's first contract was the Moroccan Mirage F1 upgrade, which began in 2009.

Samtel-Thales Avionics. In April 2009, the Indian government approved a new Thales and Samtel Display System joint venture, called Samtel-Thales Avionics Ltd, to develop and locally produce helmet-mounted sight and display systems. Thales holds a 26 percent stake in the venture.

Schneider Electric. In October 2013, Thales and Schneider Electric signed a commercial cooperation agreement for the development of cybersecurity solutions and services to protect command and control systems from cyberattacks. Schneider Electric and Thales will initially work together to offer these joint solutions to French companies.

SCORPION Program. In September 2020, France's DGA placed a contract to build the GRIFFON and JAGUAR engines for the SCORPION program. The DGA thus confirms the delivery of 42 JAGUAR and 271 GRIFFON engines for the years 2022 and 2023, as scheduled in the 2019-2025 military programming law. Among the new features, this tranche includes the delivery of the first GRIFFON Artillery Observation Vehicles (VOA) and GRIFFON Sanitary (SAN), which will join the Troop Transport Vehicle (TTV) and Command Post Vehicle (CPV) versions.

In December 2019, the DGA placed its sixth contract, known as MEPAC2, under the SCORPION program. The consortium of Nexter, Arquus (formerly Renault Trucks Defense), and Thales will deliver 54 additional Griffon multirole armored vehicles (VBMR3) equipped with Thales' 120-mm 2R2M (Rifled Recoiled Mounted Mortar) system.

The SCORPION program involves the upgrade and/or replacement of the bulk of the French Army's aging ground vehicle fleet with new armored vehicles. This program includes a 24.5-ton heavy VBMR (referred to as the Griffon in Army service), a 10-ton light VBMR, and the EBRC (Engin Blindé de Reconnaissance et de Combat) dubbed Jaguar. Originally awarded in December 2014, the EUR5 billion SCORPION vehicle and communications modernization program plans the

Thales

delivery of 1,872 Griffons to the French army through 2025.

Thales is in charge of the vetronics subsystem and will develop and manufacture the SCORPION common vetronics solution, communication solutions, including the intercom system, perimeter vision system, self-protection suite, and navigation system for all variants. The vetronics network is designed to support the future Contact software-defined radio system, the SCORPION forward information system (SICS), and the Atlas artillery system, developed under separate contracts. The program also involves Safran for optronics and the Jaguar's weapons fit, CTA International for the 40mm gun, and MBDA for the MMP medium-range missile.

Shanghai AVIC. In November 2014, Thales and Shanghai AVIC (SAVIC) signed an MoU confirming their partnership to provide joint solutions to the Chinese helicopter market. Thales will bring its latest certified helicopter avionics skills and technologies, while SAVIC will provide local expertise of systems integration, software development, customer support, and through-life services. The joint solution will be based on Thales' TopDeck certified helicopter avionics.

Software République. In April 2021, Atos, Dassault Systèmes, Groupe Renault, STMicroelectronics, and Thales announced their intention to join forces to create the Software République, a new ecosystem for innovation in intelligent mobility. By pooling their complementary expertise, the partners plan to develop and market together systems and software to provide an enriched and sustainable mobility offer for cities, regions, businesses, and citizens. Three main areas of cooperation have been identified: intelligent systems to facilitate secure connectivity between the vehicle and its digital and physical environment; simulation and data management systems to optimize flows for territories and companies; and energy ecosystems to simplify the charging experience.

Space Alliance. Founded in 2005, this is a strategic partnership between Leonardo and Thales. It includes two joint ventures: Telespazio (Leonardo 67 percent, Thales 33 percent) and Thales Alenia Space (Thales 67 percent, Leonardo 33 percent).

In March 2018, the Space Alliance took a minority stake in Seattle-based Spaceflight Industries. BlackSky, the geospatial intelligence company of Spaceflight Industries, is now fulfilling its vision to deploy a high revisit rate Earth imaging constellation that, when combined with other space- and terrestrial-based sensors, will enable the delivery of innovative global monitoring solutions and geospatial activity-based intelligence products and services.

Steyr Mannlicher. In January 2012, Thales Australia and Steyr Mannlicher signed an agreement to cooperate on global market opportunities. Under the agreement, the two companies will continue their cooperation in military markets, with Thales Australia taking the formal lead in Australia and New Zealand. Steyr Mannlicher is the original designer of the Australian Defence Force's F88 assault rifle, which Thales Australia manufactured and subsequently developed further.

Team Tempest. Lead by BAE Systems and including Leonardo, MBDA, Rolls-Royce, and the RAF's Rapid Capabilities Office, this team is developing the Tempest concept for the U.K.'s Future Combat Air effort. The British MoD's aim is to develop a sophisticated future fighter to replace the RAF's Eurofighter fleet in the 2040s, at which time they will serve alongside the F-35 Lightning II combat aircraft.

The Team Tempest joint program office will spearhead development of a new design by 2025. This phase will be underwritten by GBP2 billion (\$2.6 billion) in funding technology originally committed under the 2015 Strategic Defense and Security Review (SDSR). According to government and industry officials, the Tempest aircraft is necessary to sustain the U.K.'s combat aerospace sector. The Tempest is intended to enter service around 2035, replacing the Eurofighter Typhoon.

A full-scale model of the Tempest was shown at the 2018 Farnborough Air Show. In September 2019, the partners signed a Statement of Intent that will see the parties work together to define a concept and partnership model. In July 2020, the U.K. selected seven other companies to support Team Tempest: Bombardier Belfast, Collins Aerospace Systems, GE Aviation UK, GKN Aerospace, Martin-Baker, QinetiQ, and Thales UK.

Thales UK will design and develop the "digital ecosystem" of the platform.

In July 2020, Italy and Sweden entered into formal discussions with the U.K. on the program. The new trilateral framework sees industry from the three nations bringing together their skills and expertise in the combat air sector to collaborate on the research and development effort. The three national industries comprise companies from the U.K. (BAE Systems, Leonardo UK, Rolls Royce and MBDA UK), Italy (Leonardo Italy, Elettronica, Avio Aero and MBDA Italia), and Sweden (Saab and GKN Aerospace Sweden). This framework is another step on the path towards a full agreement between these national

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industries to formalize areas of joint collaboration on future combat air systems development.

Website: www.raf.mod.uk/what-we-do/team-tempest/

Telespazio. Created in July 2005, this joint venture between Leonardo (67 percent) and Thales (33 percent) concentrates on operations and services for satellite solutions, including Earth observation, satellite navigation, and integrated networks for multimedia telecommunications, integrated connectivity, and added value. It is headquartered in Rome, with plants in Italy, France, and Germany.

Website: <https://www.telespazio.com>

Thales Advanced Solutions. In February 2009, Thales and C4 Advanced Solutions (C4AS), an Emirates Advanced Investments subsidiary company, created a joint venture in Abu Dhabi named Thales Advanced Solutions. The joint venture has developed an expertise in four business segments: SATCOM, Radar, Radio/Network, and Support. Thales holds a 49 percent stake and C4AS holds the controlling 51 percent share.

Thales Kazakhstan Engineering. In September 2011, the joint venture company Thales Kazakhstan Engineering (TKE) was established in Almaty, Kazakhstan, by Thales and Kazakhstan Engineering to produce tactical radio units. At this facility, TKE produces the VHF PR4G F@stnet and HF Skyf@st families of software radio products for the Kazakh armed forces.

ThalesRaytheonSystems. In July 2016, the ThalesRaytheonSystems joint venture was restructured to focus solely on NATO agencies and NATO member nations for the delivery of the Air Command and Control System, Theater Missile Defense, and Ballistic Missile Defense (ACCS). Moving forward, the ground-based radars and non-ACCS-related air command and control systems currently within the joint venture portfolio will transition to their parent companies.

The former TRS LLC - U.S. Operations is now a wholly owned subsidiary of Raytheon Technologies, Raytheon Command and Control Solutions.

The former TRS SAS - French Operations is now a wholly owned subsidiary of Thales.

Because of the transaction, Raytheon made a cash payment to Thales for \$90 million.

The venture was originally formed in December 2000 to encompass air defense/command and control centers and ground-based air surveillance and weapons-locating radars. The enterprise had operating subsidiaries in Fullerton, California, and the greater Paris metropolitan area.

Website: <https://www.thalesraytheon.com/>

Thales Software India. In June 2014, L&T Technology Services, a wholly owned subsidiary of Larsen & Toubro Ltd (L&T), purchased 74 percent of the equity capital of Thales Software India Pvt Ltd, the Indian subsidiary of Thales. With this transaction, L&T Technology Services will manage and oversee the management and operations of the new joint venture. The joint venture brings together the strategic strengths of both groups. By retaining a 26 percent equity stake, Thales will help the company develop the latest trends in the avionics industry.

