

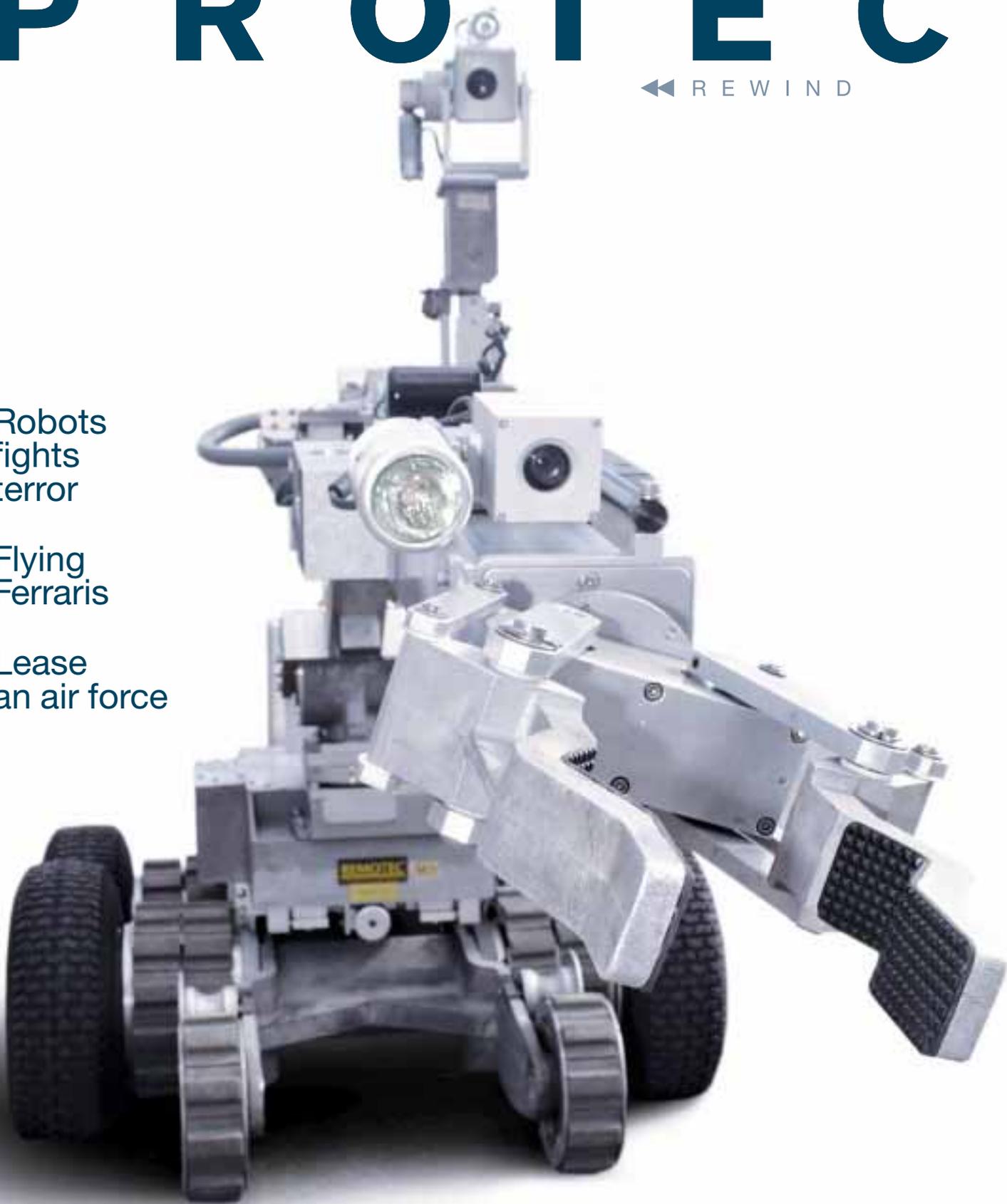
# PROTEC

◀◀ REWIND

Robots  
fights  
terror

Flying  
Ferraris

Lease  
an air force



# A taste of FMV's numerous projects

2004 was an eventful year for Sweden's most project-intensive authority. Over 1,400 assignments from the Swedish Armed Forces and other government authorities impose exacting demands on the Swedish Defence Materiel Administration, FMV.

Our external magazine PROTEC has enabled Swedish readers to share in some of these assignments, large and small, national and international, with the common denominator that they all deal with technology for Sweden's security. In this English issue we present a selection of articles from 2004. Enjoy.



Jerry Lindbergh, Chief Editor

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**Cover picture**

Jerry Lindbergh

**What is FMV?**

FMV has a clear and inspirational assignment: to be responsible for the supply of materiel to the Swedish defence organisation.

The challenge FMV faces is to find, propose and introduce innovative and cost-effective solutions to safeguard the development of the defence organisation, in relation to both technology and new equipment.

Developments taking place in the total defence system present many great, complex and exciting opportunities.

Military defence has to be developed to operate in a network-based manner and in collaboration with international forces, while civilian defence has to cope with severe and unforeseen strains on society. As an independent, civilian authority, FMV contributes both knowledge and a high level of expertise in many different areas.

FMV has around 1,900 employees, mainly located in Stockholm, Linköping, Karlsborg, Vidsel and Arboga. Invoiced sales amount to around 20 billion Swedish crowns every year.

# Think Small



The SEP project is a revolution in "thinking" armoured vehicles.

The tempo for the SEP – the armoured unified platform – has been tightened up a notch. In December 2003, Alvis Hägglund handed over a driveable prototype of the wheeled version of the vehicle. The tracked version, the so-called "blue box", has been in existence for a number of years already.

**But a revolution?**

The difference to present-day fighting vehicles with large, heavy transmission units is that the SEP's transmission is electric. "This means that we are free to locate all the vehicle's systems where we want to," the Swedish Defence Materiel Administration (FMV) project manager Rickard Lindström explains.

The SEP is driven by two passenger car diesel engines, which can be located in the track shel-

ves, i.e. the area where present-day fighting vehicles store cotton waste, oil cans and other material. This leaves more room on the inside. Taken together, the two car engines provide more power than one gigantic truck engine. The power is transmitted by two electric cables to electric motors beside each driving wheel. This feature makes the SEP drive solution unique and available for unconventional solutions, such as the fact that the SEP has a crew module and various role modules, depending on the task at hand.

"The SEP should be capable of being anything from a truck to a tank, both as a wheeled and as a tracked vehicle," says Rickard.

**Standardisation**

During the nineties, the Combined Defence Forces realised that they needed more armoured fighting vehicles, not least for international assignments. The number of different types of vehicles has become a problem, particularly for the Army.

Standardisation on a unified type of vehicle for all services means that the entire chain – from training to maintenance – becomes cheaper. The SEP will eventually replace three types of armoured vehicle used by the Combined Defence Forces. At present, only Stridsfordon 90 has a planned service life that extends past 2020.

**Roles**

SEP currently has twelve priority roles to fill. These are primarily the traditional roles of troop transport, ambulance, command and repair/towing.

"These roles are currently met by Tracked Vehicles 302 and 401.

But these vehicles will become obsolete between 2007 and 2015. On the other hand, the SEP can not replace Stridsfordon 90; it will function as a complement to the operative units," says Lieutenant Colonel Kenneth Tapper, materiel system manager in the Combined Defence Forces. "With an all-up fighting weight of 15 tonnes, it will be possible to quickly move 'SEP units' with Hercules C-130 transport aircraft.

We need to be flexible in international assignments. We don't always need heavy fighting vehicles," Kenneth explains. "For example, Tracked Vehicle 302 was initially the right type of vehicle for our operations in Bosnia and Kosovo. But when the threat picture faded, these vehicles began to constitute 'overkill' and are also a relatively expensive vehicle system to keep in operation. In addition, tracked vehicles can also be perceived as extra threatening by the local population and combatants.

The SEP system, which contains both wheeled and tracked vehicle platforms, means that we can adapt our vehicles to suit the perceived threat, terrain and climate."

**NBD**

SEP will be the first fighting vehicle to be introduced in a network-based defence system (NBD). This will not be permanently built into the system, it will be included in the role modules, like a building block. And for those who have their doubts about the technology, Rickard Lindström offers reassurance.

"New technology must be given time to mature. But we already have four driveable prototypes

to test the technology in. And it is present-day young PlayStation champions who will look after the equipment in the SEP. In general, we collaborate with other ongoing projects to get them into the SEP early on. All equipment which would normally be loaded outside the vehicle will be inside the SEP, to offer the lowest possible signature. Not as 'stealth', that would be too expensive, but the idea should be built into the basic design."

