

SELEX Galileo Unmanned Air Systems capability

Within the Finmeccanica Group, SELEX Galileo provides leading capabilities in surveillance, protection, tracking, targeting, navigation & control, imaging systems and space sensors. In the UAS sector SELEX Galileo has full responsibility from the Mini-Macro to the tactical UAV systems and leverages through its wide experience in avionics and a full range of payloads including AESA radar, fourth generation EO systems, IR and advanced sensors.

SELEX Galileo TUAS solution includes the FALCO tactical unmanned aircraft, a new Common Ground Control Station (CGCS), and a range of mini-micro UAS (STRIX, ASIO) developed in collaboration with small high-tech companies.

The FALCO UAS features maximum deployability, endurance, survivability and a wide suite of payloads that make it particularly suitable for enduring surveillance missions, target detection, localisation, identification and designation, which are well suited to border patrol, coastal watch and homeland security requirements. The FALCO has been successfully launched from a pneumatic catapult, allowing the system to be deployed where no airstrip is available highlighting the dynamic qualities of the aircraft.

SELEX Galileo's new Common Ground Control Station (CGCS) is STANAG 4586 compliant, meeting UK, US and NATO standards for imagery, command and control for maximum flexibility and speed of operation. Support for the addition of plug-in exploitation modules ensures the ground station can be easily updated at anytime during its life to suit requirements and remain current with new technology. Platform agnostic, SELEX Galileo new CGCS will be able to operate various and different class of UAS simultaneously and can be fully networked within NEC architectures.

THE FALCO

The Falco UAV System, designed and manufactured by SELEX Galileo at the Ronchi dei Legionari site in Italy, is a tactical UAV System designed to supply command and control net-centers with a tactical overview of the operational scenario and target cueing in real time. Its characteristics of deployability, endurance, survivability and its wide suite of payloads make it suitable for missions of homeland security as well as civil and military surveillance, target detection, localisation, identification, designation and dangerous, dull and dirty missions.

General description

The capability of the Falco UAV System enables 7/24, all-weather persistent surveillance which allow it to perform missions ranging from border patrol, coastal watch, immigration control, law enforcement to power and pipelines surveillance, illegal fishery prevention and environmental monitoring. Falco features a fault-tolerant architecture which meets European Aviation Safety Agency (EASA) Airworthiness Guidelines for both civil and military oriented products.

In addition to its inherent automatic Short-Take-Off ability from semi-prepared airstrips, the Falco air vehicle, can be launched from a pneumatic catapult in a tactical environment and is transportable on C-130 type aircraft and the complete Falco system is deployable by at most 10 people in only 4 hours. For the operational phases of preflight, flight and landing the system shall be operable with at most 5 people.

System recovery is accomplished by automatic conventional wheeled landing, tactical short landing, or by parachute. Landing gear is designed to prevent payloads and aircraft structure damages due to heavy landings (decks landings or parachute recovery) and for semi-prepared landing strip operations.

A proven product

- 2001 start of system development
- 2003 Maiden flight of the technology demonstrator
- 2004-2006 extensive test campaigns at four separate sites (Sardinia, Bulgaria, UK, and Desert Location in High Temperature/High Humidity). Thousands of simulated flights at RIG, with the real hardware in the loop, achieving high reliability results
- 2005 (June) Falco becomes the first UAV in Europe, to obtain a Civil Permit to fly thanks to its development under EASA draft rules for UAVs, performed under control of the Italian National Authorities for Civilian Aviation (ENAC)
- 2006 In production
- 2008 The system fully operational with the first international customer and is used as a ISTAR platform

Military certification – Timeline

- 2005 Falco System Military Certification Work Group to define the Homologation Requirements.
- 2006 Law provisions concerning Italian Armed Forces UAVs
- 2008 Issued System Requirement Specifications compliant with Italian Armed Forces Homologation Norm.

Civil certification - Timeline

- 2005 ENAC issued the first European “Permit to Fly” clearance and the first UAV civil identification code to the basic Falco UAV System
- 2006 UK CAA endorsed ENAC “Permit to Fly” authorizing flights at ParcAberporth

Advantages

- Hostile locations can be surveyed with no HSE risk.
- Remote, harsh locations where the UAS can fly for up to 14 hours with basic surveillance payload without refuelling.
- Minimal refuelling and lower maintenance and flying costs compared to rotary or fixed wing aircraft.
- Ability to fly at night.
- Automated way-points based missions can be flown from take-off to landing, including beyond radio-link coverage.