Transas Marine. In October 2012, Thales Germany and Transas Marine International signed a cooperation agreement to develop and market a full warship trainer. This modular simulation solution, which will be offered in various configurations, creates a virtual simulation of an entire warship for training purposes. It encompasses the ship's control from the bridge, the work in the engine room, combat management system training, realistic door gunner exercises for helicopter missions, and weapons training for boarding teams.

Yahsat. In September 2011, Thales and UAE-based Al Yah Satellite Communications Company (Yahsat) signed an MoU to offer highly secure satellite communication services to military forces and government agencies. Through this MoU, Thales and Yahsat established the principles of a technical and commercial cooperation to offer a customized, secure ground satellite communications capability. Specifically, Yahsat provides its Ka-band satellite resource, and Thales provides its associated ground segment secure solutions.

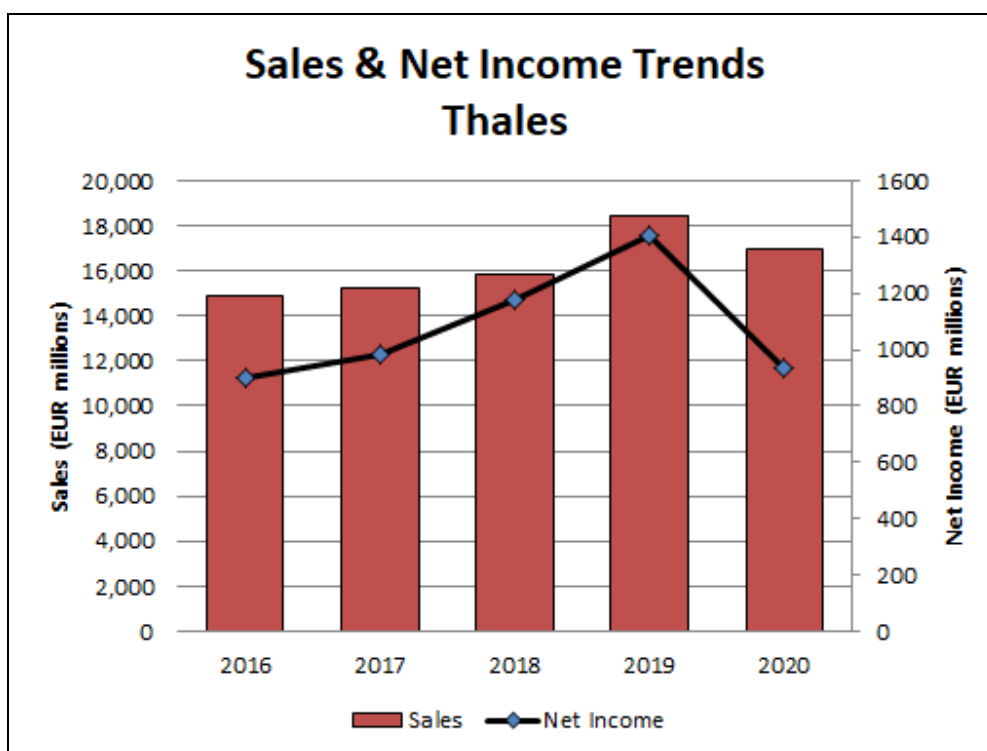
Financial Results/Corporate Statistics

For 2020, Thales reported sales of EUR17.0 billion, down 7.7 percent from EUR18.4 billion in 2019. Thales posted net income of EUR937 million, compared with net income of EUR1.4 billion in 2019. Latest available year statistics, restated to the company's current presentation, are provided below. R&D figures are for company-sponsored research only. The jump in employees was due to the completion of the Gemalto acquisition in April 2019. U.S. dollar figures are translated as of December 31, 2020, at the rate of EUR1 = USD1.22824.

Thales

Thales (EPA: HO)

(EUR millions)	2016	2017	2018	2019	2020	(USD) 2020
Net Sales	14,885	15,228	15,855	18,401	16,989	20,867
Net Income	897	982	1,178	1,405	937	1,151
R&D Expenditures	731	797	879	1,097	1,025	1,259
Backlog (Order Book)	33,530	32,064	32,329	33,839	34,430	42,289
Long-Term Debt	1,434	954	2,409	4,306	5,210	6,399
Shareholder Equity	4,640	5,139	5,925	5,682	5,310	6,522
Debt-to-Equity Ratio	.30	.18	.40	.76	.98	-
Employees	63,783	64,860	66,135	82,605	80,702	-



Industry Segments

An approximate breakdown of Thales' sales by business segment for the past five years is provided below. Totals may have been rounded.

SALES	2016	2017	2018	2019	2020
(EUR millions)					
Aerospace	5,812	5,747	5,780	5,595	4,217
Transport	1,603	1,723	2,001	1,910	1,618
Defense and Security	7,383	7,690	7,828	8,265	8,085
Digital Identity and Security	-	-	192	2,551	2,992
Other and Eliminations	87	67	55	79	77
TOTAL	14,885	15,227	15,856	18,401	16,989

Thales

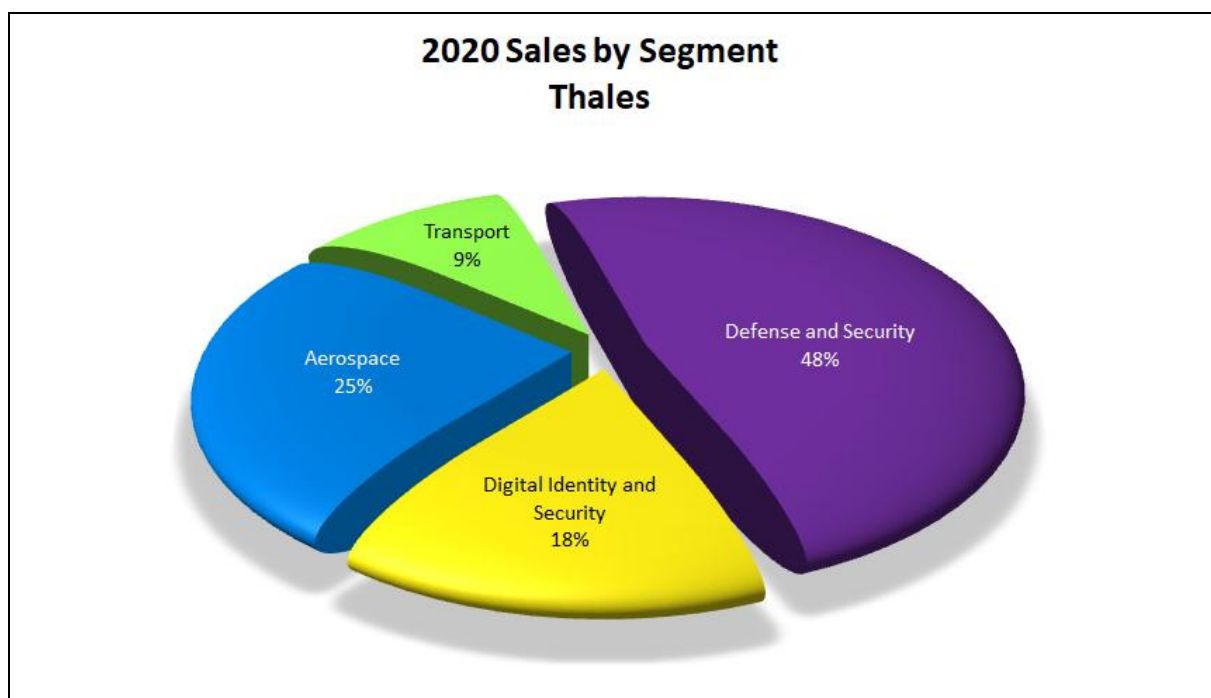
OPERATING INCOME	2016	2017	2018	2019	2020
(EUR millions)					
Aerospace	571	567	580	521	-76
Transport	11	57	88	56	86
Defense and Security	788	757	992	1,153	1,039
Digital Identity and Security	-	-	15	264	324
Other and Eliminations	-16	-48	-53	-50	-21
TOTAL	1,354	1,333	1,622	1,944	1,352

Segment Details

Below is a breakdown of key financial data for the company's major business segments for the past five years.

AEROSPACE	2016	2017	2018	2019	2020
(USD millions)					
Order Intake	5,872	5,237	5,346	4,829	3,822
Net Sales	5,812	5,747	5,780	5,595	4,217
Operating Income	571	567	580	521	-76
Backlog	9,914	8,260	7,985	7,306	6,591
Employees	18,741	18,722	18,497	18,559	17,519
TRANSPORT	2016	2017	2018	2019	2020
(USD millions)					
Order Intake	1,503	1,781	1,858	1,751	1,652
Net Sales	1,603	1,723	2,001	1,910	1,618
Operating Income	11	57	88	56	86
Backlog	4,567	4,289	4,144	4,076	3,918
Employees	6,812	7,005	7,753	7,724	7,945
DEFENSE AND SECURITY	2016	2017	2018	2019	2020
(USD millions)					
Order Intake	9,052	7,857	8,775	9,906	9,922
Net Sales	7,383	7,690	7,828	8,265	8,085
Operating Income	788	757	992	1,153	1,039
Backlog	18,964	19,451	20,012	21,774	23,245
Employees	33,282	34,011	34,677	30,984	30,451
DIGITAL IDENTITY AND SECURITY	2016	2017	2018	2019	2020
(USD millions)					
Order Intake	-	-	205	2,572	3,023
Net Sales	-	-	192	2,551	2,992
Operating Income	-	-	15	264	324
Backlog	-	-	119	588	589
Employees	-	-	-	15,347	14,737

Thales



Geographic Area

An approximate breakdown of Thales' sales by country/region is provided below.