**Collaboration**

Sweden isn't the only country that needs to renew its vehicle fleet. There are tens of thousands of American M113 tanks alone that need replacement. FMV signed an information exchange agreement in the autumn of 2003 with their British opposite numbers, the Defence Procurement Agency (DPA).

"Continued development of the SEP needs international collaboration. The United Kingdom has the same requirement specification as we do, and they have ordered a tracked prototype from Alvis Hägglund for their trials," says Brigadier General Per Lodin at FMV.

The Defence Bill which was approved in the autumn of 2004, gave green light for further development of SEP. According to the plans, FMV will order a further six driveable prototypes during 2005, with the aim of placing a mass production order during 2007. Somewhere around 2010, it should be possible for FMV to hand the first vehicles over to the Combined Defence Forces.

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PHOTO ALVIS HÄGGLUND**

# DIGITAL CONTROL

Fighting vehicles make important strides towards NBD

A new electronic architecture for fighting vehicles has seen the light of day. Cross-border collaboration between FMV and its German counterpart made this possible.

Thanks to the FMV's research and development project known as VETEC (Vetronic Architecture Integration Project), there will be a new type of digital vehicle electronics to learn as the new, armoured unified platform SEP is introduced.

"The goal has been to do something concrete in the field of vehicle electronics. What should a built-in test look like? How should the system be made fault-tolerant? Another requirement is that it should be scalable," says FMV's Johan von Porat, sub-project manager for SEP Vetronic.

He does not then mean that new modules should be bolted on and connected. Johan is exclusively talking about software.

"In the future, you should be able to download new software instead of installing more boxes. It is no longer feasible to increase functionality with traditional technology. Among other things, there is no more room in the vehicles.

## Display screens

The most obvious feature of VETEC is that the crew sees the world outside via display screens and not via periscopes which are traditionally used in current fighting vehicles. This protects the crew's eyes from laser weapons. A further bonus is that the cameras for the screens can be located high

up, while the crew are protected down inside the vehicle hull.

But VETEC is more than just display screens. Future systems will require infinitely more information, with units that can "talk" unhindered to each other. The old method of running a cable from a component to a relay and then on to the control will be too large, heavy and expensive.

In VETEC, the cornerstones are digital technology via data buses which make it possible to handle the data from weapon sights and from the cameras for driving and system monitoring. This simplifies fault-tracing and maintenance, which means lower costs.

"This is the basis of our future systems, but it can be justified to use data buses and the new presentation systems in current vehicles also," says Thomas Åhlin, project manager for VETEC.

## Computers

The VETEC system contains three PCs connected to high speed data buses in a loop – a local network for digital messages that supports broadband and video. Six graphic computers show the surrounding world to the crew via cameras – three facing forwards two facing sideways and one facing backwards.

It is vital that VETEC offer high performance in the form of always being fast and scalable. The system has to be expandable, primarily by adding new software. It should also have redundancy and should continue to function even if one computer is knocked out.

## Collaboration

VETEC is the result of a collabo-

ration project which was inaugurated in 1999 between FMV and its German counterpart, BMB. Industry was represented by Land Systems Hägglunds from Sweden and Diehl from Germany. After the requirement specifications were finalised and bench tests were completed, the VETEC was installed in a prototype SEP, referred to as the driveable prototype, track.

"By squeezing the entire architecture into the SEP prototype, we were able to do an excellent technical evaluation," says Johan.

This was in December last year, and the data from the test drives gave valuable experience for future fighting vehicles.

FMV is represented in MILVA (Military Vetronics Association), which promotes standardisation and common guidelines for vehicle electronics. The eight participating nations have not just collaborated with VETEC, they have also been international speaking partners.

"There is no need to maintain secrecy, we have agreed on common standards instead. We can all gain by working together in future," says Johan.

## COTS

The keyword in VETEC and vehicle electronics in general is COTS, i.e. components that can be purchased over the counter and used without major modifications. In the civilian motor industry, costs are lowered by using these "ready made" solutions.

"Modern cars use PCs. By modifying them for the 'rough and tumble' of field use, we can do things a lot cheaper. On the other

hand, the software in the computers needs to be developed," says Johan, who previously worked with auto electrical systems for both Volvo and SAAB.

## No choice

Fighting vehicle technology has traditionally been a question of "crowbar and sledgehammer". Most things could be fixed with ordinary tools and a bit of violence.

"Of course, we could stay still and carry on building things the same way as we did ten years ago, but we want more functions and thanks to the introduction of network-based defence, there is no way forwards except to go digital," says Johan.

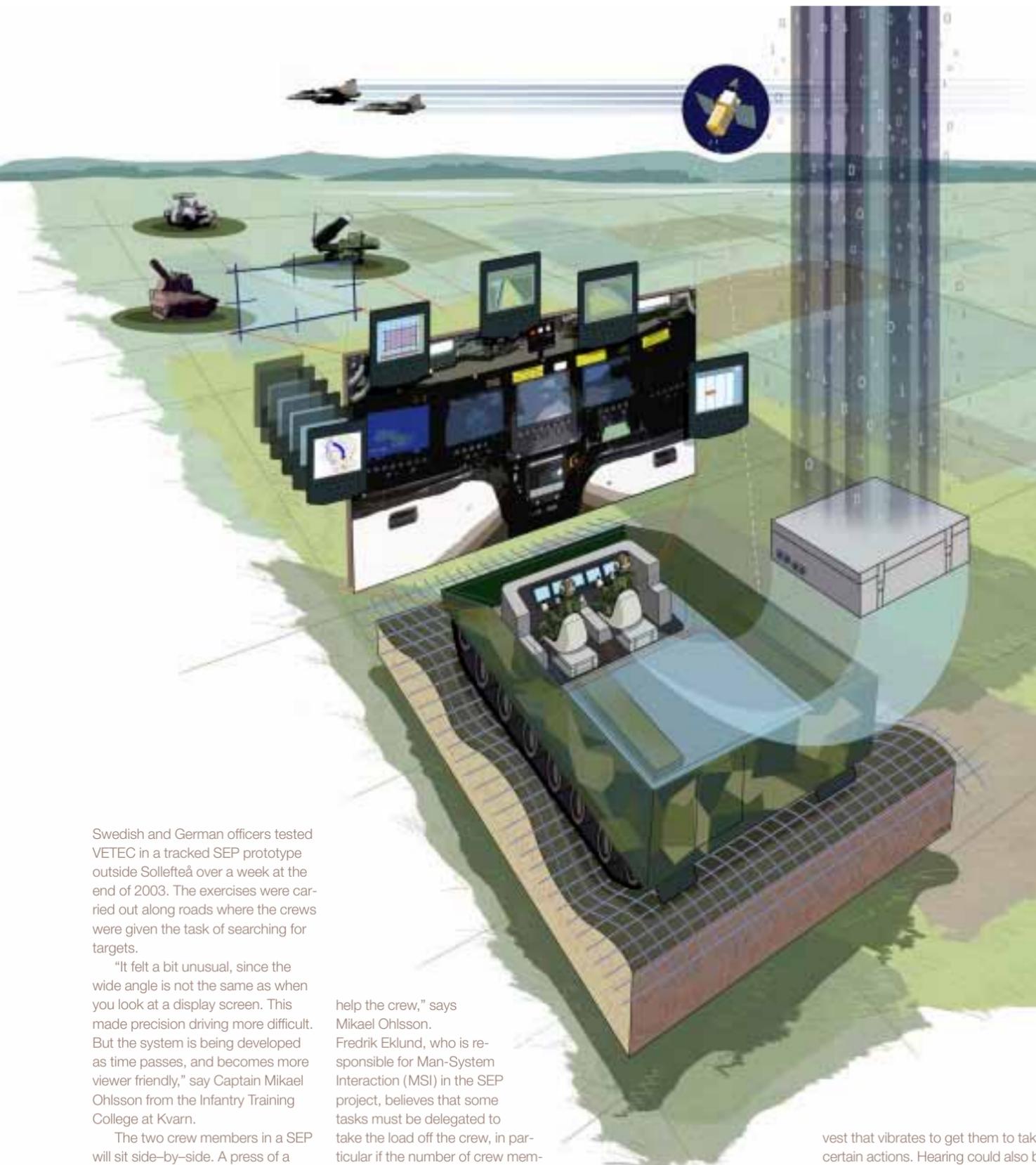
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ILLUSTRATION LEIF ÅBJÖRNSSON

## VETEC & SEP

VETEC (Vetronic Architecture Integration Project) is an example of the auto electrical architecture that can be used in SEP.

