INTRODUCTION

Today’s modern helicopters operate with increasingly complex mission systems and have significantly improved their operational capabilities. Crew effectiveness is key to achieving their ever more demanding missions and improving the safety of their operations.

Thanks to fast-evolving technologies, Thales Training & Simulation covers the full training spectrum of helicopters – from ab-initio training to mission readiness and rehearsal – and offers more and more possibilities in a large variety of domains. Thales Training & Simulation continually develops extensive technical expertise in key technologies as well as an in-depth understanding and knowledge of customers’ training needs.

This brochure aims at giving a panoramic view of Thales Training & Simulation offering for Helicopter training.

The first section offers an overview of Thales Training & Simulation, a Strategic Business Line of Thales. With strong and recognized experience in the field of simulation, Thales Training & Simulation has a very large portfolio of products for a wide range of customers, in both military and civilian domains.

In the second section we describe the benefits of simulation for Helicopter. Actually, simulation brings a lot of possibilities to Helicopter Operators and now covers a large range of needs in the fields of education, ab-initio to type training, mission readiness, collective training and rehearsal. In all branches of the armed forces, crews can very advantageously be trained by simulation to increase their proficiency and mission readiness.

Thales has delivered well over a hundred simulation systems for Helicopter Operators and offers an excellent coverage of the various needs. Section three presents a sample of simulation systems & solutions, from Flight Navigation Procedure Trainer or Helicopter Commander Tactical Trainer to Full flight Simulator and large interoperable Full Crew Mission Simulator.

Section four describes some of Thales’ Training Services achievements.

Simulation systems are high-tech products, with a large range of technologies. Thales is involved in many areas of research and technology for the benefit of present and future simulation systems. Section five gives some examples of cutting edge core technologies, especially in the domain of virtual environments.

From training equipment to training services, we lead the way in synthetic and live environment training applications.

Having pioneered simulation technology for over 60 years, our systems now cover advanced training in the most realistic environments. Our capabilities include design, manufacturing, assembly and integration, certification support, operation and logistics of over 1,100 simulators around the world including civil and military fixed wing aircraft and helicopters, land vehicles, power plant and naval platforms with associated weaponry and systems.

This unique experience means we fully understand your needs and we are capable of helping you train your personnel technically and tactically at individual, team and collective levels. Our solutions are designed to meet both training needs and budget, and range from desktop to fully integrated and networked mission rehearsal environments, including mobile devices that can be used in-theatre.

To achieve this we analyse your training needs and develop the appropriate syllabi to maximise the training benefit achieved from the training environment at all levels up to, and including, turnkey training services.

Helping you answer your specific training challenge, be it ab-initio, type conversion, concurrency or minimising skill fade in an ever evolving and increasingly complex world, you will find the right support from Thales.

Thales Training & Simulation is part of the Thales Group, Europe’s largest supplier of professional electronics systems for both civil and defence markets, employing in excess of 68,000 people in 50 countries generating sales of 12 billion Euro.

This global presence and global approach is nowhere better reflected than in Thales Training & Simulation. The company employs nearly 2,000 people in the USA, UK, Australia, Germany and France and draws on a rich heritage comprising the simulation businesses of LMT, Thomson-CSF, Rediffusion, Link Miles, Wormald Technology and Burtek.

HELIicopter TRAINING

Thales has well over 100 helicopter flight simulators in service worldwide and the company’s scalable product range includes reconfigurable simulators replicating different helicopter types. Full Flight and Full Crew Mission simulators’ reconfiguration can be accomplished in less than 80 minutes.

Thales Training & Simulation’s product range includes reconfigurable full mission simulators, full flight simulators, flight training devices, flight and navigation procedure trainers, cockpit procedures trainers, part task trainers, commander tactical trainers and computer-based training. These complementary devices provide a very comprehensive and scalable product range that covers every helicopter synthetic training demand from ab-initio to type conversion, recurrent training and mission training.

In addition to our high fidelity software models providing accurate simulated helicopter performance, the advanced solutions for high fidelity Night Vision Goggles, Helmet Mounted Sight/Display, visual and sensors imagery ensure realism. Thales’ Computer Generated Forces SET4 renders realistically intelligent computed generated forces – friendly, opposing or neutral – in the ground and air battle space. With all these advanced features aircrews are immersed in their operational environment at any time of the day in a wide range of weather conditions.

Thales Training & Simulation devices meet or exceed the most demanding requirements of Regulation Authorities.

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One of the latest advances in the evolution of the helicopter training devices is the development of Thales’ Helicopter Commander Tactical Trainer: a cost effective and efficient training system for the acquisition of tactical skills in different missions. The system is an advanced teaching tool providing the flexibility of simulation for developing mission scenarios as well as sustaining and enhancing helicopter commanders’ skills. Each manned cockpit can be configured into one of the 5 available aircraft types, enabling joint mission training as well as inter-arms training with other devices through DIS and HLA networks.

Thales has provided more than 300 armoured vehicle gunnery and driving simulators, aimed at teaching students to progress from ab-initio driving to advanced tactical driving skills. Full-scale replicas of driving cabs and turrets are included in the range, together with appropriate detection and identification sensors, and several training systems can be linked to provide networked platoon training. A Truck Driving Simulator has been developed to provide an unparalleled degree of realism, using a real truck cab linked to realtime computer-generated imagery and motion.

The Combat Training Simulation System is a reconfigurable system featuring a flexible multi-level architecture to train commanders of mechanised infantry and armoured units tactical reasoning and decision-making, co-ordination and subordinates, in decision-making, coordination and collective, technical and tactical, virtual, live and constructive training needs in the field, for company commanders and their subordinates, in decision-making, co-ordination and manoeuvring within a framework of a combined arms tactical task force. The Unit Commander Tactical Trainer is a reconﬁgurable system featuring a ﬂexible multi-level architecture to train commanders of mechanised infantry and armoured units tactical reasoning and decision-making. It is based on 3D graphic desktop stations for trainees and role-players, networked with PC stations for instructional staff.

Thales full mission simulators provide for all levels of training and include cockpits that faithfully replicate the visual, sound and tactile environment of the flight crew position in the actual aircraft, with highly realistic visual displays incorporating detailed graphics. All aspects of aircraft handling, including instrument flying, low-level missions, air-to-air combat and air-to-air refuelling, can be reproduced, with the correct "feel" to the controls, with integrated cockpit displays and voice communications. An instructor’s station has the tools for monitoring and measuring trainee performance, lesson planning, control and communications. Data fusion provides essential experience in gaining operating conﬁdence in systems management, including the real-time control of aeronautical, navigation and communications systems.

Thales is also a world leader in distributed simulation that allows simulators in different locations, and other training platforms, to be integrated into a cohesive training package. Most of Thales Training Devices have the embedded capability to train multiple crews simultaneously under the same conditions and in the same virtual space.

Thales has more than 50 years history fully committed to training realism and combat readiness. It will never stop improving our full training solutions and services so you will never stop improving the effectiveness and the safety of your missions.

Simulation has been increasingly used in the training of civilian and military personnel for decades.

You will find Thales leading the way with training and simulation devices that provide unrivalled mission capability and that save lives, time and money.

At Thales Training & Simulation we are proud of our 50-plus year's history fully committed to training realism and combat readiness. We will never stop improving our full training solutions and services so you will never stop improving the effectiveness and the safety of your missions.

A number of devices were tried during World War I and thereafter. The best-known was the Link Trainer, produced by Edwin Link in the USA and available from 1929. It was designed for the teaching of instrument flying in a less hazardous and less expensive environment than the real aircraft. After a period where not much interest was shown, the US Army purchased in 1934 a few Link Trainers after several fatal accidents. The flight simulation industry was born when some 10,000 Link Trainers were used in the second World War to train new pilots of allied nations.

Now Flight simulators are used to train flight crews in normal and emergency operating procedures. Using simulators, pilots are able to train for situations that are unsafe in the real aircraft: for instance engine failures, malfunctions of aircraft systems, of flight instruments, etc.

