TRAINING AND SIMULATION
This short section looks at two examples of training. Hans-Peter Diedrich, from the German MoD, describes the public-private partnership that is providing the simulators for training NH90 helicopter pilots and the Director of Computeach derives lessons for IT training that are applicable to both the defence and civil sectors.

The Public-Private Partnership for NH90 Simulator-Based Flight Training

by Hans-Peter Diedrich

Hans-Peter Diedrich is the NH90 desk officer in the German Ministry of Defence. In this article he examines the training requirement for Germany's NH90 helicopter fleet, and describes how it will be provided through a public-private partnership through a consortium formed by four European companies.

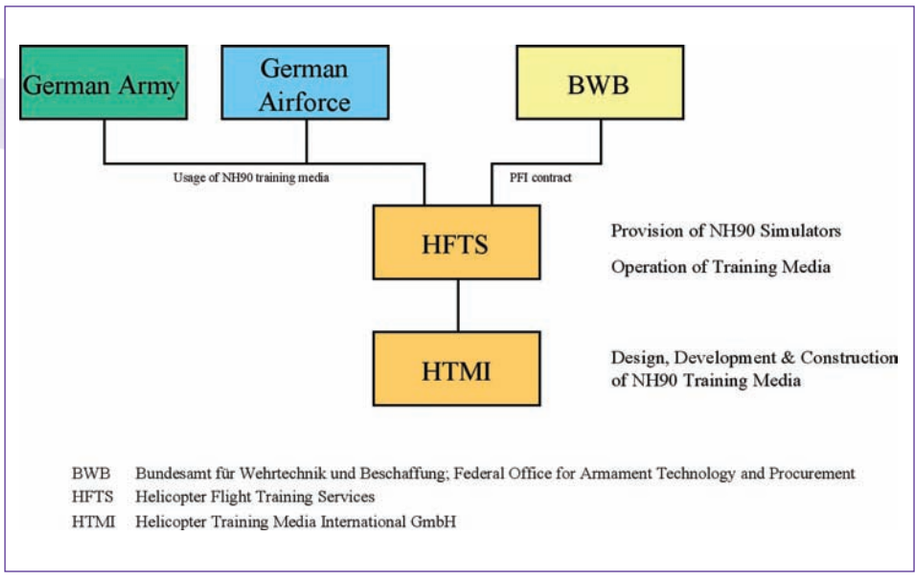

Figure 1: Relationship between German Customers and Industry: Responsibilities for NH90 training

Given the ever-increasing complexity and wide operational spectrum of modern weapon systems, intensive training is required for the personnel who will operate and support such systems. Using weapon systems to train personnel is becoming increasingly expensive, places undue strain on materiel, and often pollutes the environment. With this in mind, the Bundeswehr has attempted to use simulators and other state-of-the-art training methods to achieve high-quality training at lower costs. A higher standard of training can indeed be achieved, since technical procedures are easier to perform and understand in simulators than in actual weapon systems. In addition, only in simulators can extremely dangerous missions be 'flown' with no risk to the crew. Financial constraints and, in particular, the demands made on pilots by the complexity of new weapon systems have resulted in new standards for flight training and thus for simulators.

This is particularly true of flight training for NH90 crews. The costly, but indispensable, use of such weapon systems for training can in this way be reduced to a minimum.

The NATO Helicopter for the Nineties (NH90)

The NH90 represents the largest and most successful European helicopter programme so far. The participating nations are Germany, France, Italy, the Netherlands and Portugal. In addition, Finland, Sweden, Norway, Greece, Oman and Australia are export clients and have concluded procurement contracts with NHIndustries. A total of 357 NH90 helicopters have already been ordered. New Zealand and Spain have also decided in favour of the NH90. Germany has ordered a first batch of 80 helicopters for its Army and Air Force and received the first production helicopter at the end of 2005.

The NH90 is being developed as a Tactical Transport Helicopter (TTH) and NATO Frigate Helicopter (NFH). From these two versions derive the different national production types. For Germany, there will be an Army version (LTH Heer) and an Air Force version (LTH/SAR) of the transport helicopter.

NH90 Transport Helicopter

The NH90 is today the most modern helicopter of its class. The reasons for this include:

- The fibre composite fuselage.
- The first-ever use of fly-by-wire controls in a production helicopter.
- The bus-based avionics system.
- Comprehensive equipment for all-weather flights and night operations at low altitudes (digital maps, forward-looking infrared system, obstacle warning system, etc.).
- A comprehensive EW suite (radar warning and laser warning receivers, chaff and flare dispenser).
- In the CSAR role, additional integration of MIDS / Link 16 as well as missile options.