All units such as sensors, presentation units and vehicle electrical units are digitised and handled by the same system. This means that upgrading the software is an important feature.

SEP (Armoured Unified Platform), which is being developed in both wheeled and track versions, is constructed from modules – a basic platform for the crew and then a role module (troop transport, air defence, command ambulance etc.) which can quickly be changed, depending on the assignment.



Swedish and German officers tested VETEC in a tracked SEP prototype outside Sollefteå over a week at the end of 2003. The exercises were carried out along roads where the crews were given the task of searching for targets.

"It felt a bit unusual, since the wide angle is not the same as when you look at a display screen. This made precision driving more difficult. But the system is being developed as time passes, and becomes more viewer friendly," says Captain Mikael Ohlsson from the Infantry Training College at Kvarn.

The two crew members in a SEP will sit side-by-side. A press of a button will transfer all controls from the driver to the commander.

"Normally, the commander directs the vehicle and receives and gives orders. But should he also be a gunner? The question is how much the technology can take over and

help the crew," says Mikael Ohlsson.

Fredrik Eklund, who is responsible for Man-System Interaction (MSI) in the SEP project, believes that some tasks must be delegated to take the load off the crew, in particular if the number of crew members is reduced.

"The system must be able to make its own decisions, and the crew must trust these decisions. For example, the sensors in a warning system can register a threat and automatically suggest the best

choice of routes to avoid the threat.

We must also think about how we should use more senses intuitively. For example, the crew could use a

vest that vibrates to get them to take certain actions. Hearing could also be used. If an enemy tank locks onto a SEP with its laser, the warning system should use 3D sound to warn the crew about the direction of the threat. No time should be lost when the crew has to see and interpret information from an instrument".

# FLYING FERRARI



It has now been confirmed – size is not important – it's how you use it. Helicopter 15 is the Swedish Defence Force new, competent light weight aerial vehicle.

For Janne and Irene Asph at Rescue Skeppskär, a beautiful October day 2003 was very special. The new Helicopter 15 turned up, did a circuit round Vadstena Castle and then lowered a winch man and doctor to a rescue boat. The "patient" was checked and then all three were winched up. An exciting experience for Mr. and Mrs. Asph, since it was the first time that Skeppskär had taken part in an exercise with a helicopter. For the pilot, the exercise was pure routine, but Helicopter 15 had to prove what it could do.

**Flir**  
Image intensifiers are built into the Helicopter 15 pilot's helmet. These are the latest version of Night Vision Goggles (NVG). This FLIR (Forward Looking Infra Red) system is based on a system developed in Sweden with FMV as one of the financial backers. The FLIR is one of the best on the market, and can discover a hot object at a range of a couple of kilometres. The other sensor in the camera is used to zoom details onto a TV screen. The gyro ensures that the camera remains focused on the target, no matter how much the helicopter bucks about. At the same time, the camera is coordinated with the searchlight, which is switched on when the helicopter approaches its target.

If the pilot prefers to use the NVG system, the searchlight switches to IR light or indicates the target with a laser pointer. The FLIR marks the target posi-

tion on the digital chart. The helicopter's GPS position is also indicated – with obstruction-free altitude, to reduce the hidden danger posed by power lines and masts. Advanced control automation makes hovering safer, and the pilot can concentrate on tactical decisions for the mission.

**Ferrari**  
Young pilots who have grown up with PlayStations will feel at home in the cabin. Three computer screens can switch between the instrumentation and the digital chart or the FLIR image. The double set of controls is very similar to a games console, with fewer levers to pull and fewer buttons to press.

"Helicopter 15 is the most powerful aircraft I have ever flown," says Robert Karjel to Östgöta Correspondenten, a local newspaper. Technically speaking, it is like going from the old J19 to the Jas 39 Gripen – or even further.

And Robert Karjel, a pilot at the Helicopter Squadron at Linköping, is only talking about the civilian version – AH109 Power. The Combined Defence Forces have two on loan from Milan for training and testing. The military AH109 LUH, which will start to be delivered in early 2005, is much hotter. But it also costs twice as much, SEK 55 million apiece plus specific mission equipment.

"This Agusta helicopter is like a Ferrari in the air," says Karjel.

The comparison is not entirely unfair. The helicopter has a top speed of 300 km/h (169 kt).

The sleek Italian lines appear familiar, since the airframe has been around since the 1970s. The civilian version has been available for ten years and has been a top seller in its class. The military version promises to become a best-seller. The South African Air Force has ordered thirty AH109 LUH, which is basically the same model as the Swedish one.

**20 units**  
FMV signed a contract in 2001 with Agusta Westland to purchase twenty AH109 LUHs (Light Utility Helicopter System) for the Swedish Combined Defence Forces, which will cost a total of SEK 1.3 billion. The South African and Swedish orders have been coordinated in the development work. The difference is that the Swedish helicopter will be certified and will have radar. On the other hand, the South African units will have warning and countermeasure systems, which the Swedish version lacks but which can be added later.

In Sweden, it is designated Helicopter 15 and has more powerful engines and more efficient construction of the main and tail rotors than its predecessor, the AH109 Power. The roof has also been raised, to make space for Swedish pilots wearing an NVG helmet. For the first time, the defence forces will have a helicopter that has night vision right from the start. Another requirement was that Helicopter 15 should be able to withstand the Nordic climate.

**A**t the same time, the FMV ordered 18 Eurocopter NH90 medium-weight helicopters from NH1, Nato Helicopter Industries, with an option for a further seven. This purchase was coordinated with purchases by Norway and Finland. Helicopter 14, which is the Swedish designation, will form the core of Sweden's military helicopter fleet together with Helicopter 15. Apart from Helicopter 10, the other models will be out of service by 2010.

**Much wanted**

The two loan helicopters arrived in September 2002 and the military units are to be delivered from the first quarter of 2005 until 2008. The new helicopter is much wanted. The helicopters in the squadrons have begun to show their age. Helicopter 15 will replace the retired Helicopters 3, 5 and 6, which have mainly been used for training and transport. Helicopter 15 will be able to do much more and will fill the gap after Helicopter 9 when it disappears around 2009.

Helicopters 14 and 15 fit in with the modern defence philosophy of flexibility and network-based defence. Enemies coming from the East are no longer a threat pattern. This means that the same invasion defence, with a man hiding behind every bush is no longer needed. What is needed instead is pinpoint action against the enemy's weak points. Hunting terrorists with the Gripen fighter is impractical. Small, quick-footed units need airborne jeeps for operations both in Sweden and in other countries.

"Versatility and flexibility are the mottoes for new purchases," says Patrik Dovskog, who is the project manager for Helicopter 15 at FMV.

All in accordance with the tried and tested Swedish model, more or less like an electric cake beater, where you change the accessories to suit the task at hand.

**Something for Hamilton?**

Transport of materiel and, above all, people will continue to be an important task in the future, from the Prime Minister to soldiers in the field. The "troop taxi", the Helicopter 15 which can carry goods slung from a hook underneath, can find its way in all types of weather. If the GPS signal is lost, the pilot can use inertia navigation with gyro systems or Doppler navigation system. It has radar, of course.

The digital chart shows all details and navigation is smart. All Helicopter 15s have an encrypted SAAB AIS Transponder, so they can see each other on the digital chart. In addition, it is possible to transmit encrypted messages. In the AIS model, everybody can use GPS and a radio aura to see everybody else without any support from a command centre. AIS, which is based on an invention by the Swede Håkan Lans, is standard at sea, but it is a new feature for the Air Force.

Landing during an operation can be risky, and the automatic controls are invaluable when Helicopter 15 hovers and lets soldiers slide down a rope which is part of the new equipment, referred to as "fast rope/ rappelling installation". A task force could be lowered into a forest or on to a hijacked ship to overpower terrorists.

Jan Guillou, a Swedish author, would like the helicopter if he were to decide to write a new Hamilton novel. The story could be set at the K 3 army camp in

Karlsborg. This is the training ground for the air-borne battalions and Sweden's most secret unit, the Special Protection Group (SSG). Using the helicopter's international radio authentication, IFF, it is possible to distinguish friend from foe. The high technology radio, which supports encryption and spread frequency operation, might not function in other countries. In that case, Mr. Hamilton could land beside a petrol station, fill up and buy a cash card for the helicopter's built-in GSM telephone, which can also send e-mail.