Various categories of flight simulators and flight training devices are used for pilot/crew training. These vary from simple Part-Task Trainers (PPTs) that cover one or more aircraft systems, Cockpit Procedures Trainers (CPT) for practicing drills and checks, to so-called Full Flight Simulators (FFS).

Flight simulators are an essential element in individual pilot and flight crew training. They save time, money and lives. The cost of operating a Thales Level D Full Flight
For helicopters, the training needs of helicopter pilots and crews are unique.

No other aircraft is as fundamentally complex and unstable as a helicopter, or as frequently asked to perform so dangerous mission profiles.

The inherent instability of rotorcraft demands an enhanced flight control that is extremely complicated and difficult to simulate.

Even more than in fixed-wing aircraft training, there is a wide range of maneuvers and emergencies that simply cannot be achieved in the aircraft at all.

Costs of operating and training in the actual helicopter are generally much higher than for fixed-wing aircraft of the same weight class.

The benefits of Thales Training & Simulation’s solutions for helicopters are undeniable and uniquely suited to meeting the very specific needs of rotorcraft operators.

A first phase is dedicated to education, in order to get the appropriate knowledge. During the second phase, they must keep, update and even increase their knowledge; therefore they must be given efficient training means. At this stage, individuals have the skill set to perform missions.

**Simulator Benefits for Helicopters**

Simulator is many times less than if the training was to be on the aircraft itself. A cost ratio of worth 1:40 has been reported for a Boeing 747 Level D simulator training compared to the cost of training in a real aircraft.

**Simulation Objectives**

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**Benefits of Simulation at a Glance**

Thales’ simulation offering has many advantages:

- Safety
- Environmentally-friendly
- Cost-effective
- Extended training scope compared to real helicopter
  - (emergency, malfunctions and failures)
- Special maneuvers
- All time of day, weather conditions
- Progressive and pedagogical learning
- High availability (> 96%)

Today, Thales offers the most performing simulation based solutions for technical and tactical training for Helicopters.

**Simulation Systems and Solutions**

The capabilities offered meet or exceed the specific training requirements of civilian and military operators in full compliance with Regulatory Authorities.

**Flight Navigation and Procedure Trainers (FNPT)**

In operation since 2001 in the Air Forces and Army Aviation, as well as in helicopter flight training centres, the Thales Flight Navigation and Procedure Trainers have conclusively proven their operational training efficiency and their high operational availability.

Thales’ FNPT solution has been fine-tuned and optimised through years of experience; its design optimises both cost and performances requirements and provides our Clients with the best “value for money”.

Thanks to the EasyUp™ kit, Thales’ FNPT product range can be easily upgraded to the FTD level; offering our Customers enhanced training credits.

Training Objectives - Training Credits

Thales’ FNPT is a fixed-based helicopter trainer dedicated to ab-initio and refresher training. It is an efficient and reliable training tool fully field-proven and already delivered to both civilian and military flight training organisations.

It is a JAA approved training device at JAR-STD 3H FNPT II and III standards. According to European civil aviation authorities 25 to 30% of the flight hours required to obtain a pilot license can be performed on a Thales FNPT instead of real flight. This number rises up to 70% for instrument flight rules.

Thales’ FNPT reproduces flight behaviour and cockpit equipment of a typical twin-engine helicopter with either classic or cockpit-glass avionics. It is basically delivered with a generic helicopter terrain database including specific features such as heliports, open or confined urban landing areas, hospitals, road accidents, oil rig, sea with ship deck landing... as well as animated land and air platforms.

The capabilities offered meet or exceed the specific training requirements of civilian and military operators in full compliance with Regulatory Authorities.

**System Classification**

- Ab-initio VFR
- IFR
- MCC
- Operational Training
- Single/Dual pilot helicopter

**Training Scope**

The FNPT is key to improving flight safety and training efficiency through:

- Ab-initio training on cockpit management and helicopter handling, single or dual pilots.
- Comprehensive Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) training
- Training in various terrain – including mountain areas – and wide weather conditions in daylight or night operations with real or simulated NVG
- Experience of safety procedures including autorotation and vortex ring, as well as emergency procedures
- Multi crew co-operation training (MCC)
- Line oriented flight training (LOFT)

**System Design**

Designed to meet the requirements of flight and mission training Thales’ FNPT is a cost-effective training device. Its design meets both cost and performances requirements and provides the most sophisticated training environment.

The design of the trainer also makes easier the upgrade to the FTD level and provides our Clients with the best “value for money”.

**Extended training scope compared to real helicopter**

- Special manoeuvres
- All time of day, weather conditions
- Progressive and pedagogical learning
- High availability (> 96%)

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**Environmentally-friendly**

**Cost-effective**

**Safety**

**Training & Simulation for Helicopters**

8

9

**Missions**

**Training**

**Education**

For these activities, education, training, mission preparation or rehearsal, simulation is sometimes the unique alternative. Often it offers a useful and efficient complement to traditional training means (theoretical courses, training on the real equipment, etc.).
upgrades including the extension to collective training with other simulations through HLA/DIS networking.

Image Generation
The 3D environment is generated in real time by ThalesView, the powerful and high performance image generation suite from Thales already qualified on JAA/FAA level D Full Flight Simulators. ThalesView has been developed and finetuned to meet specific helicopter training requirements.

Visual Display
Thales FNPTs are offered with 2 display solutions.
- Flat screen
  Available with 150°x40° or 150°x60° Field-of-view, it is a cost-effective solution for FNPT II certification.
- Cylindrical display
  Available with 150°x40°, 150°x60° and 180°x80° Field-of-views, this solution is well adapted to FNPT III MCC certification. This feature also facilitates further upgrade of the Thales’ FNPT to Flight Training Device type (FTD) with the EasyUp™ kit.
  Optional chin windows can be added to the FNPT in order to enable specific maneuvers or to reflect specific helicopter configurations.

Hardware design
The large use of COTS (commercial-off-the-shelf) components, allows the system to evolve in line with customer requirements and makes its obsolescence easier to manage.

Instructor station – Remote IOS
Exercises are prepared and controlled from either the Instructor/Operator Station or the remote IOS in the cockpit.

By using scenario generation equipment, it is easy to generate tailored exercises.

Assessment of trainees’ performances is undertaken by the instructor station.

Certification tool
For initial and recurrent certifications, Thales’ WAGS (Windows Auto test Generation System) tool embedded in the FNPT enables our Customers to automatically produce Qualification Test Guide (QTG) and tests results.

Maintenance
The maintenance of the FNPT device is easy thanks to Thales design embedding the powerful proprietary General On-Line Diagnosis tool (GOLD). GOLD main functions are:
- Operators Assistance: start/stop, morning readiness checks,
- Systems status: real-time monitoring and status of the simulator; status displayed on graphical interfaces; repair advices provided, access to maintenance documentation,...
- Offline maintenance tests.

In addition to GOLD remote maintenance can be proposed.

Customer Support
Thales provides full customer support, with hotline and yearly routine inspections, with modern and customer-proved tailored support concepts, which maximize system availability (more than 98%) and minimize life-cycle costs.

References
The more recent Thales FNPTs are in operation in the:
- French Army: Fenec FNPT II
- French Air Force: Gazelle FNPT III MCC
- Héli Union: JARSTD 3H FNPT II MCC
- French Ministry of Interior, Sécurité Civile: EC-145 JARSTD 3H FNPT III MCC

ROLL ON ROLL OFF FULL FLIGHT SIMULATORS
Thales is an established provider of training solutions and services for both civilian and military Customers, holding a unique level of expertise in a wide range of simulation systems. Through continuous innovation, our advanced Full Flight Simulators help aircrews conduct their mission and return safely.

TRAINING OBJECTIVES
Today’s helicopter aircrews are required to operate agile multi-engine rotorcraft with a wider scope of operational capabilities, processing sophisticated information systems and often in harsh conditions. Only very competent and perfectly trained aircrews can achieve successfully and safely their mission objectives with high effectiveness and proficiency.

The primary goal of Thales’ Full Flight Simulators (FFS) is to address the training needs in flight training and mission rehearsal. Thales FFS are recognized as cost-effective high-end training tools for both civilian and military operators. They are key to achieving excellence in flight mission readiness and aircrew proficiency. Most of our in service devices are qualified by Airworthiness Authorities at the highest level of certification.