SALES	2016	2017	2018	2019	2020
(EUR millions)					
France	3,581	3,700	3,985	4,461	4,229
United Kingdom	1,272	1,327	1,253	1,297	1,180
Rest of Europe	3,227	3,313	3,498	4,040	4,024
U.S. and Canada	1,556	1,392	1,367	2,102	1,952
Australia and New Zealand	759	838	858	958	990
Asia	2,048	2,156	2,297	2,642	2,310
Middle East	1,887	1,569	1,647	1,601	1,201
Rest of the World	554	932	950	1,301	1,104
TOTAL	14,884	15,227	15,855	18,402	16,990

Major Competitors

Thales' broad portfolio of products and services competes against the products and services of other large aerospace, defense, and information technology companies as well as numerous smaller competitors. In aerospace, its competitors include CAE, Honeywell, Lockheed Martin, Panasonic Avionics, Raytheon Technologies, and L3Harris. In space systems, Airbus Group, Boeing, Lockheed Martin, Maxar, OHB, and Northrop Grumman.

In defense markets, competitors include Atlas Elektronik, Hensoldt, Elbit Systems, Harris, General Dynamics, Lockheed Martin, L3Harris, Raytheon Technologies, Rhode & Schwarz, Leonardo, Saab, Terma, BAE Systems, Rheinmetall, Krauss-Maffei Wegmann, Nexter, Hanwha, Bittium, Aselsan, and the China Aerospace Science and Technology Corporation. In the security sector, Airbus D&S, Boeing, Northrop Grumman, Honeywell, Siemens, Johnson-Tyco, IBM, Atos, and Capgemini. In cybersecurity, competing companies include RSA, Atos, BAE Systems, Ultra Electronics, Airbus D&S, and Secunet.

Thales

Strategic Outlook

Thales, while heavily impacted by the COVID-19 crisis, responded quickly and was able to weather the worst of the pandemic with aplomb.

The company was helped along by strong government support and success in the space and defense markets. In space, Thales recorded several orders for missions for the Copernicus program and exploration missions to the moon and Mars. Defense programs, which have consistently been strong during the crisis, performed admirably, with the company landing one of the largest contracts in its history: the development of mission systems for the German Navy's future F126 frigates.

Early in the crisis, the French government responded with a EUR15 billion stimulus plan to save jobs. In addition, the rescue package will ramp up investment in emerging technologies such as electric and hydrogen power.

The program aims to shore up major companies that are considered national assets, such as Airbus, Dassault, Safran, and Thales, while helping hundreds of smaller

subcontractors throughout the country. The country wants to preserve aviation skills in order to prevent decline and better compete with Boeing and a new potential rival in China's COMAC.

Prior to the pandemic, Thales had been focusing on operations at home and expanding abroad via teaming and joint ventures. With tensions high in many regions of the world, the drive to maintain defense has risen as well. Sales to Asia, the Middle East, and various emerging markets continue to show stability, thanks in large part to coattail wins on the Dassault Rafale in the Middle East and India and Naval Group submarines in Australia.

Despite this growth, Thales faces stiff competition from other Western manufacturers that are following suit. Price competitiveness and a willingness to team and provide offsets will be key to the company's ability to succeed in this environment. Thales has proven its willingness to partner, and this could be a mitigating factor in future competitions.

Prime Award Summary

Thales did not rank on the U.S. Federal Procurement Top 100 Contractors Report (<https://beta.sam.gov/reports/awards/static>). Information on the company's Federal contracting can be sourced from the database of www.USAspending.gov – the official U.S. government source for data on federal awards. Individual contract awards are listed in the U.S. Contract Awards section of this report (below).

Program Activity

Some important aerospace and government programs currently underway at Thales are listed below. The briefs are intended to provide a listing of programs that are of major importance to the company. For detailed information on or analysis of specific aerospace and defense programs or equipment, please refer to the applicable Forecast International service (for example, *Civil Aircraft*, *Military Aircraft*, *Military Vehicles*, *Warships*, *Missiles*, *Electronic Systems*, and *Aviation Gas Turbines*). The following is a list of the company's business interests:

- Defense Electronics
- ASW
- Avionics
- C4I Systems
- Electro-Optical Systems
- Electronic Warfare
- Radar
- Missiles
- Ordnance Systems
- Systems Integration
- Training Systems
- Unmanned Vehicles
- Warships

Thales

Electronic Programs

(ASW)

AQS-22 ALFS

The AQS-22 Airborne Low Frequency Sonar (ALFS) is a U.S. Navy helicopter-borne low-frequency active / passive dipping sonar used to locate, identify, and track submarines. Thales Underwater Systems is the program subcontractor for the Folding Light Acoustic System for Helicopters (FLASH) sonar, the expandable sonar array, and the reeling winch subsystem.

Kariwara

The Kariwara system provides the Royal Australian Navy with a passive towed array for detecting and tracking submarines. It is deployed on the Royal Australian Navy's Collins class submarine. This baseline technology has now been implemented under a variety of military and civilian program names. Thales Underwater Systems is the prime contractor.

MU-90

This is a lightweight acoustic homing torpedo produced by the Eurotorp consortium.

SSQ-32

This is an advanced surface ship minehunting search and classification variable-depth sonar. Advanced Acoustic Concepts (ACC), a DRS/Thales Company is a contractor on this system. Raytheon and Thales have teamed for shallow-water enhancements to the system. Future procurement likely to be for upgrade kits for earlier versions still in service.

SSQ-89(V)

The SSQ-89(V) is a surface ship combat system designed to search for, detect, classify, localize, and track undersea contacts. It also has the capability to engage and evade submarines, mine-like small objects, and torpedo threats. Advanced Acoustic Concepts Inc (ACC), a DRS/Thales Company, provides Scaled Improved Performance Sonar (SIPS) updates and support.

SSQ-955 HIDAR

The SSQ-955 HIDAR (High Instantaneous Dynamic Range) is an all-digital, dual-mode, directional passive sonobuoy. Its technology is based on the Directional Frequency Analysis Recording (DIFAR) sensor sonobuoy. HIDAR comes in a lightweight "G" size package and is primarily deployed from helicopters. Thales Underwater Systems and Ultra Electronics Maritime Systems produce the system.

Surface and Shallow Water

Mine Countermeasures

This program is aimed at developing ways to combat the threat of known and projected foreign mines against U.S. naval and merchant shipping in harbors, channels, choke points, sea lines of communications, and amphibious and other fleet operating areas. Thales is one of many program participants.

TSM-2233/UMS-3000/S-Cube

This is a fully integrated submarine-mounted active / passive sonar suite for the detection, localization, and identification of contacts. These systems have been deployed on board a number of diesel-electric submarines, including the British Upholder class; the Chinese Ming class; the Dutch Walrus class; the French, Spanish, and Pakistani Agosta class; and the Australian Collins class. It also equips the French Rubis class nuclear fast attack submarines. Older designations, such as Eledone and the TSM-2233, are being retired in favor of UMS-3000 and S-Cube.

Type 2076

The Type 2076 sonar is a fully integrated passive/active search-and-attack sonar suite scheduled for the Astute class submarine and the midlife update of the Trafalgar class submarine. An advanced technology Type 2076 will likely be installed on the Dreadnought class SSBN(R). Thales Underwater Systems is the prime contractor.

Type 2087

This is an integrated sonar suite for surface ships, used to counter the threat of diesel-electric submarines operating in littoral waters. The contract for the Type 2087 was awarded to Thales Underwater Systems in April 2001. Initial Type 2087 sonar production ended with the delivery of 10 systems, eight of which are full sea-based systems. The remaining two were shore-based sets: one for a shore integration facility and one to train operators and maintainers. Future U.K. Royal Navy Type 26 frigates are to be equipped with Type 2087. Down the road, the systems may be installed on future U.K. Royal Navy Type 31 General Purpose Frigate (GPFF).

Type 2093

The Type 2093 sonar was developed to detect and classify all forms of underwater mines – including self-propelled mines, which are often located at greater depths than other mines are. There are no outstanding orders for the Type 2093 at this time. Future activity is likely to consist of upgrades and modernization and the provision of spares.

Thales**UMS-4100/UMS-4110 Sonar Series**

This is a modular family of hull-mounted, integrated variable-depth sonar systems capable of covering all platforms – from patrol and fast attack craft to frigates and destroyers – assigned to detect, localize, and track submarines. The UMS-4100 family is the sonar of choice for European warship programs.