**Upgrading studies**

Crash-proof, self-sealing tanks contribute to the passive safety in Helicopter 15, and a machine gun can be installed in the door opening. Last year, Malaysia ordered eleven A109 LUHs but their armament is not currently relevant in this application.

"At FMV, we study upgrading with heavier weapons in case the Helicopter 15 has to behave more aggressively," says Patrik Dovskog.

It is hardly an attack helicopter, although Kevlar armour can be installed to protect the crew. There is an ambulance module for transporting casualties. But for competition reasons, military helicopters may not be used for transporting civilian patients except in cases of disasters.

The pilot can let go off the controls and let the autopilot take over. He then assumes a different role and becomes more of an operator. The system downloads a vast amount of data about the status of the helicopter, which can be passed on for central analysis. At the same time, the pilots in the new helicopter types, 14 and 15, have a lot of new things to learn and Helicopter 15 is definitely less expensive for training. To make it even less expensive, there is a simulator on the wanted list.

Carl von Clausewitz, the Prussian military philosopher, wrote about the fog of war. Generals dream about the transparent battlefield, preferably in real time on their desktops. Helicopters can

be seen as a piece of the puzzle in such a vision. Your own position and other units' positions are visible on the charts. The cameras will be able to transmit TV images on a broadband link. The IR FLIR can even discover if somebody has emptied his bladder behind a bush.

**Submarine patrolling**

Eight of the twenty helicopters are equipped for submarine patrolling and other tasks at sea. This model is designated SBO, Ship Based Operations, as distinct from LBO, Land Based Operations. The SBO have floats

so they can make emergency landings on water. Some components are also reinforced to withstand the rocking of a ship.

"HKP 15 forms part of a larger system, together with the Visby corvette, and this type of stationing is something new for the Defence Force," says Patrik Dovskog. The tail on the SBO model has even been shortened so it will fit inside the Visby hangar.

If there are any unwelcome submarines nearby, the helicopter will release a number of sonar buoys and then serves as a relay station to the Visby. The FLIR camera can transmit video to the corvette via a broadband link which is in preparation. Sending this volume of data, which is also encrypted, is also something new for the military.

**Tough planning**

The request for tender was dispatched in 2000 and the contract was signed with Agusta Westland the following year.

"The project group for Heli-

copter 15 at FMV had a tight schedule," says Patrik Dovskog. Planning started in 1998 when the purchase negotiations for Helicopter 12 were abandoned.

One person works half-time administering the actual purchase. Developing the specifications and planning was the bulk of the work, requiring 20 man-years.

At present, FMV is reviewing Agusta's verification, to ensure that the helicopter lives up to the specified standards. This is a matter of quality and aircraft safety, but also ensuring that the helicopter can perform as ordered. The problems related to the control system and communications have now been solved. Collaboration will begin with South Africa to exchange data on the specification work. Eventually operational data and maintenance schedules will also be shared.

FMV is currently planning roll-out and service in the units. The contract stipulates that Agusta's mechanics will travel out and look after maintenance.

Versatility and flexibility are the mottoes in the purchase negotiations for Helicopter 15. Together with Helicopter 14, it will form the core of Sweden's helicopter fleet. Apart from Helicopter 10, all other models are due to be retired from service after 2010.

It is important to ensure economy, in a life-cycle perspective, since it is generally operating costs that determine when a helicopter is scrapped. Another task for FMV is to plan delivery inspections to ensure that every helicopter delivers what is promised.

"The fact that FMV has formulated function requirements has meant a lot for Agusta's product development," says Patrik Dovskog. "We are, quite simply, better at using the products. Our certification is also valuable, since Agusta expects to sell the model in more markets."

**COPY** INGEMAR LINDMARK  
**PHOTO** AGUSTA WESTLAND



## Helicopters in the Combined Defence Forces



**HELICOPTER 9.** MBB BO 105 CS. Mtow. 2.5 tonne. 1985-2008. 21 in the Helicopter Wing. Was armed for anti tank missions up to the year 2000. Also transport of troops and materiel. Expected to be withdrawn in 2008.

**HELICOPTER 15.** Agusta A109 LUHS. Mtow. 3.2 tonne. 2005-? (Two provisional helicopters 2002-2006), 20 ordered, 12 land based, 8 ship based (Visby).



**Newly withdrawn helicopter systems**

**HELICOPTER 3.** Agusta Bell 204B. Mtow. 4.3 tonne. 1962-2000. 16 in the Army, 4 in the Air Force. Materiel, troop transport, ambulance, firefighting and search & rescue.

**HELICOPTER 5.** Hughes 269A/Hughes 300C/Schweizer 300C. Mtow. 930 kg. 28 in the Army. 1962-2002. Fire command, observation, training.



**HELICOPTER 6.** Agusta Bell 206A. Mtow. 1.3 tonne. 1968-2004. 22 in the Army, 11 in the Navy.

**HELICOPTER 11.** Agusta Bell 412HP. Mtow. 4.5 tonne. 1994-2004. 5 in the Army. Ambulance missions and troop transport.



**HELICOPTER 4.** Boeing Vertol 107 II-14/15. Mtow. 9.7 tonne. 1963-2007. 14 in the Helicopter Wing. Main missions are anti submarine warfare, troop transport and search & rescue. To be withdrawn in 2007.



**HELICOPTER 10.** Eurocopter AS 322M1 Super Puma. Mtow. 9.3 tonne. 1988-? 10 in the Helicopter Wing. Main mission is search & rescue.



**HELICOPTER 14.** NH Industries NH-90. Mtow. 10 tonne. 18 have been ordered (2006), 13 for troop transport, 5 for naval operations and search & rescue.

# Cheekiest in Liberia

About ten countries have UN troops in Liberia. The most powerful vehicle there is Swedish and is called Stridsfordon 9040C.

Johan Lukic is the gunner in a Stridsfordon 90 tank and is on his first international mission. The heat makes work harder, but the experience gained in this exotic country more than compensates for the unpleasantness of constantly wearing sweaty clothes.

As the gunner, Johan spends a lot of time in his tank. Just like the driver, Mats Karlsson, he stays in the vehicle when the squad gets out.

The gun in the vehicle is Johan's main tool. It was originally an anti-aircraft gun which has been given a new lease of life in Stridsfordon 90.

"It would have been nice to have a newer gun," he says. "On the other hand, the ammunition is world-leading. The shells can be programmed for different functions. For example, we can get them to burst five metres above the target if we want to minimise the damage caused."

**Rough ride**

The working environment in the vehicle is good. Especially since the vehicle has been fitted with new tracks. The old ones were completely worn out and gave a very shaky ride, something that the entire crew was affected by.

The LAO2 force has eleven tanks in Liberia. They travel further and get a rougher ride than at home in Sweden, and many were worried before the mission started.

"But they have worked very well," says the driver, Mats Karlsson. "Among other things, I thought that the tracks would wear much faster than they actually did."

The Swedes' fighting vehicles are in a class of their own in Liberia. Among the greatest admirers are the Irish contingent, who share a camp with the Swedes. They are



very impressed by the vehicle, especially since they don't have anything like it in their army.

"They were so impressed that they thought that the eleven vehicles we have were all that Sweden owns," says tank commander and acting platoon commander Fredrik Månsson. "But we have another 334 units of Stridsfordon 9040 at home."

As the commander, Fredrik is responsible for the vehicle and its crew. He is in charge of interaction inside the vehicle and gives the driver and the gunner orders about what to do and how to do it. Fredrik is convinced that Sweden makes some of the best defence materiel.

"We have the materiel, but we do not always get the personnel we need," he says. "We are doing all right here, but it would be difficult to recruit crews for a whole Stridsfordon 90 battalion in overseas service."

**Respect**

So far, Fredrik, Mats and Johan have travelled about 2,000 km since they arrived in Liberia. The vehicle attracts great respect.

During the street fighting in Monrovia in October, all they had to do was slew the gun round to get people to disperse and put their hands above their heads. There was no problem in travelling across the wrecked country. The vehicle is easy to drive and has excellent traction.

"So far, we have not got stuck once," says Mats. "And that is despite towing out trucks that were caught in a half metre of mud."

The only complaint about Stridsfordon 9040C is that it is less powerful and has less ground clearance and visibility than the A and B versions of the same vehicle. The reason is that the vehicle has been fitted with an

Acting platoon commander Fredrik Månsson, driver Mats Karlsson and gunner Johan Lukic serve in one of the world's best fighting vehicles.

extra tonne of armour.

"But it is definitely worth having the extra protection," says Fredrik. "The loss of speed is not large, considering the extra protection."