TRAINING SCOPES
Thales’ FFS dedicated to specific requirements of tactical transport helicopters is supporting:

Pilots training
- Initial and Type certification
- Recurrent training
- Operational training

Mission Training
- Medical evacuation
- Search and Rescue Sea and Mountains
- Personnel and sling load transport
- Low altitude and Nap Of The Earth flying
- Winching operation

Mission conditions supported
- Any time of day out-of-the window / NVG / HMSD in all weather conditions
- All flight procedures including emergency procedures that simply cannot be practiced safely aboard the helicopter

TRAINING CAPABILITIES
This section describes the training capabilities of the Full Flight Simulators and explains how their technical functionality will meet the training requirements.

The simulators will provide the following flight training capabilities:
- Cockpit management
- Flight instrumentation familiarization
- Systems operation
- Standard checklists
- Reaction to emergency conditions
- Multi Crew Co-operation procedures (MCC)
- Basic helicopter handling
- Standard pre start-up/run up check/shutdown
- Use of flight controls/co-ordination
- Take-off
- Hover
- Climb
- Cruise
- Turns
- Acceleration/deceleration, descent, approach to landing areas, landing
- Advanced helicopter handling
- General and advanced handling, all weather
- Various internal and/or external loads
- Navigation
- VFR flight
- IFR flight
- Operation of radio-navigation systems
- IFR manual flight procedures using radio navigation aids
- Practice of ILS and GCA approaches
- Practice of radio-navigation using VDR, ADF, DME... and beacons
- Safety procedures
- Practice of aircraft standard and emergency procedures
- Recognition and response to aircraft malfunctions
- Autorotation landings (autorotation entry, control during descent)
- Recognition of Vortex phenomena and practice of escape procedure.
Training & Simulation for Helicopters

Provide embedded facilities for system calibration and to set-up the simulation system and to conduct and direct the training exercises.

Additional training or technical equipment, mainly:
- I/O Interface for connecting the Host Computer to the cockpit equipment and instrumentation, also including an online diagnostic system.
- Emergency and safety systems.
- Interoperability network.
- Computer network.
- Off-board Instructor Station (Option).
- Intercommunication system between the trainees and the Instructor.
- Debriefing station.
- System administration station.

Mission training

Search And Rescue (on land and water)
- Use of FLIR
- Oil rig and ship landing
- Under slung load operations
- Formation flight
- Night Vision Goggles flight
- Battlefield effects
- Precision electrical digital engineered Control Loading Systems
- Realistic simulation of the helicopter on-ground and in-flight handling qualities – rehosted models provided by the helicopter manufacturer ensure the highest possible fidelity – avionics, mission equipment.
- Advanced sensor simulation and fault correlated environment.
- Full-fidelity cockpit replica including pilots’ NVG/ HMS&Ds when applicable.
- State-of-the-art sound, vibration and motion systems fully compliant with JARSTPD 1H Level D requirements.
- Precision digital electrical computer Control Loading System.
- Latest advanced high performance visual image generator and display system (collimated or projected).
- Fully integrated instruction system: lesson plan editor, tactical scenario generator, bird’s eye view, brief/ debrief station.
- The simulation system is the Host Computer, which:
  - Manages real-time operations.
  - Runs the modelling software.
  - Drives all peripheral subsystems.

The other main system components, the most important of which have also been indicated in the previous diagram, are:

- A one-to-one replica of the helicopter cockpit, including:
  - Operational stations for the trainee crewmembers.
  - Cockpit controls, driven by appropriate control loading systems.
  - Cockpit instrumentation and equipment.
  - A visual system that provides visual cues, based upon a detailed representation of any specified operational terrain.
  - A motion system that provides dynamic motion cues. It will be complemented by a vibration system.
  - A sound system that provides aural cues.
  - A simulation of the communication systems.

- A synthetic environment that enriches the training environment by supplying an accurate and realistic representation of the environment: terrain, weather conditions, other aircraft and vehicles, moving objects, radio beacons, weapons, etc.
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Simulation S/W

Thales’ Full Crew Mission Simulator will include high-fidelity simulation models of all ownership equipment, including aircraft systems, avionics, sensors and weapons as required to meet the highest training requirements.

For instance the flight loop model – composed of flight dynamics, ground handling, power plant and flight controls models – will represent the helicopter variant within the service flight envelope including take-off, landing and ground manoeuvres operations with respect of the physical limits of the real aircraft (weight, CG location, rotor, and stall).

Motion/CLS/Vibration

Thales hydraulics (eM2) or electric (eM2) 6 degrees of freedom (DOF) motion systems are proposed with current Thales’ FFS. A 3-axis electrical vibration platform vibrates the entire cockpit. Precision engineered digital electrical Control Loading System.

The combination of those 3 systems is key to meeting JARSTD 1H Level D requirements.

Maintenance and Certification tools:

WAGS and GOLD

The General On Line Diagnostic (GOLD) system, developed by Thales, is a powerful diagnostic tool that promotes rapid corrective maintenance. GOLD monitors in real time the simulator components, and logs any detected failures; it carries out extensive online tests and accurate diagnostics, automatically indicates detailed information on faults, and provides maintenance advice via a graphical interface. GOLD simplifies the maintenance procedures, and considerably reduces the maintenance time and the need for specialized operators.

The GOLD system status is available on any PC of the system and on the instructor station as well. By simply clicking on the failure message, the maintenance operator can get advice on the actions to be taken in order to correct the detected failure.

Thales has developed an extensive automatic test facility, called Windows Auto test Generation System (WAGS) for rapid checking of the simulator to be performed under tightly controlled tests conditions; its use has been accepted by JAA for simulator initial qualification and recurrent testing. The main benefits provided by WAGS are:

- Test repetitability
- Checks of integrity of software and hardware
- Use of controlled inputs
- The ability to fly to close tolerances
- Electronic or printer output of results
- Reduction in test time
- Pass/fail checking
- Identification of parameters out of tolerances.

MAIN ACHIEVEMENTS

Our recent achievements are with HELIUSM Eurocopter Training Services: 2 FFS Roll On Roll Off capable of EC225/725, Super Puma L1/L2, Dauphin/Panther, EC155 and NH90 in the future.

The choice of Thales Full Flight Simulator expertise ensures that your crew training will reach and maintain the level of excellence. Thales provides the most realistic and relevant training devices for your mission success.

Thales Full Flight Simulators cover the full mission spectrum of military and multi-engine civilian helicopters.

Thales’ Full Flight Simulators Roll In Roll Off concept provides unrivaled flexibility.

FULL CREW MISSION SIMULATORS (FCMS)

As a world leader in simulation and training, Thales offers the most advanced and innovative solutions for helicopter simulators. Thales is a reference provider of Helicopter Full Crew Mission Simulators for the German, English, Australian and French Armies among others. Thales high fidelity simulators are a strategic and sustained contribution toward achieving excellence in mission readiness and crew proficiency.

TRAINING OBJECTIVES

Modern helicopters and weapon systems are extremely effective and complex with a wide scope of operational capabilities. Only very competent and perfectly trained crews and teams can achieve successfully their mission objectives with high combat effectiveness and proficiency.

Thales Full Crew Mission Simulators (FCMS) are recognized as cost-effective high-end training tools for Armies. They are key to achieving excellence in mission readiness.

These high fidelity simulators address the needs in flight training and mission rehearsal. Crew members can be trained individually, collectively and tactically.

TRAINING SCOPE

Thales’ FCMS dedicated to specific requirements of tactical transport helicopters is supporting:

- Pilots training
- Initial and Type certification
- Basic pilot tactical training
- Flight instructor certification
- Crew leader certification

- Missions
- Tactical trooping
- Logistic support
- Medical evacuation
- SAR Sea and Mountains

Mission conditions supported

- Any time of day out-of-the-window / NVG / HMSD view in all weather conditions
- All flight procedures including emergency procedures that simply cannot be practiced safely aboard the rotorcraft
- Low altitude and Nap Of the Earth flying

Tactical training
- Personnel and sling loading tactical transport
- Electronic Warfare operation
- Winching operation
- Search and Rescue

Formation flying by networking simulators

Along the whole Thales’ military product range from HCTT to FCMS, teams training capability – individual through brigade unit – is a key feature of our devices. Helicopter formation flying in a complex mission and battle airspace is achieved by networking FCMSs and any other simulation into a cohesive training course.