(C4I)

Every Talk

Thales' Every Talk is a ruggedized, high-speed smartphone designed for security forces. According to Thales, Every Talk provides not only voice communication and text messaging but also multimedia services such as data, images, video, live feeds, face recognition, and database queries. Every Talk allows users to send real-time video, access remote databases, download situational information (such as maps and building floor plans), and download and share pictures as well as GPS-based positions.

Joint Tactical Radio System

The Joint Tactical Radio System (JTRS) being developed for the U.S. DoD will comprise a single standard software-operated radio for the U.S. armed services. Thales will modify its PRC-148 Multiband Inter/Intra Team Radio (MBITR) for compliance with JTRS software communications architecture. The resulting radio will be called the JTRS Enhanced PRC-148 MBITR (see entry below).

Lightweight, Multiband Airborne Radio

The LMAR is a software-operated airborne military radio manufactured by Thales Defense & Security. It is a repackaged PRC6809 MBITR with power conditioning and filtering suitable for airborne applications. Thales developed the LMAR primarily for UAV applications.

MIDS Family of Information Distribution Systems

The MIDS-LVT (USQ-140), MIDS-JTRS (USQ-190), and MIDS On Ship (URC-141), all known as Multifunctional Information Distribution Systems, are a family of military datalink terminals that provide Link 16, data, and voice communications. The MIDS terminals are utilized across the entire range of military operations, including numerous air, land, and sea platforms. Several manufacturers produce the MIDS family, including Data Link Solutions (a joint venture between BAE Systems and Collins Aerospace), EuroMIDS (a joint venture between Indra, Hensoldt, Leonardo, and Thales), and ViaSat, leading to a highly competitive sales environment.

Multichannel, Multiband Airborne Radio

The Multichannel, Multiband Airborne Radio (MMAR; also known as the ARC-6999) is a military airborne radio manufactured by Thales Defense & Security. The MMAR operates through a software-defined architecture and is composed of two integrated PRC-148 JEM radio board sets compatible with the U.S. military's JTRS standard. The MMAR is fielded on aerostats, high-altitude airships, and fixed-wing tactical UAVs. No further large-scale orders for the MMAR are expected, as the radio has largely been surpassed in technology by newer systems.

NATO ACCS

The NATO Air Command and Control System will provide command and control for all air operations undertaken by NATO countries in Europe. The NATO Air Command and Control System (ACCS) will consist of command and control sites and legacy air defense systems. ThalesRaytheonSystems is the prime.

PR4G

The PR4G (Poste Radio de 4ème Generation) is a family of VHF tactical radios that can be used in handheld, manpack, vehicular, and airborne configurations. Thales is the prime contractor and system designer.

PRC-148 MBITR

The PRC-148 Multiband Inter/Intra Team Radio (MBITR) is a handheld, software-driven tactical radio that enables defense forces to communicate military tactics to one another on the battlefield. Thales Defense & Security is the prime.

TACTICOS Combat Management System

The Tactical Information and Command System is a naval combat management system manufactured by Thales Nederland. TACTICOS allows all sensors and weapons to be integrated in one comprehensive system. The TACTICOS combat management system provides a naval command team with command and control of all resources, tactical command support, and full weapon control. TACTICOS remains popular with smaller vessels from frigates on down, especially off-shore patrol vessels.

TAVITAC 2000/NT

TAVITAC (Traitement Automatique et Visualisation Tactique) is a family of centralized, integrated naval command and control systems for various warship classes as well as coastal surveillance batteries. TAVITAC NT (New Technology) is the most recent

Thales

version of the system. Developed by Thales Naval, the TAVITAC series is designed to provide integrated command and control facilities for small frigates and corvettes where cost is a primary consideration.

TRC 6200/6500

The TRC 6200/6500 series of tactical wideband interceptor and direction finders can monitor all radio communication signals in HF, VHF, and UHF bands, including frequency hoppers. The series also provides early warning and force or platform protection. TRC 6500 is the latest selling variant.

(Electro-Optical)

Artemis

This is a naval infrared search-and-track (IRST) system for long-range surveillance and detection of multiple threats. The first major application for the system will be the FREMM frigate being produced for the French Navy. The coming years will see production of Artemis for application on FREMM frigates operated by the French Navy and by the militaries of a handful of other nations.

Claire Thermal Camera

The Claire Thermal Camera is a key sensor for the Royal Netherlands Army's Boxer and CV9035 Mk III infantry fighting vehicle. Prime contractor Thales continues to market the system for international sales.

Damocles & TALIOS

The Damocles multifunction targeting pod was designed to enable fighter aircraft to discharge air-to-ground weapons from a safe distance. Platforms include the Mirage 2000, Rafale, Super Étendard Modernisé, and Sukhoi Su-30MKM. The TALIOS pod has replaced the Damocles as the preeminent targeting pod for French-built fighter aircraft. The unit features an added SWIR IR sensor along a full-color HDTV video sensor. It fits into the same pod slot as the Damocles, with a very similar form factor.

LION

The Lightweight Infrared Observation Night (LION) sight is a handheld, uncooled, thermal-imaging binocular for use both day and night. The LION was designed for use by infantry soldiers. However, it can be adapted for use in combat vehicles and unmanned vehicles and for use as a fire control system. Thales Optronics (Glasgow) is the prime contractor. Thales has introduced a new version, LION Advance, which the company reports is in use by several NATO nations.

MIRADOR

MIRADOR is an electro-optical fire control system manufactured by Thales Nederland. It is designed for

use aboard a wide range of surface vessels, from small patrol craft to large carriers.

PIRATE

The Passive Infrared Airborne Track Equipment (PIRATE) system is in production for the Eurofighter Typhoon. The technology for PIRATE's signal processing is based on the Air Defense Alerting Device (ADAD) manufactured by Thales Optronics. The PIRATE IR surveillance system should be produced in slightly declining rates over the next several years, mirroring slowing Typhoon production.

Sirius LR-IRST

This is a long-range IRST system designed for protection of naval vessels from sea-skimming missiles and other threats. Sirius provides multispectral observation of coastal areas. It can be used for in-theater ballistic missile defense, floating mine detection, and other surveillance missions. The system can further function as a stand-alone device or be fully integrated with other shipboard multisensor suites. Thales Nederland is the prime.

SOPHIE

SOPHIE is a low-weight, multiapplication binocular / thermal imager. The system is in wide use by several branches of the French and British militaries. Newer variants are upgraded with internal GPS and color daylight camera functions. Thales has introduced SOPHIE Ultima, a lightweight very-high-performance variant.

Thales Vehicle Sighting Systems

Thales Vehicle Sighting Systems are currently in production for the British Army's Scout Specialist Vehicle. They are used for target detection, identification, and tracking. The U.K. Ministry of Defence awarded Scout SV prime contractor General Dynamics UK a Block 1 order for 589 vehicles in September 2014. In July 2015, General Dynamics UK awarded Thales a \$195 million, five-year contract to supply sighting systems and ancillary equipment for the Scout SV's (now called Ajax) production phase. Thales will provide 245 vehicle sets.

(Electronic Warfare)

ASTAC

ASTAC is an advanced, pod-mounted electronic support measures (ESM) suite for electronic reconnaissance operations intended to supplement and later replace the SYREL pod-mounted electronic intelligence system. The system acquires, records, and identifies threat emissions in the frequency ranges populated by ground-controlled interception, fire control, search, and early warning radars. Work under a

Thales

2012 contract to adapt ASTAC pods for France's Mirage 2000D fleet has been completed. The work entailed the upgrade of 55 aircraft. The need for spares and replacements among current user nations should drive additional production for the ASTAC system.

DR-3000

This is a modular ESM system for naval use. It has been installed on all types of platforms, including submarines, aircraft carriers, cruisers, destroyers, frigates, corvettes, and fast attack craft, and on maritime patrol aircraft and anti-submarine helicopters. The Thales-produced AMASCOS, which incorporates the DR-3000, should continue to provide the best opportunity for production of this ESM system.

Spectra

Spectra (Self-Protection Equipment Countering Threats to Rafale Aircraft) is an internally fitted electronic warfare device designed specifically for the Dassault Rafale combat aircraft. Its ability to provide long-range detection, identification, and location of threats gives pilots or mission systems ample time to react with electronic countermeasures jamming, infrared decoy, or evasive maneuver techniques.

Vicon 78

This is a family of add-on and fuselage-installed chaff and IR decoy flare dispensers. Vicon 78 systems are developed to be compatible with the widest possible range of airframes without reducing aircraft performance.