The only real weak point in the Stridsfordon 90 is a hydraulic hose for the cooling fan. This bursts occasionally.

Johan points out that air circulation could have been somewhat better, but when asked if he would like to swap the vehicle for a different fighting vehicle system, he answers resolutely "No, not a chance".

COPY JERRY LINDBERGH  
PHOTO JERRY LINDBERGH

# Patrolling in a Lawless Country

The situation in Liberia is constantly tense. New fighting can break out without the slightest warning. For the UN, it is important to be able to intervene at any time. For this reason, regular patrols are among the Swedish company's tasks.

It is 06.45 in the morning at Camp Clara, the barracks shared by the Swedish and Irish contingents. Three Swedish armoured groups are in the process of manning a Stridsfordon 9040 C each. The order for the day from the UN is "aggressive patrolling", which means that the Swedes have to show their muscles to the local population. The area to be patrolled is called Somalia Drive, the main street where the serious street fighting started at the end of October. About ten people were fatally injured and the UN forces were under fire.

On this day, the Swedish forces will leave the main street and show that they can travel along narrow village streets with their impressive vehicles. The Swedish force, together with the Irish force, forms the UN QRF force in Liberia. QRF means Quick Reaction Force, and means that the countries should patrol all of Liberia and support other UN forces. Other countries have been allocated certain areas.

It is the 13 November, and the last weekend in Ramadan, the Muslim month of fasting. There will be celebrations this weekend and the UN expects that there

might well be conflict between Muslim and Christian Liberians.

**07.10** After some confusion in manning the liaison unit's Mercedes Geländewagen, the Swedish column rolls slightly delayed out of Camp Clara's gates.

The three fighting vehicles immediately get the local population's undivided attention, although UN vehicles have been swarming over the country for the previous year. About ten countries have troops in Liberia, but none of them has materiel that can be compared with the 9040 C. It is modern, imposing, and rumbles so much that the ground shakes.

The acting platoon commander, Fredrik Månsson, says that they have even removed the fleche ammunition in the vehicle, since there are no targets which require such powerful ammunition. "We content ourselves with warning shots and explosive shells," he says. "We are superior anyway."

The road is bumpy and lined with people. Only ten per cent of them have jobs. Some of them make the thumbs up sign when the column passes. Others wave.

Then the soldiers wave back, but there is no extrovert waving. During aggressive patrolling, they only show their strictly business-like side. It should be obvious that they are prepared to take their gloves off if necessary, to maintain the peace.

The soldiers have "hatches up", and stand up through the vehicle hatches. They are constantly on the watch for any disturbances. Some hold their weapons ready to fire, others leave them in front of them on the vehicle roof. The gravel flies round the vehicles. Protective goggles are more or less essential.

Each fighting vehicle has six seats in the rear section of the vehicle. The men are tightly packed when wearing full battledress, especially when they have to take extra equipment and food with them. Four of the soldiers can stand up through the hatches at the same time. Sitting in the vehicle, you are supposed to wear a helmet, but there are not many who bother. If you are reasonably tall, there is not enough headroom. Nobody fails to wear ear defenders. The noise volume is high, and there is an imminent risk of hearing damage.



**07.45** First stop. It is time for the soldiers to stretch their legs and patrol a group of houses on foot. The column was separated at a road junction, and only one of the fighting vehicles has arrived so far. At the same time as the platoon commander, Lieutenant Jonas Fröberg, has radio contact with the missing vehicles, the soldiers start to reconnoitre the area. Fröberg shouts at them to wait for a bit, to ensure that everybody has visual contact.

"This is a dangerous area, we have to keep the platoon toget-

her," he explains. While waiting for the vehicles, Fröberg takes the opportunity of visiting a nearby UN post, manned by Nigerian soldiers. He exchanges a few polite phrases, tells them about today's Swedish assignment and asks if anything special has happened in the area recently.

After about a minute, the other two fighting vehicles turn up and the entire force is assembled again. The armoured personnel immediately form a column and proceed into the area, with a distance of 10-15 metres between them.

While Fröberg leads the infantry,

Månsson directs the fighting vehicles.

"It is important that the foot patrol and the vehicles know exactly what each other are doing," says Fröberg. "We must always be able to run back to the vehicles or quickly ask them to come to our assistance."

With determined steps, the foot patrol pass through yards, alleys and brushwood. The local population are enormously surprised when UN soldiers suddenly turn up round the corner of their huts. They are cautious, but do not show any immediate fear.

"We achieve most by patrolling on foot," says acting squad leader Michael Sarian. "When the vehicles are audible in the distance, we know that some people disappear. But at the same time, the vehicles must be available somehow. They are our main protection, after all."

After a half hour, the soldiers have reached a dirt road which is suitable for a rendezvous with the fighting vehicles. Fröberg calls them on the radio. Three minutes later, the rumbling is heard and the reassuring monsters soon come into sight above a hilltop 500 metres away.

The squad continues along the

street fighting during the last weekend of October 2004, were violent and bloody. The remains are visible all over the place.

road further away from Somalia Drive. The route leads to a swampy area and their primary task is to find out how far down the previous disturbances extended.

"We also want to know more about the areas which are populated by Christian Liberians and by people who belong to the Muslim Mandingo tribe," Fröberg explains. "The greatest tensions are between these groups."

“The three fighting vehicles immediately get the local population’s undivided attention, although UN vehicles have been swarming over the country for the previous year”.

**08.50**

A woman waves with a small card in her hand. The soldiers first wave back, but then realise that the woman wants to do more than just express her thanks. The card is an identity card from the former Liberian Army. The woman was a medical orderly there, and tells them that there are still some weapons left in the area, despite the massive collection effort done by the UN. Nearly 30,000 fire-arms and even more explosive devices have so far been collected and destroyed.

The UN pays 150 American dollars for each weapon, which is more or less half a year’s pay in Liberia. The payments have got

the Liberian economy moving, which is both positive and negative. One negative aspect is that the Liberian population now believes that they can afford to import things that they could really grow or produce themselves.

Fröberg notes the woman’s information and calls in his position, so that he can travel out again later and interview the woman in greater detail on another occasion.

The road becomes narrower as they approach the swamp. The buildings also appear to thin out, so the column halts. It is time to return to Somalia Drive, but first they take a ten-minute break. The sun is already high in the sky

and the heat is oppressive. They need to top up their bodies’ reserves of water.

A large number of the local population gathers 30 metres away from the vehicles, mostly children. It is exciting when UN troops suddenly turn up in your back yard.

Månsson explains that the happy cries have lessened as the mission carries on. These days, some people even point their fingers at the troops. It is easy to believe that the UN will solve all their problems, and frustration grows when they do not.

**09.25**

The journey back to Somalia Drive starts. A man with a megaphone runs round and causes some sort of demonstration. The message is not clear, so the soldiers contact him. It appears that he is inviting people to a “forgiveness meeting” on a football field nearby. The idea is that it should help to unite the various tribes in the country. This is a good initiative, of course, but there is a strong risk of trouble. The soldiers decide to make some preparations for it.

Once out on Somalia Drive, the 16 infantry soldiers embark in the fighting vehicles to do a new patrol in the next area marked on the map. It is time for another excursion down to the swamp. This road is

It is noisy and crowded inside Stridsfordon 9040C, but also extremely safe.



as narrow as the last one. The fighting vehicles depart first. When they meet an old tank lorry, it is forced to reverse into a yard. On the front, the words Stockholms Oljecenter are painted. The lorry might be left over from the 1970s, when Lamco, the partly Swedish-owned mining company, mined iron ore in Liberia.

The squad marches in line after the fighting vehicles. The area looks just like the last one. It would be

easy to get lost here.

There is rubbish all over the place. There are many large holes in the road. The houses appear to be ready to fall down, irrespective of whether they are built from brick, corrugated iron or something that looks like bamboo rods.

The people are less amicable towards the troops here. Wrecked cars along the road indicate that things have been quite lively here. A charming dog runs past, surrounded in a cloud of flies. He

lies down and starts to wriggle in the grass. The itching is obviously unbearable. No patting.

**10.10**

The soldiers stop beside two burned-out cars for a chat with the local population. They want to know what happened in the fighting and what factors triggered it off. Small talk about work and family are also part of the discussion. Beside the road, various kinds of domestic animals run around

among the rubbish. A poor hen pecks at a piece of polystyrene foam, hardly for the first time.