DESCRIPTION

Key design features of Thales FCMS include but are not limited to:

- Realistic simulation of the helicopter on-ground and in-flight handling qualities – rehosted models provided by the helicopter manufacturer ensure the highest possible fidelity, avionics, mission equipment.
- Advanced sensor simulation and faithfully correlated environment
- Full-fidelity cockpit replica including pilots’ HMSDs
- State-of-the-art sound, vibration and motion systems fully compliant with JARSTD 1H Level D requirements
- Precision engineered Control Loading System
- Latest advanced high performance visual system (collimated or projected display) and image generator
- Fully integrated instruction system: lesson plan editor, tactical scenario generator, bird’s eye view, brief/debrief station
- Embedded networkability
**CORE COMPONENTS**

**Computed Generated Forces**

The tactical environment of the helicopter is managed by the Thales’ CGF called SETHI. SETHI software offers many advanced features such as a user-friendly MMI to prepare exercise and mission scenarios, to define the behaviour of virtual actors and to manage dynamic terrain (breeches, devastation, etc.) with appropriate cues generated by the motion system.

**Image Generator**

The visual environment is offered by ThalesView. This powerful image generation suite manages wide and high realistic visual databases and renders superb true 3D pictures of the surrounding battlefield. Main features include a wide choice of moving ground and aerial objects represented with a high degree of realism, dynamic terrain, various weather conditions. In addition, ThalesView supports the simulation of FLIR, L sensors, NVG, HIMSD, weather radar, etc.

**Visual Display**

Both collimated display dome with chin windows and direct projection dome are available with Thales’ FCMS.

The choice is made according to the main training tasks to be achieved: a larger field of view with direct projection versus a better resolution and no parallax error with collimated.

**Instructor station**

On-board and off-board instructor/operator stations

- (IDS) are provided to manage and control exercises and to monitor the trainees through user-friendly man-machine-interface. The on-board IDS includes a handheld portable control unit.

**Cockpit – Avionics**

Both simulated and real avionics instrumentation are made available. The genuine OEM avionics Software can be rehosted.

**Simulation S/W**

Thales’ Full Crew Mission Simulator will include high-fidelity simulation models of all ownership equipment, including aircraft systems, avionics, sensors and weapons as required to meet the highest training requirements.

For instance the flight loop model – composed of flight dynamics, ground handling, power plant and flight controls models – will represent the helicopter variant within the service flight envelope including take-off, landing and ground manoeuvres operations with respect of the physical limits of the real aircraft (weight, CG location, rotor, and stall).

**Motion/CLS/Vibration**

Thales hydraulic (M2K) or electric (eM2K) 6 degrees of freedom (DOF) motion systems are proposed with current Thales FCMS. A 3-axis electrical vibration platform vibrates the entire cockpit. Precision engineered digital electrical Control Loading System.

The combination of those 3 systems is key to meeting JAR-STD 1H Level D requirements.

**Modularity and Expandability**

Thanks to the FCMS design and modular architecture, sub-products have been produced as stand alone Part Task Trainers (PTT), Crew Procedure Trainers (CPT) or Flight Training Devices (FTD). All of them share the same technology with the FCMS. Due to its modular and open architecture and to its HLA/DIS interoperability, a Thales’ FCMS has real growth potential to cope with evolving customer’s demands and helicopter evolutions.

**MAIN ACHIEVEMENTS**

Thales has built an enviable reputation as leading provider of helicopter high-end training solutions for Armies and Air Forces. Our recent achievements in the arena of Full Crew Mission Simulators are mainly with the major helicopter programs such as the Tiger attack helicopter and NH-90 multirole medium helicopter.

- German and French Armies: 2 Tiger FCMS in service, 7 to come
- Australian Army: 2 Tiger FCMS
- German Armed Forces: 4 NH-90 TTH FCMS networked
- Australian Army: 2 MRH-90 FCMS
- HELSIM Eurocopter Training Services: 1 NH-90 TTH FCMS
- Italian Army: 1 A129 FCMS in cooperation with the helicopter manufacturer
- UK Army Aviation: 1 Lynx Mk7/9 FCMS

The choice of Thales Full Crew Mission Simulator expertise ensures that your crew training will reach and maintain the level of excellence.

HELIHOSTER COMMANDER TACTICAL TRAINERS (HCTT)

Thales Simulators are a strategic and sustained contribution toward achieving excellence in mission readiness and crews proficiency. As a world leader in simulation and training, offering the most advanced and innovative training solutions for helicopters, Thales has built a unique expertise in cost-effective and affordable tactical trainers for helicopter commanders with its unrivalled dynamic reconfigurable HCTT.

**TRAINING OBJECTIVES**

Modern combat, reconnaissance and utility helicopters are extremely effective and complex with a wider scope of operational capabilities than older platforms. Achieving future battlefield success with crews perfectly trained to operate as cohesive units is essential.

Thales Helicopter Commander Tactical Trainers (HCTT) are cost-effective and affordable as well as modular and reconfigurable training devices. They are a strategic and sustained contribution toward achieving excellence in mission readiness.

**ACQUIRE, DEVELOP TACTICAL SKILLS AND COMMAND ABILITY**

Thales HCTTs address the needs of tactical education, tactical flight training and mission rehearsal. Aircrews can be trained individually, collectively and tactically.

**TRAINING SCOPE**

Thales HCTTs dedicated to specific tactical helicopters requirements is supporting the training of pilots, patrol, squadron leaders and regiment commanders in a combined arms environment:

- Initial training
  - Flight procedures
  - Tactical low altitude navigation and moves
  - Detection, Reconnaissance, Identification
  - Observation and Maneuvers
  - Survive hostile "air-sea/land" forces

- Weapon system training
  - Operational education (armaments, sensors, anti-tank, anti-aircraft, ...)

- Special operations
  - Combat, escort, landing troops or special forces, search and rescue, aerial work, medical evacuation, in-flight refueling, ...

- Unit Training
  - Cohesive unit at Crew, Patrol, Squadron level
  - Tactic flight improvement: navigation and flight-path management in all weather day and night conditions
  - Complex missions training rehearsal

**CONCEPT**

HCTT is a highly flexible tactical training tool that enables any combination of 6 helicopter cockpits modules.

Thales’ HCTT has the capacity to train multiple aircrews simultaneously in the desired formations: for example 6 single crews individually, 2 patrols and 2 single, 3 patrols, 1 squadron, ...
The dynamic configuration of the 6 helicopter manned modules is easily achieved by software and does not require any special tools.

**Description**
Key design features of Thales’ HCTT include but are not limited to:

- Easy dynamic software configuration for individual cockpit training up to collective training with multiple helicopter types (Cougar AS532, Tiger, A109, Gazelle, Fennec)
- Realistic simulation of the helicopter handling qualities for each of the 6 replicated platforms
- Advanced sensors simulation including virtual reality helmet that represents either a NVG or a HMSD faithfully correlated to the environment
- Modular and reconfigurable cockpit
- Latest advanced high performance visual image generator ThalesView and computed generated forces system SETHI
- Flexible and user-friendly instructor station and briefing/debriefing station
- DIS/HLA Networkability

**Core Components**

**Computed Generated Forces**
The tactical environment of the helicopter is managed by the Thales CGF called SETHI. SETHI software offers many advanced features such as a user friendly MMI to prepare exercise and mission scenarios, to define the behaviour of virtual actors and to manage dynamic terrain (trenches, devastation, etc.) with appropriate cues generated by the motion system.

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**Visual Display**
A panoramic 190°x40° field-of-view display is offered with each helicopter module. A virtual reality helmet that simulates either a NVG or a HMSD is also provided with Thales’ HCTT.