(Radar)

(Airborne Radars)

I-MASTER

The I-MASTER radar is a small, lightweight, high-performance sensor for use on UAVs, helicopters, small fixed-wing aircraft, and tiltrotor platforms. It is a synthetic aperture radar with a ground moving target indicator. Applications include the AC-235, AC-295, DA42 MPP, King Air 350, PC-6, PC-9, and Scorpion Jet manned aircraft, and the CAMCOPTER S-100, Eagle Eye, Hermes 180, Hermes 450, Ranger, Seeker II, Shadow 200, SPERWER, and Watchkeeper UAVs. Although the list of manned platforms capable of being equipped with the I-MASTER continues to grow, few orders are emerging as customers opt for EO/IR options.

Ocean Master & Searchmaster

This is a multimode, H/I-band, coherent pulse-compression radar for maritime patrol aircraft and helicopters. It provides full capabilities for weather avoidance, search and detection, target classification, and missile fire control. European demand for the

NH90 NFH helicopter will fuel production of the Ocean Master European Navy Radar (ENR). The Searchmaster provides a similar multirole capability mission set but adds an AESA and air-to-ground capability. Searchmaster will overcome Ocean Master as Thales' primary multirole surveillance radar offering.

RBE2

The RBE2 is an airborne, X-band, multifunction / multimode radar with a second-generation VHSIC; programmable signal processing; and high, medium, and low pulse-repetition frequency. The current RBE2 version is an electronic scanning array radar. Thales is currently evolving the system to include an active-array antenna. The RBE2 radar's sole platform is the Dassault Aviation Rafale fighter aircraft. However, according to Thales, the RBE2 radar can be fitted on large or medium-size fighter aircraft.

RDY

The RDY is an X-band, multifunction/multimode, mechanically/electronically scanned radar with first-generation VHSIC-programmable signal processing and low, medium, and high pulse-repetition frequency. The RDY was designed specifically for the Dassault Mirage. The system is capable of performing air-to-ground, air-to-sea, and air-to-air missions. Deliveries are winding down as potential customers switch to more modern fighter platforms. Production is expected to end in 2025, when UAE's Mirage upgrade program ends.

Searchwater

This is an I-band, frequency-agile/pulse-Doppler radar for maritime patrol and airborne early warning aircraft. Platforms have included Nimrod aircraft (for maritime reconnaissance) and Sea King aircraft (for AEW duties). Searchwater has been selected by the U.K. to fulfill the radar component in its helicopter-based Crowsnest AEW program. Beyond 2023, additional Searchwater production is highly uncertain.

(Ground-Based Radars)

COBRA

COBRA is intended to detect and classify enemy artillery shells, mortar bombs, and rockets in flight, compute their origin, and provide a fire control solution for effective counterbattery fire with a multiple launch rocket system and conventional artillery. The system was produced by the Euro-Art consortium, made up of Thales, Lockheed Martin, and Airbus. The U.K. exited the COBRA program, but operators France, Germany, and Turkey remain committed. COBRA began a midlife upgrade in 2018 that will last into the early 2020s, providing a bump in O&M funding.

Thales

Ground Master

The Ground Master is a family of static and mobile air defense radars that provide detection against a variety of threats at an array of ranges and altitudes. The Ground Master radar is available in mobile or fixed versions, making it attractive to defense departments worldwide.

PPS-5C/D/E

The PPS-5C MSTAR (Man-portable Surveillance and Target Acquisition Radar) is a lightweight, pulse-Doppler, J-band radar system used to meet the surveillance requirements of land-based reconnaissance elements. It can also play a secondary role in perimeter surveillance of high-value installations. Thales UK is a licensee.

(Naval Radars)

Herakles

The Herakles is an E/F-band (S-band), 3-D active phased-array radar intended to provide surveillance and local air defense coverage. Herakles is designed to be used as the sole radar on board vessels of frigate size. Herakles also functions as the main radar in conjunction with a long-range radar for specialized applications. French FREMM frigates are the Herakles' primary platform. Production may end in 2022 if no further sales are made.

Integrated Mast

The Thales Integrated Mast (I-Mast) is a family of various-size mast structures that accommodate all the major radars, sensors, and antennas of a naval vessel. A typical I-Mast configuration includes the SMILE / SeaMaster 400 and Seastar/Seawatcher 100 radars.

MW08

The MW08 is a G-band, 3-D, medium-range naval radar. It is used for surveillance, target acquisition, and tracking. The radar also provides additional channels for gun control against surface targets. Thales Nederland is the prime.

S1850M

The S1850M has been specified for frigates, destroyers, and aircraft carriers and is used for the automatic detection, track initiation, and tracking of up to 1,000 air targets at a range of 400 kilometers. Thales Nederland is the prime. Only a single additional S1850M system is forecast before production ends in 2019; it will be produced in support of the U.K.'s final Queen Elizabeth class aircraft carrier.

Scout

Scout (Signaal's Covertly Operating Undetectable Transceiver) is the first member of a family of stealthy radars developed by Thales Nederland. Due to their low

probability of detection by electromagnetic support measures, Scout radars reverse the current balance of capabilities between radar range and electronic warfare systems detection. The VARIANT short- to medium-range surface surveillance radar incorporates a G-band radar, the Scout's LPI I-band systems, and an identification friend or foe (IFF) secondary radar. Additionally, it can provide input for fire control systems. The Scout and VARIANT were designed for use on surface craft, coastal radar installations, and submarines.

Sea Fire

The Thales Sea Fire is an upcoming multimission radar designed to equip the French Navy's next-generation medium-size FTI frigates. It provides early warning for air or surface threats using 3D surveillance, horizon search, and surface surveillance.

SMART

SMART is a family of multibeam 3-D naval radars, each with slightly differing missions. The SMART-S and SMART-S Mk 2 are multibeam, 3-D, naval medium- to long-range volume search, air, and surface surveillance radars that operate in the E-/F-band (S-band). SMART-L is a long-range volume-search radar operating in the D-band, evolved from the SMART-S design. It is particularly designed for use against small high-speed anti-ship missiles. The final SMART-L new-production contract was fulfilled in 2013. The new SMART-L MM/N, with its extended ballistic missile defense capability and leading-edge GaN circuitry, will provide Thales with new revenue streams. Thales Nederland is the prime.

STIR/STING

This is a lightweight I/J/K-band monopulse naval Separate Track and Illumination Radar (STIR) for surface-to-air weapons systems. The Signaal Two-Aerial Integrated Naval Guidance (STING) radar is a lighter version of STIR for use on smaller vessels. Thales Nederland is the prime.

(ATC Programs)

ATCALs

The U.S. Air Force's Air Traffic Control, Approach, and Landing Systems (ATCALs, also referred to in the singular Air Traffic Control, Approach, and Landing System) program researches, develops, and manages new air traffic control, communications, surveillance, positioning, and precision approach landing systems. ATCALs' subprojects involve a broad range of land-based equipment, including instrument landing systems, primary and secondary radars, and radios. Thales Defense & Security is one of numerous contractors involved in this effort.

Thales**TopSky**

TopSky (formerly Eurocat) is a modular air traffic control system for continental en route, transcontinental, oceanic airspace, and approach control areas, from low to very high traffic density. TopSky supports the safe and efficient movement of aircraft and vehicles at an airport. More than 100 flight information regions are controlled by TopSky in Africa, Asia, Central America, Europe, the Middle East, the Pacific, and South America. As a worldwide period of widespread technological refresh is underway, TopSky is experiencing increased demand. TopSky is expected to provide the backbone of Australia's massive OneSky program.

OneSky. In February 2015, Thales Australia was selected to develop Australia's OneSky air traffic management system. OneSky will integrate the country's civil and military air traffic control into a single and harmonized ATM system. The OneSky system will replace The Australian Advanced Air Traffic System (TAAATS), which is aging, and the Department of Defence's Australian Defence Air Traffic System (ADATS). Thales won the contract over a competing bid from Lockheed Martin. A \$940 million contract with Thales, Airservices Australia, and the Department of Defence was signed in early 2018.

Military Vehicle Programs**Hawkei**

In October 2015, Thales Australia received final approval for the delivery of 1,100 Hawkei vehicles. The contract is valued at EUR820 million and fulfills the Department of Defence's LAND 121 Phase 4 program to replace the Army's Land Rover fleet with protected vehicles. In addition to the vehicles, 1,000 trailers will also be produced as part of the contract. Thales Australia's Hawkei team, which includes Boeing Defence Australia, PAC Group, and Plasan, was downselected for the program in December 2011 over competing offers from Force Protection Europe and General Dynamics Land Systems. The production phase is scheduled to run through 2021.

Missile Programs**(Air-to-Air)****ASRAAM**

This is a next-generation, short-range air-to-air missile system developed by MBDA. Thales provided the air target fuzing for the ASRAAM. Production underway to meet additional foreign orders.

Meteor

Meteor is a medium-range air-to-air missile produced by MBDA. The missile's active seeker, which is being provided by MBDA and Thales, is based on the 4A seekers used on the ASTER surface-to-air and MICA air-to-air missiles. Meteor entered Swedish service in 2016.

MICA

This is a short- and medium-range air-to-air missile produced by MBDA. Thales provides the 4A seeker.