Safety functionality

- Redundant Architecture for Safety critical function.
- Primary and Back Up FMS (Flight Management System) and Inertial Navigation Systems with real time GPS.
- Dual power Supply.
- Double Command and Control Console (CCC)

The Ground Control Station of the Falco UAV

The Falco Ground Control Station (GCS) enables mission planning and retasking, mission simulation for operator training, mission rehearsal and play back. From the GCS the operator can control payloads and sensors and handle the collected data in real time or pre-program their tasks during the mission planning phase, enhancing UAV autonomous operational features.

The aircraft can be flown in manual and in fully automatic mode, including automatic take off and landing operations. The GCS is capable of off-line target data evaluation and processing, for further diffusion through the C4I net.

The Ground Data Terminal provides a higher-than-200 Km redundant link range between the GCS and the Falco air vehicle, through a jam-resistant option data transmission in real time.

Updates

The FALCO System was validated after very successful trials lasting 15 months which were carried out in three different continents (Africa, Europe, Asia), under the most diverse climatic and operational conditions.

In particular, during the flight tests made by the end user, the Falco System carried out a surveillance mission with a maximum payload which lasted 9 hours and 15 minutes. This performance shows that, by using an auxiliary fuel tank, the maximum range for the system would exceed the 14 hours previously anticipated.

All the main functional requirements for surveillance missions have been fully demonstrated. The results obtained include:

- Collection and control of data on a 200 Km redundant link between the GCS and the Falco air vehicle, through a jam-resistant transmission in real time
- An operational ceiling of a maximum of 6000 meters
- Autonomous navigation control system and automatic use, during flight, of different payloads
- Automatic Take Off and Landing (ATOL) operability
- Night-time missions operability

Recently on 11 December 2008 at the Cheshnegirovo air base in Bulgaria The Falco has been successfully launched from a pneumatic catapult.

The catapult launch allows the Falco to be operated where no airstrip is available, satisfying the complete range of operational requirements .

Technical specifications

Air vehicle length:	5,25 m
Wing span:	7,20 m
Height:	1,80 m
MTOW:	420 Kg
Performances (ISA conditions)	
Endurance:	8-14 hours
Max payload weight:	70Kg
Ceiling:	6000 m
Max airspeed:	60 m/s
Link range:	200 Km (extendable with relay capability or GCS handover)

Payloads

EO/IR
Laser designator
SAR
Maritime surveillance radar
ESM
Chaff/Flares dispenser
NBC sensors
Hyperspectral sensor

THE MIRACH 100/5 INTEGRATED AERIAL TARGET SYSTEM

The Mirach 100/5 is the standard high-performance reusable, multi-threat target, designed and manufactured by Galileo Avionica, a Finmeccanica Company. In use with worldwide Armed Forces to train and qualify major Weapon Systems, the Mirach 100/5 delivers reliability and manoeuvrability, making it the best state-of-the-art, multi-role, target drone system on the market.

General description

The system is controlled by a Ground Control Station that allows mission planning and retasking, mission rehearsal and play back, operators training. A wide and flexible selection of mission payloads, installed inside the fuselage and under the wings, effectively complies with the requirements of most complex missile systems engagement scenarios for training and weapon systems test and evaluation.

Mirach 100/5, endowed with a naturally low radar and IR cross section, fully develops its ability to mimic flight profiles of attacking aircraft and anti-ship missiles through its high payload capability and ample variety of configurations. The launch from a zero-length ramp from land or ships, and recovery by parachute into water or land, enables the system to be used by Air Defense units as an organic training capability, simulating multiple threats and war-like scenarios in tactical conditions.

Certified by the Italian Joint Forces in 1998, since its debut on the market, the Mirach 100/5 System has been in use by the Armed Forces of: UK, Italy, France, Argentina, Belgium and Denmark, and has been continuously upgraded.

The Mirach 100/5 Aerial Target System simulates most of the present-day threats and their performances, among which very-low-altitude sea skimming missions, tight formation flights and 3D manoeuvres up to instantaneous 8g sustained load factors, covering a flight envelop between 3 and 12.500 metres above sea level. The top-performing Mirach 100/5 System combines great operational flexibility (e.g. rapid adaptation to mission planning changes) with a NATO certified Mission Reliability of more than 98%.