**Instructor station / Role Player Module**
Each Role Player Module is equipped with a two-screens workstation and can play different roles depending on the HCTT configuration and operating modes: command animation, exercise management, off-line scenario development.

**Manned Cockpit Module**
The manned cockpit module represents the environment that is required by tactical training of the helicopter crews. It is composed of 2 separable cockpit seats that can be arranged either side-by-side or tandem-like. Sensor image and simulated instruments and panels are represented on the screens.

**Briefing/Debriefing Module**
The Briefing / Debriefing Module usually located in a separate room, contains a two-display computer workstation and a backwall projection system. It performs 3 main functions:
- briefing the crews before their training,
- stealth supervision of any of the on-going exercises,
- debriefing the crews after their training with the help of the Bird’s eye view.

**Modularity and reconfigurability**
Thanks to the HCTT modularity, open architecture and HLA/DSA networkability, a Thales HCTT has real growth potential to cope with noticing customer’s demands and helicopter improvements as well.

**Main Achievements**
Thales has built an enviable reputation as leading provider of helicopter high-end training solutions for Armies. Thanks to our experience and expertise in Helicopters and Land Forces systems, we have brought to the market a new affordable device fully dedicated to tactical aircrew skills.

Our recent achievements in the arena of Helicopter Commander Tactical Trainers is with the:
- French Army Aviation School
- Belgian Light Aviation

**Core Technology**

**INTRODUCTION**
In this section, many items could be described, since simulators are really high-tech products with a lot of specific technologies inside. However, a focus on the most discriminating technologies is proposed. An effective positive training can be reached only if the crew is sufficiently “tricked” into acting as if the simulation exercise was a real operational mission. This goal requires a very high level of realism, especially in the field of external environmental conditions. This is covered by the notion of “synthetic environment”, which is actually divided in 2 items: the natural environment (terrain, roads, bridges, buildings, etc.) and the tactical environment (external “agents” such as allied, enemy, and neutral forces, civilian population, etc.).

To offer a powerful synthetic environment, two main concerns must be taken into account:
- The quality of the presentation of the synthetic environment to the crew, and especially the quality of image rendering in the sensor views;
- The quality of the tactical animation of the synthetic environment, and especially the credibility of the actions, reactions and behaviours of the so-called “non-played agents” or “computer generated forces”.

**The quality of the synthetic environment relies upon image rendering and computer generated forces**

Thales has an extensive experience in these two domains and offers two outstanding products:
- ThalesView for 3D Image Rendering
- SETHI for Computer Generated Forces

SETHI is a very high fidelity Tactical Environment Generator. It fulfils high-end requirements for technical or tactical training in a virtual environment. It is also designed to support simulation based design or operational analysis. SETHI provides all the elements required to create and animate very detailed and sophisticated tactical environments for combined and joint operations.

The other focus proposed in this paper is on Advanced Studies. Actually, Thales is very much involved in such studies with many funding sources including a lot of self-funded studies. Some significant examples of Advanced Studies are given in the corresponding section.
The whole range of the various conditions encountered by civil and military operators of ground vehicles and fixed or rotary-wing aircraft, from direct views, sighting equipment (periscope, telescope, binoculars), to sensor imagery (forward looking infra red, lowlight TV, light intensifier) is supported, with total correlation and consistency through the system’s graphics channels.

ThalesView is fully compatible with all associated simulation components, such as Computer Generated Forces, Radar images, Plan View Displays and mission preparation stations. Complemented by the Thales DBGS production process, correlation is ensured throughout the training device.

Thanks to its scalable client-server architecture, the ThalesView solution benefits from the rapid developments in PC hardware. For instance, a central server minimises the database installation time as the clients are dedicated to only graphics or support mission functions, therefore using the H/W resources at their maximum capabilities.

The database portrays either an actual or a virtual environment, from countryside to large urban areas. The high-level system performance allows the processing of very detailed databases, including dense vegetation and accurate terrain skin. 3D content is automatically added with various 3D elements (rocks, bushes, ...) thanks to a unique procedural LOD terrain management providing all the necessary cues to the trainee.

Graphics shaders technology is intensively used to render all the lighting and meteorological effects, such as Phong or bump-mapping. Advanced special effects include cast shadows dependent in realtime on sun or moon position and reflections on wet surfaces.

Dynamic effects are represented, for instance landscape modifications due to military activity (tank holes, trenches, etc.), or combat effects such as craters, destroyed objects, or tracks according to the terrain nature. These modifications are taken into account in a consistent manner through the various components of the system, including mission support functions.

A comprehensive set of battlefield effects is provided, e.g., explosions, smokes, dust, smoke shells, lighting shells, depending on ammunition types.

All of the necessary weather conditions are realistically displayed, such as clouds, rainfalls, snowfalls, fog. The sky and associated transmission effects are rendered with a physics based model, dramatically improving their realism. A fog layer, locally conforming to the terrain, can be used to reduce visibility at ground level when appropriate.

Furthermore, these effects are fully integrated with the simulation models, so that the training conditions reproduce exactly the difficulties that they create in observation and driving capabilities. Thus, the trainee crew can practice driving (on the road and on the field), observation procedures, tactical manoeuvres and the use of weapons.

This performance and continuing product development makes ThalesView one of the most advanced visual systems in the simulation industry.

Major simulation platforms already use ThalesView, for example the full crew LECLERC MBT, the TACTIS system, Tiger, NH-90, EC-225, ... More than 100 helicopter simulators in world-wide use are equipped with ThalesView, in countries such as Switzerland, Germany, France, Belgium, Australia, United Kingdom and the Middle East.

Sensors image generation sticks to the actual process. Luminance and energy of every texel are computed from an accurate physical model, valid for any wavelength and environment conditions. The sensor itself is then simulated with own characteristics, including specific post-processing algorithms (AGC, noise, etc.) to display the final picture.

The high-fidelity visual cues provided by ThalesView support a very wide range of training missions. The trainee crew can practice driving (on the road and on the field), observation procedures, tactical manoeuvres and the use of weapons.

Beyond the figures, ThalesView meets the most demanding training requirements of JAR-STD 1H Level D.
The animation of the virtual battlefield is a key issue for technical training and even more critical for tactical training. To provide trainees with realistic environments, it is necessary to put them into a virtual reality including many other ground vehicles, aircraft, infantrymen, civilians, etc. In order to minimize the instructors’ efforts, the actors of the battlefield must operate automatically and therefore should be ‘Computer Generated Forces’. Today, the technology in the field of Artificial Intelligence and Artificial Life offers very powerful solutions to populate the virtual battlefield. Thales has developed a very deep expertise on this technology and, thanks to a long-term and fruitful collaboration with many Armies, has been able to integrate it into many virtual and constructive simulators. For the currently developed or future simulators, a lot of capabilities are being improved, especially in the domain of urban terrain and asymmetric warfare.

**FUNCTIONAL ARCHITECTURE OF SETHI**

The following diagram gives an overview of the functional architecture of SETHI.

**SETHI MAIN CAPABILITIES**

The main operational features of SETHI are:

- **The terrain representation is based on the same database used by ThalesView.**
- All types of virtual entities can be simulated as “intelligent” autonomous agents.
- SETHI simulates and manages all the entity types needed for the creation of a realistic “virtual outside world”:
  - Ground vehicles.
  - Helicopters.
  - Aircraft.
  - Ships.
  - Infantry, militias, guerrillas.
  - Civilian populations.
- SETHI possesses aggregation capabilities, and can manage different levels:
  - Platform.
  - Battalion.
- SETHI supplies tools that considerably simplify the preparation and review of tactical scenarios:
  - Scenarios can be easily defined by means of milestones, waypoints, synchronisation of events, etc.
  - Scenarios can be tested off-line, before the simulation session, in order to check their training validity and their operational coherence.
- 3D views generated by ThalesView are also available during off-line test runs.
- SETHI provides advanced, high-quality models of virtual entities.
- SETHI allows the implementation of different model types:
  - Physical models with editable parameters (motion, detection, firing, damages)
  - Behavioural models with editable doctrines.
- SETHI provides user-friendly Graphical User Interfaces.
- All SETHI control actions are carried out via graphical interfaces. Operational personnel do not need any specialised capabilities in computer programming.
- The configuration of SETHI is fully adaptable.
- SETHI supplies editable libraries for many types of virtual entities and their related components, including weapons, sensors, electronic warfare devices, etc.
The new entities thus created, i.e., trenches and trees, will have full tactical consequences. The simulation of these effects in a realistic manner is of course tactically important, and is performed by the Dynamic Terrain model.