The NH90 thus places high demands on training. With this in mind, the NH90 partner nations have together specified the training

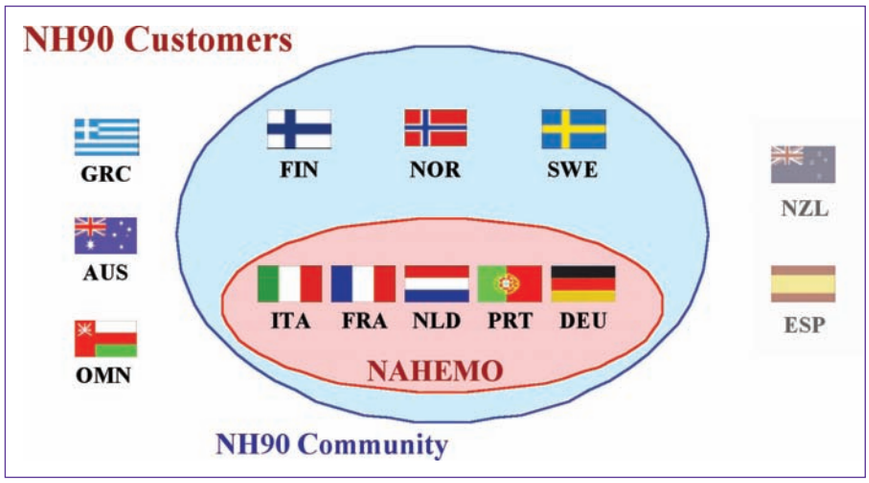

Figure 2: NH90 Customers

media for the various training areas and levels. Germany intends to use the following training assets:
Technical and logistical training:
- Virtual Maintenance Trainer.
- Training Rigs.

Flight training:
- Part Task Trainer (beginner flight training).
- Tactical Procedure Trainer (specific types of operations; tactical aspects; employment of weapons).
- Full Flight Simulator (basic, advanced, and pre-deployment training).

The NH90 Full Flight Simulator (FFS)

The NH90 FFS is based on the production specifications of the transport helicopter ordered by Germany. The design of the simulator was characterised by two essential ideas:
- Extended use should be made of commercial off-the-shelf (COTS), governmental off-the-shelf (GOTS) and military off-the-shelf (MOTS) products in order to keep costs low.
- Through a re-hosting effort, as much original aircraft software as possible should be used; this must then be upgraded for typical simulator functions (i.e. freeze, replay, etc).

Since the Bundeswehr intends to make widespread use of simulators in flight training, the NH90 FFS will be compatible with current Bundeswehr helicopter simulators. This includes the NTF and HGA simulators of the Army Aviation School in Bückeburg as well as the TIGER full-mission simulators at various locations throughout Germany. The systems are networked with LAN or WAN connections using HLA or DIS interfaces.

All simulator systems (visual + motion system, cockpit instruments + MFDs, sound) that directly stimulate the senses of the pilot (touch, hearing and sight) are synchronised. This ensures that no differing or contradictory sensations are produced in the man-machine interface of the NH90 FFS.

The NH90 FFS will fulfil the requirements of civilian guideline JAR STD-1H (Level C).

In technical and functional terms, the NH90 FFS has a modular design (base module, type module, sensor module and tactical module).

FFS: The Base Module

The Base Module includes the basic elements and functions of the simulator (sight, motion and sound system including the instructor operating station and the cockpit instructor operating station) and the aerodynamic model of the NH90.

The host computer (Silicon Graphics Origin 300) features a dynamic simulation capability for the entire flight envelope, including taxiing and deck landings on moving waterborne platforms. This applies to normal and degraded modes of operation of the NH90. All data produced or simulated during the simulator mission will be recorded and transferred to the debriefing station. It is even possible to produce a cockpit replay of the entire mission.

The multi-channel visual system is based on the use of SPACEmagic by Thales Training & Simulation (TT&S) on a SGI Onyx 3000 InfiniteReality 4 machine. It makes possible a simulation of up to 256 animated objects (six degrees of freedom) on the ground and in the air. The field of view is made up of eight segments (two rows with four channels each). The horizontal field of view is 230° (± 115°) and the vertical 85° (+ 35° to – 50°).

The motion system allows for cockpit movement with six degrees of freedom. In addition, the pilot and co-pilot seats are provided with a vibration system.

FFS: The Type, Sensor and Tactical Modules

The Type Module is a true representation of the NH90. It consists of a copy of the German NH90 cockpit and can simulate avionics, flight controls and basic systems.

The Sensor Module comprises the various NH90 sensor systems (Helmet Mounted Sight/Display, FLIR, Image Intensifier Tube, Weather Radar and Obstacle Warning System).