(Air-to-Surface)**SCALP**

SCALP is a modular-type weapon system designed to attack (day/night) a variety of stationary and moving targets, including armored targets, at various standoff ranges. MBDA is the prime, with Thales providing the microwave seeker and digital radio altimeter.

(Surface-to-Air)**ASTER 15/ASTER 30**

These are multiplatform, surface-to-air missile systems being developed by the Eurosam consortium. Work is underway at MBDA, which is responsible for development of the ASTER missile/launcher hardware. Thales provides the seeker and fuzing.

Rapier/Ceptor

Rapier is an all-weather, low-altitude, air-transportable system for air defense against helicopters and low-level supersonic maneuvering aircraft. MBDA is the prime, with Thales providing fuze and telemetry equipment. Production has concluded. Ceptor, which is part of the Common Anti-air Modular Missile (CAMP) program, could replace the Rapier SAM.

RIM-162 Evolved SeaSparrow

This is a point defense, surface-to-air quick-reaction missile for use against anti-ship missiles, aircraft, and cruise missiles. Raytheon is the prime, with Thales providing the folding aerodynamic control fins and thrust vector control unit.

Seawolf/Sea Ceptor

Seawolf is a shipborne, quick-reaction, short-range supersonic missile used against supersonic aircraft and anti-ship cruise missiles. MBDA is the prime, with Thales producing the proximity fuze and radar equipment. Sea Ceptor will replace the Seawolf.

Thales

Starstreak

Thales UK (Short Brothers) developed Starstreak to meet the requirements of ground forces for high-velocity air defense missiles against threats posed by low-flying aircraft and pop-up strikes by helicopters. In June 1986, Starstreak was selected as the next man-portable, short-range anti-aircraft missile system for the U.K. In addition to land-based applications, Starstreak can arm helicopters and naval surface combatants. The system is in service, with Thales UK upgrading existing air defense systems.

Umkhonto

This is a short- to medium-range surface-to-air missile system. Denel Dynamics is the prime, and Thales provides the fuze.

(Surface-to-Surface)

Mer-Sol Balistique Strategique

This is a submarine-launched strategic nuclear missile (SLBM). Airbus Defence and Space is the prime, and Thales provides the Sagittaire digital guidance computer system for the missile. The French Navy deploys M51 SLBM on four nuclear-powered SSBNs. France is considering the introduction of a further improved version of the M51.

(Anti-Ship/Submarine)

Exocet

This is a family of anti-ship missiles developed and produced by MBDA. Thales provides the seeker for the weapon.

OTOMAT

This is a multipurpose, long-range anti-ship missile designed and manufactured by MBDA. It is capable of being launched from land (mobile or fixed installation) and has been experimentally fitted to aircraft for air-to-surface operations. Thales is a major subcontractor, providing the radio altimeter.

RBS15

Initially, the RBS15 was developed by Saab Bofors Dynamics as a ship-mounted, sea-skimming, anti-ship missile. Thereafter, plans called for an air-to-surface variant to arm AJ 37 Viggen and JAS 39 Gripen aircraft. Thales manufactures the system's digital radio altimeter.

Sea Skua/Sea Venom

Sea Skua is a helicopter-launched, all-weather, anti-ship missile system originally conceived for the Lynx helicopter. Sea Skua can also be surface launched. MBDA is the prime; Thales produces the radio altimeter. The new Future Anti-Surface Guided

Weapon-Heavy (FASGW-H) missile is in development at MBDA. The U.K. Royal Navy's name for this missile is Sea Venom.

(Anti-Tank)

AGM-114 HELLFIRE

This is an anti-armor missile system developed and produced by HELLFIRE Systems LLC. Thales manufactures the Longbow HELLFIRE in the U.K.

BGM-71 TOW

This is a wire-guided, heavy anti-tank missile produced by Raytheon. For its TOW 2B missile, the United States has adopted a variant of the fuze used by the British Further Improved TOW (FITOW). This active infrared proximity sensor is manufactured by Thales.

Eryx/Enforcer

Eryx is a man-portable, short-range anti-tank missile developed and produced by MBDA. Enforcer is a lightweight guided weapon system. Thales supplies the Mirabel thermal imager for the system.

Fury

Fury is the U.S. name for the FreeFall Lightweight Modular Missile (FFLMM) designed by Thales UK. Thales is working with Textron Systems, which provided technology from its G-CLAW semi-active laser-guided weapon project. Textron is offering the Fury to the U.S. Marine Corps to arm its RQ-7 Shadow UAVs.

Lightweight Multirole Missile

Thales is working on the Lightweight Multirole Missile (LMM). This missile uses a laser-riding guidance system (semi-active laser guidance will be available in the future) and weighs only 28 pounds. Thales rapidly designed the LMM using technology from the Starstreak and Starburst air defense missiles. The LMM has a range of 8 kilometers and carries a 6.6-pound warhead. Blast/fragmentation and anti-armor options are available. LMM will first enter service with the U.K. armed forces aboard the new Wildcat Lynx helicopter. In 2011, the U.K. became the first customer for the Lightweight Multirole Missile. The LMM will meet the U.K. Royal Navy's Future Anti-Surface Guided Weapon-Light (FASGW-L) requirement.

MILAN/MMP

This is a man-portable anti-tank missile system produced by MBDA. Thales produces the MIRA infrared sight with MDSL and Siemens AG. The French Army has taken delivery of the first Missile Moyenne Portée (MMP) and launchers. The MMP is replacing the venerable MILAN man-portable anti-armor missile.

Thales

PARS-3/TriGAT

This is a third-generation anti-tank missile system for medium- and long-range applications on helicopter and land vehicles. Two TriGAT missiles were developed: one designated TriGAT-MR (Medium Range), which will not be produced; and the other designated TriGAT-LR (Long Range). PARSYS GmbH (formerly the Euromissile Dynamics Group) developed the missiles. Thales produced the fuze. Production has concluded.

(Anti-Radiation)

ARMAT

This is an anti-radiation missile system developed and produced by MBDA. Thales is a major subcontractor on this program and supplies fuzes.

Ordnance and Munitions Programs

(Tube Artillery)

CAESAR 155mm Self-Propelled Howitzer

This is a wheeled 155mm self-propelled artillery system produced by Nexter. Thales manufactures the system's ATLAS Fire Control System.

G6 Renoster 155mm Self-Propelled Howitzer

This is a wheeled 155mm self-propelled artillery system developed by Denel. Thales provides the system's computer fire control system.

L118/L119/L127/M119 105mm Light Gun

These are towed 105mm artillery systems developed by BAE Systems. Thales Australia is a licensed producer.

(Airborne Ordnance & Submunitions)

Air-Launched Rockets

TDA produces a range of air-launched rockets, from 68mm to 120mm.

(Man-Portable Anti-Tank/Anti-Armor)

MBT LAW

The MBT LAW man-portable anti-tank weapon was developed by Saab-Bofors Dynamics and Thales Air Systems. Final development began in May 2002. Weapons to meet the British and Swedish requirements, plus others, will be produced in Belfast.

Space Systems – Satellites & Spacecraft

(Civil Communications/TV Satellites)

1300

The 1300 (formerly FS-1300) is a high-power satellite intended to meet civilian communications requirements. Its largest application will be for the Intelsat

telecommunications consortium. Space Systems/Loral is the prime contractor. Thales provides traveling wave tubes to the program.

Arabsat

Arabsat is a geostationary commercial telecommunications satellite system. Arabsat provides telecommunications, digital and analog TV broadcasting, VSAT voice data transmission, and high-speed Internet access to Arab Satellite Communications Organization (ASCO) members. Airbus Defence and Space is the prime. Thales Alenia Space provides the electric generator subsystem and solar power generator.

Brasilsat/Star One

Brasilsat and Star One satellites are two related series of geostationary communications satellites serving Brazil and Latin America through Embratel. Boeing Satellite Systems (BSS) was prime contractor for the Brasilsat B1, B2, B3, and B4, supplying the BSS-376 and BSS-376W satellite buses and communications payload. Thales Alenia Space is the prime contractor for the C1 and C2, Star One's first two Ku-band satellites.

Eutelsat

Eutelsat is a European commercial communications satellite system. The Eutelsat system provides regional telecommunications – specifically, full-time transponder leases, telephony, occasional TV, VSAT, and land-mobile communications – by way of the Euteltracs system. Thales Alenia Space, Space Systems/Loral, and Airbus Defence and Space are the prime contractors. Eutelsat 10B has been ordered, and it will be built by Thales Alenia Space, with a planned 2022 launch.

Globalstar

Globalstar is a satellite-based mobile communications system. Space Systems/Loral, Palo Alto, California, was responsible for Globalstar satellite production. Thales Alenia Space provided communications payloads. Due to its acquisition by Thermo Capital, Globalstar avoided being forced to de-orbit its 48-satellite constellation. Its new owners have also made it clear that they are ready to make a strong investment in Globalstar. Thales Alenia Space built the second-generation system under a contract worth approximately \$904 million. Globalstar's satellite network was declared operational in August 2013.