The simulation of obstacle creation, by means of elementary actions, as shown in the following diagram.

Each entity receives a mission to be fulfilled, either defined in the scenario or created / modified in real time by the user. This mission is defined as a sequence of elementary actions, as shown in the following diagram.

The system is delivered with a default BDB containing generic rules dealing with firing authorization, rules of engagement, actions on contact, etc.

The user has full control over the behaviour of all entities, allowing him to modify their attitude and reaction in real time (e.g., to modify the firing authorization by just clicking on a specific entity).

The Tactical Environment, which determines battlefield effects, their magnitude, and their locations.

The simulation of these effects in a realistic manner is of course tactically important, and is performed by the Dynamic Terrain model.

This advanced model actually requires the close cooperation of:

- The Tactical Environment, which determines battlefield effects, their magnitude, and their locations.
- The Image Rendering, creating their respective 3D representations.

The 3D consequences of obstacle creation, by means of trench digging and tree felling, are represented in the following figures.

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The figure below shows a screenshot of the SETHI Tactical HMI. This screenshot shows some of the windows used to create and monitor scenarios: definition of units, definition of efficiency, access to regulation orders, missions, etc.

The SETHI Tactical HMI is used both in the scenario preparation and execution phases. It uses conventional symbols. These symbols may be modified to any standard desired by the Customer.

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**ADVANCED STUDIES**

Thales is a world leader in the field of Modelling, Simulation and Synthetic Environments and has developed a centre of excellence in the use of Synthetic Environments for a wide range of applications. Three of them are here below described to illustrate the multifaceted know how of Thales in mastering this field in which essential Advanced Studies are undertaken: simulation of large complex systems (e.g., system of systems, human organization), rapid production of operational results (for decision-aid rehearsals, etc.) and simulation of populated virtual cities (for defence or homeland security purposes).

Thales has been at the forefront of the Synthetic Environment (SE) and exploitation since its inception and has been influential in promoting the use of SEs in military acquisition programmes. It has gained practical experience of using modelling and simulation to support different phases of the lifecycle on major acquisitions. The types of situations that Thales has applied to SEs include: analysis of concepts, rapid prototyping, aiding design with trade-offs, operational assessments and risk reductions.

Thales has developed an extensive library of models and simulations, which can be networked together to satisfy a wide range of requirements from different domains.

In addition, for over many years, either for aircraft simulators or for vehicle driving simulators, Thales has acquired a unique know how in visual databases processing for civilian and military applications.

**CURRENT STUDIES**

**Military acquisition programmes: SEBA**

Thales capacities have already proven their usefulness in UK for programmes as WATCHKEEPER (UAV) or CVF (Carrier Vessel Future).

In France, two Advanced Study Systems from Thales are now operated by the French MOD and will be integrated into its Battle Lab to support studies on vehicles within the programme “Cooperative Fighting System”.

An Advanced Study System mainly consists of a set of generic platforms, each of them being able to play any carrier, or a sensor or a weapon system or to be used as a workstation for scenarios preparation.

This flexibility is achieved through a modular HLA architecture and modular Graphical User Interfaces.

On each platform the running situation is available in real time by a 2D map display and a 3D out of the window view.

A comprehensive suite of software components is provided for architecture analysis and comparison purposes; a multi-criteria analysis may be carried out to optimise some parameter in different phases of an exercise.

Any type of sensor and weapon system (direct and indirect fire, area weapon effect, etc.) either for ground or for air vehicles (helicopters, drones, fighter aircrafts) can be modelled. Communication and tactical combat systems are also modelled. In addition, advanced models of human behaviour of soldiers and hostile crowds have been developed to study how the equipment and the procedures are adequate in combat, peacekeeping and crisis management situations.

**Rapid mission preparation tool: 3D CHRONO**

Some important operational applications using simulation (decision-aid, rehearsal, etc.) squeeze technology to ever increase the performances of rapidity and simplicity of use to produce results. In this field, Thales has achieved a true breakthrough with its 3D.CHRONO product: it allows SOF commandos on the field to create on their own within hours a synthetic 3D mock-up of any built-up area of intervention, using nearly any kind of input sources (pictures, video, blueprints, maps, etc.). A stringent COTS-reuse policy to constitute 3D.CHRONO has been a key factor of this success.

**3D urban data: TERRA DATA**

3D digitisation of the urban word is widely used in the common life, as digital maps coupled with GPS navigators.

Conversely, full 3D digitisation of cities detailed up to each monument and house is just emerging.

In France, due to its unrivalled expertise in visual data bases building and processing, Thales has been chosen as the Leader of a large trans-industry/agencies/academia programme focused on this subject: its objective is to put in place technical means and methods that ensure a global and consistent process for all the essential aspects (data acquisition, fusion, visualization, animation, etc.) leading to the production of large virtual cities, geo-typical or geo-specific. The two main technical challenges are to automate as much as possible the overall generation process, and to embed in the models the proper information /“intelligence” (e.g., buildings physical and functional characteristics) that will be required by all the potential applications, military or civil.

**APPLICATIONS**

A wide spectrum of applications can take benefit of this study: for instance, urban development of cities – simulation and decision-making aid tool –, design and control of urban transport network, driving training simulation, navigation and other nomad applications in a town, heritage development for tourism, museography, interactive artistic creation, etc.
With a heritage of aircrew training experience that extends over half a century, Thales is today a leader in the design and delivery of training services, supply of training devices and training solutions for all aspects of helicopter crew training, both military and civil.

**TRAINING SERVICES**

Thales’ offering extends from the supply of top of the range simulators and training aids for all types of flight training, to less complex tactical trainers to meet the most exacting military requirements, and the provision of complete turnkey and delivered training services.

Thales is a worldwide supplier of Aircrew Training Services to both civil and military markets. In addition Thales has supplied well over 100 helicopter simulators to customers globally, bringing in new levels of performance and sophistication to the synthetic training environment, while improving the cost-effectiveness and flexibility of crew training. Continuous company investment in developing innovative ideas, combined with the best new technologies and materials, has resulted in a comprehensive world-class products and services that offers aircrew suitable for every customer need.

Thales offers a complete synthetic training service and management of the training schedule including the planning of live flying training using a “Training Management Information System”.

**TRAINING SERVICES SCOPE**

Thales Training Services cover the following aspects.

**Training Services Delivery**
- Instructional design and delivery
- Courseware design, delivery & support
- Training syllabus design
- Training effectiveness measurement

**Training Management**
- Course Scheduling
- Personnel Management
- Training Management Information System

**Programme Management**
- Quality Assurance & Validation
- Process control
- Sub-contract management

**Synthetic Aircrew Training**
- Type rating
- Currency
- Mission Training

**A Complete Product Family**
- Full Mission Simulator (FMS)
- Full Flight Simulator (FFS)
- Flight Training Device (FTD)
- Flight & Navigation Procedures Trainer (FNPT)
- Cockpit Procedures Trainer (CPT)
- Helicopter Commander Tactical Trainer (HCTT) also named Combined Arms Tactical Trainer (CATT)
- Computer Based Trainer (CBT)

The simulators and training devices provide for:
- Ab-initio training
- Type rating
- Recurrent training
- Mission training
- Cockpit procedures
- General flight training
- Instrument flying
- Visual flying
- Emergency procedures
- Nap-of-the-earth flying
- Tactical flight training
- Flight with Night Vision Goggles
- CSAR / SAR mission

**CUSTOMERS’ CHOICE**
Thales has developed close partnerships with many customers requiring total training solutions. An example is the joint venture, Helisim, a pilot training academy for customers of the growing Eurocopter family of helicopters. A new training complex includes a number of advanced reconfigurable full flight simulators plus supporting trainers and facilities. Another major long term partnership programme is the 15-year Public Finance Initiative contract with the UK Ministry of Defence for the provision of all aircrew training for the British Army’s Lynx Mk 7 and Mk 9 battlefield helicopters. This includes an all-new training centre building containing comprehensively equipped classrooms and briefing facilities, an advanced flight simulator, cockpit procedures trainer and computer-based trainers. All training activities are co-ordinated electronically by a purpose-built information system.