The Tactical Module comprises the mission system incorporated into the German NH90 production types, including the electronic warfare suite and MIDS/Link 16. Among other things, this involves a re-hosting of the original operational software of the mission tactical computer (MTC OFRS). In addition, the tactical module provides a simulation of the tactical situation.

The NH90 Full Flight Simulator will be enhanced by various support systems:
- Briefing and Debriefing Facilities.
- Database Generation System (DBGS).
- Database Management System (DBGS).
- Lesson Plan System (LPS).
- Tactical Scenario Generation System (TSGS).

The Public-Private Partnership for NH90 Simulator-Based Flight Training

In the year 2000, the Bundeswehr began studying the concept of public-private partnerships and evaluating various possible applications (logistics, training, etc.) in terms of feasibility and efficiency. Economic efficiency in particular is directly dependent on the special circumstances of each project (scheduling, connection to other projects, etc). A common effort by the NH90 partner nations to order the NH90 FFS proved to be particularly difficult. It hasn't been realised until today. NH90 simulator training was, however, supposed to begin when the helicopter was introduced in the Bundeswehr.

For this reason, the Bundeswehr concluded a public-private contract with Helicopter Flight Training Services (HFTS) on simulator-based NH90 flight training in December 2004. This was the Bundeswehr's first privately financed project in the field of flight training.

HFTS (Hallbergmoos, Germany) was founded by a consortium of four companies (CAE, Eurocopter Deutschland, Rheinmetall Defence Electronics and Thales), each owning 25%.

The contract will extend through 2022 and totals some €488M. Given the anticipated service life of the NH90, the contract contains options to extend the term up to 30 years in total.

Since January 2005, HFTS has been developing and manufacturing four NH90 full flight simulators and establishing training centres at three locations (the Army Aviation School in Bückeburg, Transport Helicopter Regiment 10 in Fassberg, and Helicopter Transport Wing in Holzdorf). There the crews will be trained not only in flight operations, but also in complex scenarios such as combat situations.

This will be followed by an operational phase of about 14 years. This phase is scheduled to start in the middle of 2008, when the first training centre is operational, and will extend through 2022. Extensive arrangements have been made for the payment of damages, should HFTS fail to deliver the flight simulators in time.

During this phase, HFTS will maintain and operate the simulators (this includes avoiding and eliminating obsolescence) and support the infrastructure of the training

NH90 tactical transport helicopter of the German Army

centres. The flight instructors required for simulator training will be provided by the Bundeswehr. Following a ramp-up phase of two months for each simulator, the available capacity for each full flight simulator will amount to 327 simulation hours per month (Bückeburg) and 347 simulation hours per month (Holzdorf and Fassberg).

HFTS is required to ensure that the training facilities can be used by NH90 crews at all times during the operational phase. Germany, on the other hand, is required to use the simulators for a total of 217,000 hours. This number of hours has been calculated on the basis of training requirements for the crews of the 80 NH90 helicopters already ordered. The German Government will pay an hourly rate.

In accordance with the German NH90 procurement plan, all NH90 simulator buildings will be designed to accommodate two simulators.

The NH90 training centres in Germany will be the first ever to be built for this helicopter. The public-private contract will allow HFTS to sell simulator hours to third parties as well. HFTS must, however, disclose the identity of the third party as well as relevant financial agreements to the German Government for approval. In addition, contracts with third parties must in no way interfere with the training of Bundeswehr personnel.

Summary

For years now, simulator-based training has proven useful in the Bundeswehr for the initial and follow-up training of crews for all types of aircraft. In addition, this approach drastically reduces the flight hours of actual aircraft. This applies in particular to modern and complex weapon systems like the NH90. It is thus the most efficient solution and is beneficial for both materiel and the environment.

The public-private partnership for NH90 simulator-based training offers the Bundeswehr, for the first time ever, a flight training service that is completely operated by a private company. In this way, investment and operating costs can be scaled down, since there is no need to build and operate expensive facilities. In addition, payment is based on a complete training and service package. A private company is responsible for rendering the service and providing all necessary facilities.

For this reason, the public-private partnership for NH90 simulator-based training is a testing ground for future measures in the field of training. ■

The NH90 flight simulator

NOTES

1 NATO Helicopter Industries

2 Leichter Transporthubschrauber Heer; Light Utility Helicopter, German Army

3 Leichter Transport Hubschrauber/Search and Rescue; Light Utility Helicopter, German Air Force

4 Night and low-flight simulators, CH-53G and UH-1D-simulators

5 Helicopter pilot basic training, EC 135 simulators

6 High-level architecture

7 Distributed Interactive Simulation (DIS STD: IEEE 1278)

8 Mission Tactical Computer Operational Flight Resident Software