Inmarsat

The Inmarsat system is a global constellation of telecommunications satellites. In June 2014, Inmarsat and Arabsat agreed to jointly purchase a satellite. Designated EuropaSat/HellasSat-3, the new satellite will provide both fixed and mobile satellite services. Thales Alenia Space will build the satellite based on its Spacebus 4000 C4 platform. Inmarsat will operate an

Thales

S-band and Ka-band payload on the satellite, while Arabsat will operate a Ku-band and Ka-band payload. Launch occurred on June 28, 2017. In June 2017, Inmarsat ordered a fifth Inmarsat 5 satellite, which launched in late 2019. While Boeing built the first four satellites, Thales Alenia Space built the fifth.

Intelsat

Intelsat is an international satellite telecommunications system. Intelsat satellites provide a range of services, including voice, TV, and data transmission. Producers include Airbus Defence and Space, Boeing, and Space Systems/Loral. Thales Alenia Space is responsible for the communications repeater.

Iridium

Iridium is a worldwide digital, satellite-based, cellular personal communications system. In June 2010, Iridium Communications selected Thales Alenia Space as the prime contractor for the Iridium NEXT program. Iridium signed a contract with Thales Alenia Space worth \$2.2 billion for 81 satellites (including six ground spares). In January 2017, the first 10 Iridium NEXT satellites were delivered into orbit on a SpaceX Falcon 9 rocket. The final 10 Iridium NEXT satellites were put into orbit in January 2019. Iridium likely will not need to replace Iridium NEXT satellites until the early 2030s.

Website: <https://www.iridiummuseum.com/>

Spacebus Series

The Spacebus satellite series is intended for use in telephone/data communications and direct broadcast television. Thales Alenia Space is the prime contractor. So far, the model has been ordered for more than a dozen programs, including Agila, Arabsat, Eutelsat, Hispasat, Hot Bird, Nahuel, Sirius, Stentor, TDF, Tele-X, Thaicom, Turksat, and TV-Sat. The Spacebus 2000, 3000, and 4000 models are in production. Thales Alenia Space has introduced a new variant of the Spacebus, known as the Spacebus 4000 NEO.

Spacecom

Spacecom is a commercial communications satellite company that operates Affordable Modular Optimized Satellites (Amos) spacecraft, which are small communications satellites for deployment in a geosynchronous orbit. Amos spacecraft provide telecommunications services to the Middle East, Europe, West Asia, Africa, and Atlantic North America. Israel Aerospace Industries Ltd, MBT Systems & Space Technology Electronics division, Yehud, Israel, is the program's prime contractor. Additional contractors include Thales Alenia Space (communications payload).

(Military Space Systems)

Galileo Satellite Navigation System

Galileo is a European navigational satellite constellation, similar to the U.S. Navstar Global Positioning System. The Galileo system is intended to provide secure civil navigation and positional data to all of Europe, relieving it of its dependence on the U.S. GPS. Galileo will be used mainly for emergency, search-and-rescue, and security applications. It will be an independent civilian system compatible with both GPS and GLONASS. Interoperability among the three systems is being discussed; it would require only minor adaptations to the ground systems software. OHB Systems is the prime. Thales Alenia Space provides power conditioning and distribution units.

Helios / Optical Space Component (CSO)

Helios satellites are military optical imaging reconnaissance satellites. Composante Spatiale Optique (CSO) satellites are follow-ons. Helios satellites provide military optical reconnaissance data from low-Earth polar orbit. Helios 1 systems are based on the SPOT 4 Earth resources satellite bus but have a higher resolution of 1 to 5 meters. Similarly, Helios 2 satellites are based on the SPOT 5 spacecraft platform and offer a 50-centimeter resolution. Airbus Defence and Space is the prime, with Thales Alenia Space providing the system's high-resolution instruments. Helios' replacement, the Optical Space Component (Composante Spatiale Optique, or CSO) satellite constellation, is a high-resolution reconnaissance system. The first Optical Space CSO satellite (CSO-1) launched in December 2018. The first, second, and most of the third satellite are already funded, and therefore the three satellites are likely to be completed and launched. The CSO-2 launched aboard Soyuz in 2020; CSO-3 will be on one of the first Ariane 6 payloads in 2021.

(Remote Sensing Satellites)

Copernicus

Copernicus, formerly known as Global Monitoring for Environment and Security, is an effort of the European Space Agency (ESA) and the European Union to improve Earth observation. The space component of Copernicus will consist of a series of Sentinel satellites. Copernicus will cost an estimated \$9.4 billion. This includes development, manufacturing, launch, and operation of the satellites as well as the development and construction of ground infrastructure. Both Thales Alenia Space and Airbus Defence and Space build

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Sentinel satellites under this program. The first satellite, Sentinel-1, was launched on a Soyuz rocket from Europe's Spaceport in French Guiana in April 2014. ESA awarded contracts for new Sentinel-1, Sentinel-2, and Sentinel-3 satellites in 2015 and 2016. Sentinel-1A, -1B, -2A, -2B, -3A, -3B, and -5P are currently operational.

In July 2020, Thales Alenia Space signed a EUR72 million first tranche contract with OHB System, prime contractor of the project, to develop the payload for the two satellites of the Copernicus CO2M mission. Thales Alenia Space will also serve as prime contractor for CHIME (Hyperspectral Imaging Mission); CIMR (Passive Microwave Imaging Mission); and ROSE L (L-band SAR Mission) under the Copernicus effort.

In November 2020, Thales Alenia Space signed a EUR93 million contract, as part of an overall EUR495 million contract, with the ESA to build the Copernicus Imaging Microwave Radiometer (CIMR) environmental monitoring satellites. The venture was also awarded a ERU90 million first tranche contract to design and build the two environmental monitoring satellites of the Copernicus Hyperspectral Imaging Mission for the Environment (CHIME), the total amount being EUR455 million.

In December 2020, Thales Alenia Space signed a EUR482 million contract with the ESA to build the Copernicus Radar Observation System for Europe in L-band (ROSE-L) environmental monitoring satellite as part of Europe's Copernicus program, the first tranche being EUR90 million. Thales Alenia Space will serve as prime contractor for this program, with Airbus Defence and Space as main partner for the radar instrument.

COSMO-SkyMed/Pleiades

The COSMO-SkyMed/Pleiades is an international civil / military constellation of four COSMO-SkyMed low-Earth-orbiting radar satellites and two Pleiades remote-sensing satellites. The COSMO-Pleiades is a dual-use French-Italian satellite system designed to provide information on environmental damage, topography, the agricultural industry, and law infringement within the Mediterranean Basin. Thales Alenia Space was the prime contractor and an investor in the COSMO-SkyMed. Italy is now focusing on the COSMO-SkyMed Second Generation (CSG) constellation, which is being developed by Thales Alenia Space. The first COSMO-SkyMed Second Generation satellite launched in December 2019. Two more COSMO-SkyMed satellites were ordered in December 2020. Airbus is pursuing privately funded Pleiades Neo constellation, with plans to sell data to governments and commercial customers. Four COSMO-SkyMed and two Pleiades

spacecraft have been produced and are in service. One COSMO-SkyMed Second Generation satellite is in orbit.

Earth Observing System

The Earth Observing System is a series of scientific spacecraft forming part of the U.S. Earth Science Enterprise program. Thales Alenia Space is one of several contractors involved in this effort.

Earth System Science Pathfinder

NASA's Earth System Science Pathfinder (ESSP) program funds low- to moderate-cost, small to medium-size missions that focus on scientific objectives to support studies of Earth's atmosphere, oceans, land surface, polar ice regions, and interior. Projects include airborne missions and involve remote sensing satellite instruments and full satellites. Thales Alenia Space produces the Proteus satellite bus for this program.

Living Planet Program

The Living Planet Program comprises two main elements: a science and research arm in the form of Earth Explorer missions, and the Earth Watch element designed to facilitate the delivery of Earth observation data for eventual use in operational services. There are two categories of Earth Explorer missions: Core missions and Opportunity missions. Core missions are selected through consultation with the scientific communities and are led by the ESA. Core missions are launched approximately every two years. Opportunity missions use smaller, lower-cost satellites, are less complex, and can be implemented more quickly. Therefore, Opportunity missions are expected to occur more frequently. Thales Alenia Space and Airbus Defence and Space are contractors on this effort. To date, eight missions have been selected for implementation: four Core missions and four Opportunity missions. In September 2017, ESA began seeking ideas for a 10th mission, with a planned launch date in 2027 or 2028.

Meteosat

Meteosats are a series of geosynchronous meteorological satellites. A \$1.8 billion contract was signed with prime contractor Thales Alenia Space to begin work on the Meteosat Third Generation (MTG) program in 2012, and construction started shortly after that. MTGs are expected to secure Meteosat weather and climate data for Europe over the next 30 years. Under the MTG program, six satellites will be produced in two distinct variants: four imaging satellites (MTG-I) and two sounding satellites (MTG-S). MTG-I satellites will launch starting in 2022, while MTG-S satellites will launch starting in 2023.