The company has developed a major capability and places a high priority on understanding customers’ overall training needs so that the optimum solution can be prepared to best satisfy individual requirements. Thales outstanding track record of delivering customised training solutions for all types and scale of helicopter operation, offers the customer a wealth of detailed knowledge to assist when the requirements are being defined in detail before key decisions have to be taken on selecting the most appropriate systems and equipment. This close relationship with customers continues throughout the development, implementation, operational and support stages of the programme.

REALISM, FLEXIBILITY AND VALUE FOR MONEY

All simulators and trainers supplied by Thales feature the use of sophisticated digital technology to provide the highest quality visual and interactive realism, which enables every aspect of crew training to be undertaken safely and with the benefits of a highly efficient and cost-effective crew/instructor interface. A wide variety of configurations and operational features enable all types of training, from cockpit familiarisation, flight and mission simulation; and for military customers, tactical training featuring complex ‘virtual’ battlefield scenarios. Thales is a world leader in the provision of synthetic environments and distributed training, which allows customers in separate sites, and other training platforms, to be integrated into a cohesive training package. Adding to the considerable flexibility that is now available to customers through such developments, are full mission simulators that can be reconfigured quickly to replicate different helicopter platforms, allowing optimum training with minimum downtime. Improving the quality and productivity of training solutions while reducing the overall costs of the training task remain at the heart of the Thales business mission.

TACTICAL TRAINING

The company has developed a major capability and market leadership in providing advanced networked training systems that enable armed forces trainers, pilots and operators to conduct complex virtual operations within a realistic visual and real-time interactive environment. With modular design based on COTS hardware, cockpits can be configured as different helicopter types [e.g., Gazelle, Puma, or Tiger] allowing joint missions to be “flown”. As a flexible multi-level trainer, this advanced teaching tool can be used to develop mission scenarios as well as evaluating students and instructors, and carrying out the training of commanders and individual pilots. Its use enhances the teaching of the situational awareness and tactical decision-making of helicopter crews, and its post-exercise analysis capability allows detailed debriefing to maximise the total learning experience for participants.

Partnerships

Regardless of the requirement, military or civil, Thales places a high priority on understanding customers’ overall training needs so that the optimum solution can be prepared to best satisfy individual requirements. Thales outstanding track record of delivering customised training solutions for all types and scale of helicopter operation, offers the customer a wealth of detailed knowledge to assist when the requirements are being defined in detail before key decisions have to be taken on selecting the most appropriate systems and equipment. This close relationship with customers continues throughout the development, implementation, operational and support stages of the programme.

Thales currently has programmes in the UK, France and Germany where it delivers flight crew synthetic training and manages the scheduling of pilot training. These programmes are:

- Helicopter Flight Training Services (German PFI)
- Helisim Synthetic Training Services (France)
- Lynx Army Training Service (UK PFI)
- Tornado GR4 Synthesis Training Service (UK PFI)
- FSaST Integrated Aircrew Synthetic Training Service (FRANCE)

Helicopter Flight Training Services (for the German PFI)

At the end of 2004 Thales established, together with its partners, Helicopter Flight Training Services (HFTS) for the supply of NH90 training in Germany. Thales and CAE have a long term partnership for NH90 training with Helicopter Training Media International (HTMI):

- Established near Munich Airport (Germany) since December 2004
- Created exclusively to provide the entire range of NH90 Training Media products and services
- Mandate:
  - As Program and Design Authority for all NH90 Training Media Programs
  - Managing design, manufacturing, delivery and certification of all NH90 Training Media Products.

The 18-year contract awarded in December 2004, is a service contract placed by the BWB on HFTS for the training of the German Army and Air Force with 4 NH90 TTH FFS at three separate military training facilities (Bückeburg, Holzdorf, Fallberg).

- The Aircrew Training Service comprises:
  - State of the art 6 channels dome visual system
  - High fidelity
  - Motion system/vibration
  - Environment simulation (Computer generated forces /Weather) including sensors (IT/FLIR/Weather radar/EMS) and re-hosted avionics software
  - Support systems including briefing/debriefing, lesson planning, database generation and on/off IDG

Helisim Synthetic Training Services (France)

Created at the beginning of 2000 as a joint venture between Thales, Eurocopter, and Defense Conseil International (DCI), Helisim provides aircrew training type rating, currency training and mission training.

In a changing helicopter training environment (with strict worldwide safety requirements and more sophisticated missions), Helisim enables operators to perform their missions in optimum conditions. The training objectives are based on two key concepts:

- SAFETY: the pilot’s safety and that of passengers is paramount. Safety requires the operator’s full knowledge of the helicopter, gained only through expert training.
- MISSION: the main goal of each flight is to complete the mission with the highest efficiency. Helisim provides mission training in all extreme conditions whilst maintaining optimum levels of safety.

Military Missions Training Courses

- Search & Rescue Training (SAR)
- Night Vision Goggles (NVG) Training
- Tactical Flight Training (NDE)
- Combat SAR Training

Civil Missions Training Courses

- Offshore Training
- Search & Rescue Training
- VIP Flights Training
- Emergency Medical Services (EMS) Training
- Desk Operations Training

Helisim training programmes combine “ground breaking” technology with highly experienced instructors. The Training delivered includes Ground Courses, Computer Based Training (CBT), Cockpit Procedures Trainers (CPT), Flight Training Device (FTD), Full Flight Simulators (FFS) and Flight Training. This winning combination provides the most comprehensive and efficient training available in today’s market.
Training & Simulation for Helicopters

A management system was set up that included the development and implementation of a Training Management Information System, that takes responsibility for the scheduling and control of training both synthetic and live flying from the point of introduction as an ab-initio trainee through to transfer back to the operating unit. This managed by Thales under the approval of the Army Liaison Officer who is a serving pilot on the base. Thales has had to set up a full support service, which includes the maintenance of the simulators (6 maintainers) and training media and facilities management of the buildings, which are owned by Thales on land leased from the Ministry of Defence. The Training delivered by Thales includes:

- Operational Conversion Unit
- Ab-initio
- Refresher
- Pre-deployment Training
- Combat Search & Rescue

To deliver the training, Thales has responsibility for the instruction which includes:

- Syllabus Development, Maintenance & Delivery
- Courseware
- Provision of 6 Qualified Instructors

Tornado GR4 Synthetic Training Service (UK PFI)
The Tornado GR4 Training Service (designated “ACE”) was awarded in June 1999 and provides synthetic training for aircrew initially for 22 years [with an option up to 32 years]. The service, which includes the supply of instructors, buildings, synthetic training equipment and support staff commenced in October 2001. It provides conversion and squadron training at RAF Lossiemouth and squadron training at RAF Marham. The following new equipment was certified and brought on stream and is now delivering training.

- 3 Full Mission Simulators
- Navigation / Attack System Trainer
- Cockpit Procedure Trainer
- Computerised Instruction Facility
- Fully Fitted GBT Classroom

Again, a management system was set up to include the development and implementation of a Training Management Information System that takes responsibility for the scheduling and control of training.

The training delivered by Thales covers:
- Operational Conversion Unit, converting both new pilots from the hawk trainer to the Tornado GR4 and also pilots transferring from Harrier, Jaguar to Tornado GR4
- Combat-ready work-up prior to operational deployment
- Ab-initio
- Refresher
- Continuation

To deliver the training, Thales has responsibility for the instruction which includes:
- Courseware
- 18 Instructors
- Syllabus Development, Maintenance & Delivery

Thales has had to set up a full support service, which includes the maintenance of the simulators (6 maintainers)/training media and facilities/management of the buildings, which are owned by Thales on land leased from the Ministry of Defence.