The patrol continues down towards the swamp. When the built-up area ends, it is time for another ten-minute break. Some of the soldiers use the break to talk more with the local population, while others tease each other. The sky darkens. The feared downpour holds off, but it does not really matter, the platoon is already drenched. By sweat. The tempe-

Acting squad leader Michael Sarian has “hatched up” and is keeping an eye on his surroundings while the patrol rolls through Monrovia.

ature is 37°C (98°F) in the shade and the relative humidity is 90 per cent.

**10.40**

The column turns back. When they are almost back at Somalia Drive, they take a new break while the liaison unit and one of the

“A woman waves with a small card in her hand. The soldiers first wave back, but then realise that the woman wants to do more than just express her thanks”

squads make a detour to an adjacent gravel yard to interview a group of people. Within minutes, a group of about a hundred locals crowd round the liaison personnel. The atmosphere is somewhat tense. A confrontation could now have catastrophic consequences. The squad is strategically placed in a circle round the gravel yard. They have their backs to the crowd, but keep a constant eye on them.

After a quarter of an hour, there

is no more information to be gathered. The liaison group has gained a picture of the people's feelings, but they did not get any new information about trouble-makers this time.

**11.15**

The patrol has been in operation for four hours, and the infantry men have walked about 10 km with full battle equipment. The soldiers can take a small drink of

water frequently through a hose to their mouths and special water bags on their backs, so-called camelbacks. Their bodies feel best if they are able to sip water frequently. This is the way that the body absorbs water best.

The last stop for the day is different to the other two. The vehicles are now going to drive in along small farm tracks and pass only a few metres from people's porches.



It does not start well. Right in the first farm, one of the vehicles sinks down in a soft lawn. The driver reverses at once, but the damage is done. Despite the deep

A woman who used to be a medical orderly in the Liberian Army turns out to have very interesting information about the places where weapons are hidden in the area.

ruts, the family on the veranda do not seem aggravated. Maybe they don't dare. Or they might just be glad that the UN has shown an interest in their own area.

The last area is patrolled faster than the first two. The soldiers' stomachs have started to rumble. They have no hope of a delicious meal when they get back to the camp, however. The kitchen is

closed for renovations and they will have to eat their rat packs (freeze-dried ration packs that are re-constituted with water), just like their breakfasts.

The journey back goes smoothly. The only road back through Monrovia is often clogged with traffic jams, but not today.

“For some reason, there are always fewer cars when we drive

our fighting vehicles,” Månsson concludes with a smile.

Back at the camp, they find that the information they have gained forms a good basis for the rest of the weekend. They have also found that the area appears to be calm at present. The Swedes know that the situation can change rapidly, however, without prior warning. That is the reality of present-day Liberia.

The platoon presses forward as a column. It is important that each soldier always has visual contact with the man in front of and behind him.

Footnote: The Ramadan weekend passed without any of the serious incidents they had feared.

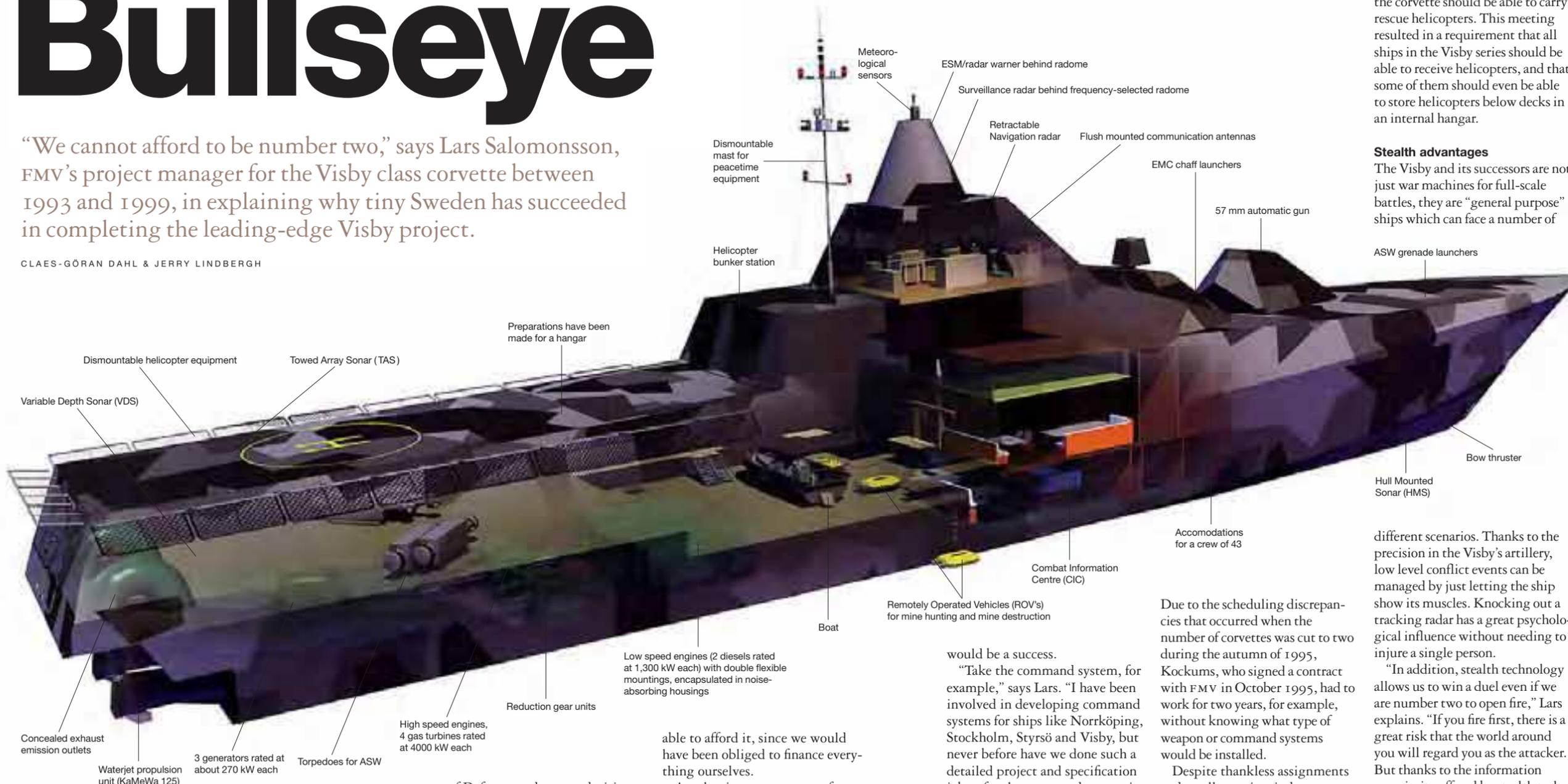
COPY JERRY LINDBERGH  
PHOTO JERRY LINDBERGH

# Bullseye

A world leading

“We cannot afford to be number two,” says Lars Salomonsson, FMV’s project manager for the Visby class corvette between 1993 and 1999, in explaining why tiny Sweden has succeeded in completing the leading-edge Visby project.

CLAES-GÖRAN DAHL & JERRY LINDBERGH



Variable Depth Sonar (VDS)  
 Dismountable helicopter equipment  
 Towed Array Sonar (TAS)  
 Preparations have been made for a hangar  
 Helicopter bunker station  
 Dismountable mast for peacetime equipment  
 Meteorological sensors  
 ESM/radar warner behind radome  
 Surveillance radar behind frequency-selected radome  
 Retractable Navigation radar  
 Flush mounted communication antennas  
 EMC chaff launchers  
 57 mm automatic gun  
 ASW grenade launchers  
 Bow thruster  
 Hull Mounted Sonar (HMS)  
 Accommodations for a crew of 43  
 Combat Information Centre (CIC)  
 Remotely Operated Vehicles (ROV's) for mine hunting and mine destruction  
 Boat  
 Low speed engines (2 diesels rated at 1,300 kW each) with double flexible mountings, encapsulated in noise-absorbing housings  
 Reduction gear units  
 High speed engines, 4 gas turbines rated at 4000 kW each  
 Torpedoes for ASW  
 3 generators rated at about 270 kW each  
 Waterjet propulsion unit (KaMeWa 125)  
 Concealed exhaust emission outlets

It's both a unique and a imposing situation when you can say that the FMV, on assignment from the Swedish Navy and in collaboration with the Kockums Shipyard, has developed a type of ship that has changed sea warfare in for good. On top of this, it has created this world leading vessel with what could be regarded intentionally as minimal resources. During the course of the project, there were many doubters. We now know, though, that the efforts have been successful and that the Visby corvette is a world in many respects.