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(Scientific Spacecraft)

Cosmic Vision 2015-2025

Cosmic Vision is a mechanism through which science missions of the European Space Agency are implemented. The program aims to develop small-class (S-Class), medium-class (M-Class), and large-class (L-Class) spacecraft. ESA is developing two medium-class missions: Solar Orbiter launched in 2020, while Euclid will launch in 2021. Thales Alenia Space was selected as prime contractor for Euclid. The goal of Euclid is to map the geometry of and study the nature of dark energy in the universe. Euclid's launch is set for 2021. Airbus was the prime contractor for the LISA Pathfinder mission; however, Thales Alenia Space was awarded a contract to study LISA in June 2018. LISA is planned to launch in 2034.

ExoMars

ExoMars is a program consisting of two missions to Mars: one comprises an orbiter and a descent module that were launched in 2016, and the other features a rover that was to be launched in 2020. ExoMars missions will study methane in Mars' atmosphere and on its surface. The missions will also investigate the Martian environment and demonstrate new technologies, paving the way for a future Mars sample return mission in the 2020s. ESA signed a contract with Thales Alenia Space in December 2016 to design and build the ExoMars rover. ExoMars rover launch date was delayed from 2018 to 2022 due to development problems.

Unmanned Vehicle Programs

CALAS

This is an unmanned underwater target vehicle produced by Thales Underwater Systems. It is designed to simulate submarine signatures in anti-submarine warfare training operations. Production has been completed. Upgrades to existing unmanned undersea target systems will enable them to meet the needs of the French Navy for the immediate future. While CALAS is no longer in production, it remains in service with the French Navy. New systems are in development.

ESPADON USV

In July 2009, the French defense procurement agency (DGA) awarded Naval Group (then DCNS), Thales, and ECA a contract to study ways to minimize the risks surrounding certain aspects of the maritime drone-based future anti-mine warfare system. The ESPADON (Évaluation de Solutions Potentielles d'Automatisation de Déminage pour les Opérations Navales) system

comprises a minehunter, two unmanned surface vehicles (USVs), and autonomous underwater vehicles (AUVs).

While remaining a safe distance from the minefield at all times, the minehunter or similar dedicated vessel will deploy and control the USVs, each programmed specifically to operate in minefields. The USVs, in turn, will deploy AUVs. An AUV is a smaller and completely autonomous type of subsea naval drone carrying sensors and robotic devices to detect and neutralize naval mines. ESPADON will feed technology into France's Systeme de Lutte Anti-Mines Futur (SLAMF), the future mine countermeasures (MCM) program. Thales is responsible for the USV, MCM outfitting, and the sensor module, comprising an AUV and a towed sonar for mine detection, identification, and location. Thales is also responsible for communications among the components. The French Navy is looking to put a new MCM system into service in the early 2020s.

Watchkeeper

In August 2005, Thales UK signed a contract worth GBP700 million (EUR1,029 million) for development and manufacture of the Watchkeeper system and for the initial support phases of the Watchkeeper program. Watchkeeper is designed to provide the U.K. armed forces with an essential intelligence, surveillance, target acquisition, and reconnaissance capability based on a UAV system. The Watchkeeper system consists of the WK450 UAV carrying day/night sensors and a laser target designator connected by a datalink to a network of containerized ground control stations where Army operators control the mission and interface within a network-enabled environment. The air vehicle was built in the U.K. by Thales and Silver Arrow (a subsidiary of Elbit Systems). Deliveries to the British Army are complete, and the system achieved Full Operational Capability in 2018. The British Army will operate Watchkeeper through 2042.

In April 2015, Thales proposed teaming with Polish industry to offer a weaponized version of the WK450 for Warsaw's tactical UAV requirement (see Gryf Program in the **Teaming/Competition/Joint Ventures** section).

Warship Programs

Goalkeeper

Goalkeeper is a 30mm close-in weapon system for naval surface combatants. Thales' subsidiary Thales Nederland is responsible for the fire control radar and systems integration.

Thales**U.S. Contract Awards**

Below is a listing of major contracts awarded to Thales from the U.S. government in the recent past (contracts as of press date). Note that the Description section is excerpted directly from U.S. DoD listings. For full details on contracts and their associated modifications, visit <https://www.defense.gov/Newsroom/Contracts/>

Date	Award (USD millions)	Contract #	DESCRIPTION
2016			
1/27/16	49.2	W91CRB-16-D-0008	UNIVERSAL BATTERY CHARGERS, BATTERY INTERFACES, SOFT COVERS, HARD COVERS AND/OR ACCESSORY KITS.
4/26/16	7.1	SPRPA1-16-C-Y017	SONAR DOMES.
10/13/16	14.0	FA8730-15-C-0015	THREE ADDITIONAL DEPLOYABLE INSTRUMENT LANDING SYSTEM (D-ILS) PRODUCTION-REPRESENTATIVE UNITS AS PART OF A RISK REDUCTION EFFORT.
12/2/16	14.1	N00019-17-C-0016	OPTIMIZED TOP OWL HELMET-MOUNTED SIGHT & DISPLAY SYSTEM DEPOT-LEVEL SPECIALIZED TEST EQUIPMENT IN SUPPORT OF MARINE CORPS H-1 AIRCRAFT.
2017			
3/16/17	10.7	N00024-17-C-5422	TWO MISSILE GUIDANCE UNITS, SPARE PARTS, TECHNICAL MANUALS, TRAINING & ENGINEERING SUPPORT FOR JAPAN.
5/12/17	9.9	H92222-17-D-0016	MULTIBAND INTER/INTRA TEAM RADIO (MBITR) FAMILY OF RADIOS SUSTAINMENT IN SUPPORT OF U.S. SPECIAL OPERATIONS COMMAND (USSOCOM).
12/20/17	7.7	N00383-18-F-AQ01	ONE WEAPON REPAIRABLE ASSEMBLY ON THE AIRBORNE LOW FREQUENCY SONAR SYSTEM SONAR DOME, WHICH IS REQUIRED TO SUPPORT THE H-60 HELICOPTER.
2018			
2/23/18	7.2	N00383-17-G-A501	REPAIR OF FIVE ITEMS THAT INCLUDE MODULES & HELMETS REQUIRED TO SUPPORT THE H-1 HELICOPTER.
7/16/18	249.6	W15P7T-18-D-0003	SUPPORT THE WAVEFORM DEVELOPMENT ENVIRONMENT ECOSYSTEM, MULTIPLE WAVEFORMS & NETWORK SERVICES.
7/16/18	12.2	FA8730-18-C-0034	DEPLOYABLE-INSTRUMENT LANDING SYSTEM (D-ILS) PRODUCTION UNITS.
11/19/18	30.6	FA8730-18-C-0034	DEPLOYABLE INSTRUMENT LANDING SYSTEM (D-ILS) PRODUCTION UNITS & SPARE PARTS.
11/21/18	14.0	N00383-17-G-AQ01	REPAIR OF 58 DOME SONARS IN SUPPORT OF THE H-60 AIRBORNE LOW-FREQUENCY SONAR SYSTEM.
2019			
1/24/19	30.9	N00039-19-D-0001	CONTINUED PROCUREMENT, MANUFACTURING, TESTING & DELIVERY OF HIGH-FREQUENCY DISTRIBUTION AMPLIFIER GROUP SYSTEM COMPONENTS & ENGINEERING SERVICES.
9/18/19	21.8	FA8730-18-C-0034	PURCHASE OF SIX ADDITIONAL DEPLOYABLE INSTRUMENTAL LANDING SYSTEMS.
9/25/19	11.9	N00383-17-G-AQ01	REPAIR OF 73 DOME SONARS IN SUPPORT OF THE H-60 AIRBORNE LOW FREQUENCY SONAR SYSTEM.
9/27/19	41.1	SPRPA1-19-C-Y084	CONTRACT FOR SONAR DOMES.
9/30/19	8.5	FA8232-19-D-0019	REPAIRS OF THE F-16 HELMET MOUNTED INTEGRATED TARGETING SYSTEM & ASSISTANCE IN STARTING UP THE ORGANIC DEPOT REPAIR PROGRAM.

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Date	Award (USD millions)	Contract #	DESCRIPTION
2020			
4/3/20	8.0	SPRPA1-20-C-Y011	H-60 REEL & CABLE ASSEMBLIES.
4/24/20	19.3	SPRPA1-20-C-Y025	AIRBORNE LOW FREQUENCY SONAR SPARE PARTS.
6/23/20	81.8	SPRPA1-20-C-Y043	AIRBORNE LOW FREQUENCY SONAR SPARE PARTS.
9/23/20	21.5	SPRHA3-20-C-0002	TRAVELING WAVE TUBES.
2021			
3/31/21	31.0	SPE4AX-21-D-0016	MH60 AIRBORNE LOW FREQUENCY SONAR SYSTEMS.

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