FaAST Integrated Aircrew Synthetic Training Service (UK PPP FaASTS contract)
The FaASTS Training Service (designated “Merlin”) commenced on 1st January 2003 and will run for 17 years. The contract is set up to provide training to aircrew (both pilots and rear crew) on 9 aircraft types using over 20 training flight simulators in 10 locations around the UK. In addition to the simulators it includes 64 Part Task Trainers. Merlin provides instruction, syllabus, support and management on all sites. With over 94 qualified CFS trained aircrew.

- Sea King (Includes training of RAF and RN Search and Rescue air crew and rear crew)
- Hercules
- Tri-Star
- VC10
- Nimrod
- Hercules C130K
- Tornado
- Tucano
- Jaguar (recently retired from Service)

FORWARD LOOKING
Thales takes an active role within all the appropriate industry working groups reviewing regulations and certification issues to ensure that its products and services meet all current and future requirements. All activity today is governed by the stringent standards of E522001, TickIT, and other worldwide-recognised quality standards as CMM Level 3 for software. Already the company is incorporating into its training devices the requirements of the new JARSTD 1H (Helicopter Simulator) and JARSTD 9H (Helicopter FNPTI) prepared by the European Joint Aviation Authorities (JAA) as well as FAA AC 130-63.
WORLD CLASS SUPPORT SOLUTIONS

One of our core customer commitments is to offer tailored services and technical support which best fit our customer’s needs and which add significant value to their business operations.

At one end of the scale Thales can simply be there for our customers as and when help, support or technical advice is required. At the other end of the scale we can offer full turnkey maintenance and training solutions, covering the full operation and daily maintenance of the training equipment plus complete building and facilities management and provision of fully trained flight crew instructors.

Thales is justifiably proud of our long standing training service contracts with UK and French armed forces, delivering cost effective, mission critical service solutions for both fixed wing and rotary wing aircraft.

Today in the UK Thales is responsible for operating two rotary wing training centres:

- A Sea King Mk3 simulator is operated and maintained at RAF St Mawgan, England, as part of the UK MoD FsAST Integrated Aircrew Synthetic Training Service (FIASTS) contract. One of the primary tasks for this service is to train aircrew for search and rescue work. The contract specifies levels of simulator availability, various maintenance improvements and regular technology insertions to produce year on year improvements to the overall service provision. A relocation to RAF Valley, Wales, in 2008 will see this simulator operated under a new support contract that will include delivery of aircrew training by Thales own instructors.

- At the British Army Aviation training base in Middle Wallop, England, Thales provides a full training service for Lynx Mk7 and Mk9 aircrews in a purpose built facility under a long term PFI contract, underwritten by service credit guarantees. Tasking includes operational pilot conversions, ab-initio and refresher training along with mission practice and pre-deployment rehearsals all of which prove to be vital in delivering frontline operational capability. Both these training service contracts have been in place for a number of years and the quality and scope of the services are audited, assessed and scored annually as part of the UK MoD Supplier Relations Group Survey.
Finally, Thales operates the SIMMAD Full Turnkey Maintenance Contract which delivers training services to the French Air Force, the French Army Aviation and French Navy Aviation utilising a total of 76 simulators and training devices located throughout France.

**UPDATES & UPGRADES**

It is not only obvious but also of great importance that any training device in operation must evolve during its life to cope with evolution of technologies, new standards of the simulated platform and new training needs either to improve the level of training or to take into account new regulation.

These evolutions could be a big concern for the user if the industry is not organised to manage them and to propose modernisation and growth capabilities during the whole life of the equipment.

Thales is permanently ready to help and advise its customers in defining and proposing updates and upgrades of their equipment.

Through upgrades and updates, owners of training devices can benefit from the latest developments made by Thales in its products lines.

By combining the latest available HW technologies with in-house software applications and COTS products, modifications of aging training devices can be conducted to deeply improve:

- The visual system,
- The synthetic environment,
- The realism of the simulation,
- The training capabilities,

As well as the maintainability and supportability of the upgraded system, subsequently solving potential or known obsolescence issues.

Thales has a dedicated team to cover upgrades. At the early stage of the programme, a front-end analysis is performed together with the Customer to define the scope of modifications, and evaluate the relevant engineering efforts along with impacts of the in-service support activities.

The platform modifications work is organised such that the impact in the ongoing training schedule is minimised.

Thales has the capability to upgrade systems for which we were not the original design authority.

**KEY MESSAGES AND CONCLUSION**

Thales Training & Simulation recognizes the breadth and complexity of both Civil and Military Helicopter Training requirements and the challenges faced by these authorities.

Our approach has been to create a comprehensive range of training solutions and services designed to meet these diverse requirements by pulling together core competencies and strengths from within the Thales Group. We are fully committed to developing and expanding our product portfolio to meet both current and future training needs of all our Customers.

At Thales Training & Simulation we are proud of our 50-plus years history and the comprehensive range of operating helicopter simulators in worldwide service. We are fully committed to providing a realistic training and combat readiness environment.

We will continue improving our training solutions and services to provide our Customers with the very best devices to improve the effectiveness and safety of their missions.

**PRODUCT RANGE**

**INDIVIDUAL, CREW, TEAM TRAINING**

- Computer Based Trainers
- Flight and Navigation Procedures Trainers
- Part Task Trainers
- Cockpit Procedures Trainers
- Flight Training Devices
- Full Flight Simulators including Roll On Roll Off feature
- Full Crew Mission Simulators including Roll On Roll Off feature
- Helicopter Commander Tactical Trainer
- Tactical Procedure Trainers
- Rear Crew Trainer (Weapon System Operator)
- Virtual Maintenance Trainers

Our Rotary-Wing References

- CH-53 Sea Stallion
- Chinook
- S-61 Sea King
- OH-58 Kiowa
- UH60 BlackHawk
- Lynx
- TIGER
- NH90
- A129
- Cougar / Super Puma
- Ecureuil / Fennec
- Gazelle / Alouette
- EC225 / EC725
- Dauphin / Panther
- EC145
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TECHNICAL EXCELLENCE

Through continuous innovation and investment in new developments, Thales aims at offering advanced training solutions incorporating the most recent technologies, at reducing overall training costs and preparing for operational mission success.

Advanced Operational Environment
Operational realism, high accuracy, simulation consistency requirements are guaranteed by a family of dedicated tools developed by Thales, such as:

- ThalesView real-time image rendering software is capable of representing in real-time complex tactical situations in a highly realistic 3D visual environment.
- ThalesScene – Thales visual database generation system – provides the facilities to generate or modify terrain databases from a very large range of source data.
- SETHI – Thales Computer Generated Forces – is a powerful and flexible software package providing realistic synthetic tactical environment to multiple applications.
- Em2K Motion
- Software Models – Blade Elements Theory
- Special helicopters effects

Advanced Tools
- GOLD – Thales General On Line Diagnostic system – is a powerful tool that promotes rapid corrective maintenance. GOLD simplifies the maintenance procedures, and considerably reduces the maintenance time and the need for specialized operators.
- WAGS – Thales Windows Auto test Generation System – is an extensive automatic test facility for rapid checking of the simulator used for both initial and recurrent certifications.

LOOKING FORWARD

Thales is fully engaged in the evolution and development of future helicopter training requirements. Nations are facing new types of engagements demanding new concept developments. The resulting complexity of these new demands requires enhanced system engineering practices and tools, in addition to new training devices.

In line with these major challenges for the Industry, Thales focuses on many areas of interest.

New technologies and standards
Thales implements new technologies as part of National and European advanced studies, to explore the processes and solutions that will be the backbone for future implementation in training devices, aiming at enhancing their capabilities.

Thales also participates in the definition and implementation of all international standards in the area of interoperability between simulations and simulators.

FIRST CLASS TRAINING SERVICES

Thales can design and support any customised training services, including training centre operation. As a service prime contractor with an established network, Thales has developed close partnerships with customers and provides end-to-end services from training through to operations.