One of the people behind the success story is Lars Salomonsson, who guided the project into shore in close collaboration with the Navy representative, Göran Frisk. Even these men doubted the project would ever succeed. “Technically, we were never worried about the Visby, but when we were informed in 1995 that we would only be given approval for making two ships instead of four, we doubted that the financial framework would ever hold water,” says Lars.

**Five ships**  
 In December 1996, the Ministry

of Defence made a new decision to build four ships, and in 1999 they raised the number to six units, before they changed the final number to five, with an option for the sixth. This option, though, was never exercised. There are many reasons for the success of the Visby project. Above all, it was important that it would be a true spearhead project. “Yes, since we produced a basic design which was then regarded as being revolutionary, both our national and international suppliers were prepared to make their own investments,” says Lars. If we had prepared an everyday product, we would never have been

able to afford it, since we would have been obliged to finance everything ourselves. Another important reason for the success of the project was the excellent collaboration between all parties concerned in general, and between Lars Salomonsson and Göran Frisk in particular. “You have to respect each other, and learn from each other,” says Göran. “It sounds almost as if we were preachers, but in complex projects like this, you have to know, understand and respect each other. That was the key to succeeding despite the meagre resources we had available.”

**No gold plating**  
 There was never any doubt that the technical aspects of the project

would be a success. “Take the command system, for example,” says Lars. “I have been involved in developing command systems for ships like Norrköping, Stockholm, Styrösö and Visby, but never before have we done such a detailed project and specification job as for the command system in the Visby. When FMV and SAAB Tech Systems (then known as Celsius Tech Systems) signed the contract in March 1998, both parties agreed that the command system was fully feasible. They had gone through the technical, financial and scheduling aspects of the system together to eliminate any risks. Each contract signed during the Visby project was preceded by long and tough negotiations. There was an audit inspection of each contract and a quick look at them shows that the contracts were far from gold plated for industry, neither financially nor in their structure.

Due to the scheduling discrepancies that occurred when the number of corvettes was cut to two during the autumn of 1995, Kockums, who signed a contract with FMV in October 1995, had to work for two years, for example, without knowing what type of weapon or command systems would be installed. Despite thankless assignments and small margins, industry was still interested. Participating in the Visby was nevertheless a magnificent feather in their hats.

**Sensitivity**  
 Several features in the Visby corvette are unique. It is extra noteworthy that the corvette meets the requirements for present-day needs, although the corvette was designed at a time when anything apart from defence against invasion was not contemplated. This witnesses great sensitivity and flexibility. As an example of the modifications done during the course of the project, Lars Salomonsson mentions that after the Estonia

disaster, he was called to the Navy Chief-of-Staff, who requested that the corvette should be able to carry rescue helicopters. This meeting resulted in a requirement that all ships in the Visby series should be able to receive helicopters, and that some of them should even be able to store helicopters below decks in an internal hangar.

**Stealth advantages**  
 The Visby and its successors are not just war machines for full-scale battles, they are “general purpose” ships which can face a number of

different scenarios. Thanks to the precision in the Visby’s artillery, low level conflict events can be managed by just letting the ship show its muscles. Knocking out a tracking radar has a great psychological influence without needing to injure a single person. “In addition, stealth technology allows us to win a duel even if we are number two to open fire,” Lars explains. “If you fire first, there is a great risk that the world around you will regard you as the attacker. But thanks to the information superiority offered by stealth technology, the Visby can await an opponent’s opening move. If the opponent fires a missile, it is possible to deflect it using modern methods, since the Visby has such a low signature. This forces the opponent to come in close and be openly aggressive, and there is then no longer any doubt about who it was that escalated the conflict.”

**World leading**  
 The Visby is without doubt a modern naval system. The fact that tiny Sweden has managed to develop the ship is impressive, but not entirely surprising. Sweden is a leading nation in developing

command systems and ships intended for shallow waters. “The Combined Defence Forces have decided that we will continue to develop the naval systems where we are regarded as being world leaders, i.e. fire control systems for coastal operations,” says Lars. “FMV is currently in demand as an international collaboration partner, which means that we will be able to remain as world leaders in the future.”

**HMS Visby**  
 Length: 72 metres  
 Beam: 10.4 metres  
 Draft: app. 2.4 metres  
 Displacement (weight): app. 650 tonnes.  
 Crew: 43 persons  
 High speed machinery: four gas turbines producing a total of 16,000 kW  
 Low speed machinery: two Diesel engines producing a total of 2,600 kW  
 Top speed: nearly 40 knots

**The Visby series.**  
 HMS Visby is the first of five stealth corvettes for the Swedish Royal Navy. The ship is currently being tested by FMV and will be delivered to the Navy in 2006. Ship no. 2, HMS Helsingborg was launched in 2003 and will be delivered in 2007. Before the end of 2008, HMS Härmösand, HMS Nyköping and HMS Karlstad will also have been delivered.

The ships are expected to be in service for 25-30 years and are built from carbon fibre reinforced plastics laminate, which makes them very strong in relation to their weight. The material and the technology has been developed in collaboration between FMV, Kockums and the Royal Institute of Technology (Stockholm). The material is non-magnetic and is very difficult to detect by radar and IR (heat radiation), which forms the basis of the Visby’s stealth technology.

Visby series ships are equipped with a combination of diesel engines and gas turbines. The engines power water jet units which give the ships quiet running and excellent manoeuvrability.

In order to carry out their objectives in the network-based defence environment, the Visby series is equipped with modern communication systems so that they can efficiently exchange information with other units, both inside and outside the military defence organisation. For example, the Visby should be able to aim its fire using data from other units, which further reduces the risk of discovery, over and above its stealth technology. The Visby series is also equipped with sensors and weapon systems which can act on, above and under the water at all levels of conflict.

# PHOENIX

A SMALL STEP FOR MANKIND – A GIANT STEP FOR VIDSEL?

Twenty millimetres, that was the deviation from the programmed stop point when the Phoenix landed on the Swedish Defence Materiel Administration (FMV) air base at Vidsel. In other words, the prototype of the European space shuttle, Hopper, managed its 90 second descent with flying colours.



PHOTO: EADS SPACE/INGO WAGNER

**T**he time was 09.45 on the eighth of May 2004 and every-body's nerves were at breaking point when the FMV vertol helicopter nudged the 1,200 kg craft out at an altitude of 2,400 metres (7,900 feet). The Phoenix does not have an engine and flies like a paper dart. If there was a single program bug, the craft would have crashed into the ground.

Instead, the Phoenix flew by itself with the aid of GPS navigation. The FMV operators provided guests from EADS in Bremen with data from radar, theodolites and remote sensing stations. If the Phoenix had come off course, the safety manager would have called "terminate" three times and then the German technicians at EADS would have released a parachute. For safety, five families temporarily had to evacuate their homes at Gransel, which is near the air base.

"This is the first time we used a safety zone at the air base," says Nils Widén, who is site manager at the FMV testing range at Vidsel. We usually operate in the unpopulated firing range which is 40 kilometres to the north-west."

But the safety zone was not needed. The Phoenix computer control functioned perfectly, and when it finally reached the asphalt, the brakes were applied at the correct instant. And there she stood proudly, almost seven metres long and four between the wingtips. Or maybe it was a he, like the mythical bird which rose again from the ashes?

The three landings which were carried out at Vidsel became a feather in the hat for EADS Space Transportation at Bremen, who had built the Phoenix and were responsible for the landing. According to Google News, two hundred English language newspapers wrote about the landing. "Everyone here is ecstatic. This gives us wind in our sails," is how CNN quotes Johanna Bergström at NEAT (North European Aerospace Test Range). NEAT is the resource pool in which FMV

and Rymdbolaget market a joint test range for unmanned aerial vehicles. Rymdbolaget (with Esrange) helps civilian customers to get their vehicles up to high altitudes using rockets and balloons, whereas FMV is more down-to-earth and concentrate its efforts on military rockets.

**Like Jutland**

NEAT's core is the FMV and Rymdbolaget's test ranges of 5,000 square kilometre apiece. When civilian air traffic is restricted in between, an unmanned aerial vehicle (UAV) can take off from Kiruna airport and land at Vidsel air base without being bothered by other traffic. The corridor is 100 km wide and 350 km long – as large as Danish Jutland! The question is whether any other test range is as shielded from observation and still as easily accessible? There is definitely no comparable facility in Europe.

"We have unique resources here at Vidsel, as regards competence, equipment and land area," says Nils Widén. "We have to put it to good use."