SELEX Galileo has also developed for the Mirach 100/5 a specific payload, consisting of an expendable air launched, jet-propelled, autonomous sub-target, named Locusta, that allows a direct hit on an independent fast flying threat, without establishing a "friend or foe" procedure, thus improving the realism of the tactical scenario in the most cost-efficient way.

The Locusta Drone can be provided as a stand-alone product, and can be fired from an aircraft or helicopter.

In December 2006 the Mirach 100/5 confirmed its operational excellence being selected as the High Performance Target for the CATS (Combined Aerial Target Services) Program covering 20 years activity of threat simulation for weapon systems training and T&E requirements of the UK Defence Forces. The CATS Contract has been established as an all-encompassing major private finance initiative to provide aerial threat emulation services across the entire training and missile development spectrum.

The QinetiQ Ltd. CATS Program has been awarded the "Best UK Deal to Sign" in the "Public : Private Finance Awards 2007".

Technical specifications

Length:	4,07 m
Wingspan:	2,30 m
Height:	0,89 m
Fuselage diameter:	0,40 m
MTOW:	330 Kg
Performances (ISA conditions)	
Endurance:	90'
Max speed:	Mach 0,85

Min altitude:	3 m
Max altitude:	12.500 m
Load factor:	Instantaneous: 8g
	sustained: 6g
Max payload:	> 60 Kg
Payloads	
Active and passive RCS augmenters	
IR augmenters	
IR and chaff dispenser (IRCM/A and IRCM/M)	
2 Towed body systems (IR, active/passive RF Tow targets)	
2 Air launched autonomous expendable sub-targets (Locusta)	
Missile seeker head simulators (eg. AN DPT-1)	
Miss distance indicator	
Vector scoring system	
Smoke generator system	

THE NIBBIO

Nibbio, a fast drone system developed by SELEX Galileo, stems from the successful Mirach 100/5 aerial target drone family. Nibbio is part of a programme which studies the transformation of the Mirach 100/5 aerial target drone from a training version ("target") to a tactical one ("fast drone").

The transformation programme defines the tactical aircraft's operating capabilities by studying the possible scenarios in relation to the tasks assigned to the armed forces. From the base of the prerequisites required for a "fast drone", particular characteristics are singled out, developed and implemented on the Mirach 100/5 fast drone. Some features, such as the preprogrammed altimetric control of the aircraft, the ability of mission reprogramming in flight, and acquisition of images in real and differed time were checked during the flight activity started in May 2005.

During the flight campaign, a digital link for sending information in LOS conditions (line of sight) as well as a satellite link for command and control of the aircraft in BLOS conditions (Beyond Line Of Sight) were also successfully tested.

Nibbio occupies a significant position within the UAV range of systems, completing the offer of capabilities for clients to perform the entire spectrum of surveillance missions and recognition without risking pilots' lives.

The next steps in the programme will be to select the final prerequisites needed by the Mirach 100/5 aircraft for the complete transformation of the system to a "fast drone".

THE FALCO BATTLELAB

The SELEX Galileo Falco Unmanned Ariel Vehicle BattleLab (UAVBL) is a cost effective system for:

- Operational Analysis of UAV missions
- System Requirements Definition / Simulation Based Acquisition (SBA)
- Analysis and demonstration of innovative solutions/technologies
- Training

The Falco UAVBL can be linked directly to a Ground Control System (GCS) or to a simulated UAV GCS. The system supports a wide range of tasks including the simulation and validation of:

- Route plans
- Terrain avoidance/obstacle avoidance
- Sensor Scan coverage verification
- Radio link verification
- LOS verification
- Sensor/multi sensor comparison (Platform Optimisation)
- UAV pilot and co-pilot Briefing/debriefing

The main elements of the Falco UAVBL are:

- UAV simulator (Simulation of UAV dynamics and sub-systems)
- UAV ground control station (A real UAV ground control station can be connected, an alternative, simulated UAV ground control station is available)
- Sensor simulator: EO, IR, Radar (RBGM & SAR) (Sensor simulation includes also the simulation of the sensor logic and tracking functionalities)
- Synthetic Environment (SE) for environment and CGFs simulation
- Geographic database and libraries: geographic data, maps and the libraries of CGFs
- 2D Scenario Tactical Display (TDF)
- 3D visualization of the tactical scenario (Stealth View)
- Interface to other simulation networks