International marketing of NEAT has begun to produce results. Last year, the Japanese released their prototype space ferry from balloons high above Esrange. In addition, the Eagle UAV made by EADS was flown between Kiruna and Vidsel in collaboration with the Swedish Combined Defence Forces. And next year, the Germans will do another Phoenix trial at Vidsel, but with a new control system. This can then be followed by a high altitude test from balloons. Or the Phoenix can be released from a large jet aircraft and fly between Kiruna and Vidsel. But it is not just a question of coming here, releasing a vehicle and then driving away. It is a complicated operation with painstaking preparation.

**Civilian customers**

FMV mainly focuses on military customers, and Rymdbolaget focuses on civilian customers, so it seemed to be natural that it was Rymdbolaget's personnel at Esrange who were responsible for customer contact and administration this time. In addition to the FMV test range at Vidsel, the defence test range at Linköping has contributed resources to the

Phoenix project. For example, when EADS did a test flight of the Phoenix last year, hanging from a helicopter.

At that time, their contribution included designing the support frame which allowed the helicopter to release the prototype.

**Orchestra**

The test flight at Vidsel was like tuning an orchestra with a number of well-rehearsed specialists. Five people from FMV in Vidsel and Linköping comprised the "ground crew" who installed the Phoenix in the frame. The F21 air force base helped with the drop mechanism, which was initially a bomb release mechanism from a Viggen fighter. FMV's test leader supervised the flight until the drop was made.

The German technicians received data from Vidsel's sensing stations and the FMV safety manager ensured that nothing went wrong. The test personnel thus consisted of a well-rehearsed professional team from FMV at Vidsel, Linköping, Esrange and F21.

"According to our customers, you have to patiently wait for a later occasion at other test sites, if you are not able to carry out your tests in the allocated slot time," says Annica Lindh. "At our site, you get far better service."

**Retirement**

The Ariane rocket will be retired in about ten year's time, which means that EADS space division will need a replacement which is cheaper, more reliable, and can take heavier loads. The Hopper space ferry is intended to become that replacement. The Hopper can be regarded as an unmanned, spacefaring heavy truck. It should be able to unload seven tonnes 130 km up in the sky, and then return to earth. There might well be an astronaut in the payload, but above all, it is intended to be a low-cost satellite lifter. The more than 2000 metre long runway at Vidsel should really be enough for the rocket sledge that launches the Hopper. But the space flights will in all probability continue to depart from French Guyana as previously.

The Phoenix is a scaled-down model of the Hopper ferry.

EADS Space Transportation, which is part of the EADS space

division, is investing more than €8 million in Phoenix. The German Space Agency and Bremen Province will provide as much. EADS is also developing the Eurofighter, which the Spanish low temperature tested in Vidsel in December 2004, but with assistance from F21. This test might be of some importance when the Swedish Parliament makes a decision about the future of F21.

**High aims**

It was in the cold light of austerity that the NEAT collaboration was announced in 2001. The number of test days at the test range was reduced from 100 to 60 per annum when the Combined Defence Forces had to cut back, which caused red figures and personnel reductions. Space research also suffered from the cutbacks. One can see NEAT as the two companies' survival strategy in the wild forest.

The future is looking up. The UAV market offers a promising opportunity, and with the right endurance it can be of great importance for the region. Arctic cold and deserted countryside, which is not unnecessarily subject to observation, can be transformed into hard currency. This has been proven by the car testing sites sixty kilometres further west at Arjeplog – Sweden's most expansive municipality last year according to *Veckans Affärer*, a financial journal. Few places north of the Arctic circle are so conveniently located, and during the high season the flights going to Arjeplog is normally fully booked.

As distinct from Arjeplog, Vidsel already has the infrastructure and technology for radar, theodolites and telemetry. At the air force base, there are hangers, workshops and space for lodgings. The same can be said about Esrange and Kiruna Airport.

**Take-off for the UAV**

Testing space ferries, such as the Phoenix, is a niche market. What is much more interesting is the UAV field, where Europe wants to catch up on American advances. At EADS, the German and French manufacturers are the ones who most actively promote unmanned flying, but Swedish SAAB is also encouraging it.

There are a lot of indications



PHOTO: ANDERS ASBERG

After being dropped from 2,400 metres (7,900 feet), the Phoenix floated in on a controlled track to the FMV runway at Vidsel. The perfect touch down concluded the vehicle's first fully automatic landing. Photo: Anders Åberg / Thomas Ernsting



**About NEAT.** The North European Aerospace Test Range has been a joint venture between FMV and Rymdbolaget since 2001. The two groups pool resources to offer civilian and military customers the opportunity of testing systems for unmanned aerial vehicles. NEAT actively carries out marketing at international exhibitions etc. in order to reach aerospace companies and organisations.

**About EADs.** The European Defence and Space Company is the world's second largest aeronautical company after Boeing and is also Europe's second largest weapons manufacturer. It has 100,000 employees and sales of € 30 billion per annum. Its best known products are Airbus, Eurocopter and Eurofighter and it is owned by Aerospatiale-Matra in France, DASA (Dornier, Daimler Chrysler) in Germany and CASA in Spain. One of its divisions is EADS Space, whose 12,000 employees work for the European space programme. Part of this is EADS Space Transportation in Bremen, which administers the Phoenix project. The company also builds Ariane rockets, the Columbus laboratory and a load carrier for the International Space Station.

that the fighter aircraft of the future will be UAVs, where the pilot stays on the ground. The price would be lower and greater risks can be taken. These aircraft have to train, possibly together with troops. The Government has said that it wants to make things easier for troops from other countries to train in Sweden. In the Norrbotten area, there are hopes of positive effects once the present government review has been concluded.

The analysts Frost & Sullivan predict that Europe will spend € 5,5 billion on developing military UAVs between 2003 and 2012. The market for civilian UAVs is said to be just as promising since in many cases they can replace satellites, ordinary aircraft and helicopters.

In Kiruna, you can roll a jumbo jet into the Arena Arctica hangar, which has nearly a half hectare of floor space.

Theoretically, it would be possible to fly passenger aircraft without pilots, if it were not for terrified passengers. Would you book a seat as a test passenger if your airline decided to test landing with the cockpit empty?

COPY INGEMAR LINDMARK



PHOTO: THOMAS ERNSTING

# ROBOT FIGHTS TERROR

Ammunition clearance and handling of terrorist bombs have high priority all over the world at present. For this reason, Sweden has renovated and upgraded its ammunition clearance robots.

In 1996, FMV acquired three ammunition clearance robots for the Combined Defence Forces. They were designated Amröjrobot 1 and were almost immediately dispatched for international service in Kosovo.

"The robots have worked well, but after eight years of service, they had begun to be worn out. For this reason, it was justified to give them a thorough overhaul," says Jan Lindgren, who is in charge of FMV's work in upgrading the robots.

An upgrade was required instead of just replacing worn components since new functions were needed and the American manufacturer, Remotec, had discontinued certain older components.

"The biggest visible new feature is that the robot now has wheels as a complement to the tracks," Jan says. "These give a more even ride, which generates less wear."

Other new features are that the electronics units has been replaced by one with more modern technology and servo motors, the robot has been given more firing circuits for any weapon it carries,

#### AMRÖJROBOT 1 B

Three units are available. Weight 300 kg. Max speed: 3.5 km/h. It has six general firing circuits and a specific circuit for the shotgun. The stand and grapple cameras can zoom up to 72x. The system has a range of 300 m with fibre optics and 100 m with radio control.

and the arm and the grapple have been given longer extension. In addition, the cameras which monitor robot movement and the grapple have been replaced by units with much better resolution and zoom capacity.

"The biggest change for the user is that the entire control unit is new," says Jan.

"It now has a high resolution colour monitor and everything fits into an easily carried box. Previously, you had to drag along a TV and a whole wheelbarrow full of equipment."

#### Fibre optics

The Amröjrobot's task is to retrieve and detonate unexploded ammunition. The robot is generally controlled by means of a fibre optic cable. This gives a range of 300 metres, compared with 100 for remote control via radio.

When a suspected terrorist charge is discovered, the operator manoeuvres the robot up to the object, while remaining at a safe distance. Two real time cameras on the robot mean that the operator has good control of operation and a wide angle view of the area. The camera which is located on the high reconnaissance stand can be raised, lowered, panned and tilted. There is also a halogen spotlight beside this camera, together with a microphone so that the operator can hear any noises close to the bomb. There is also a loudspeaker, so that the operator

can warn anybody nearby before detonating the suspected charge.

The second camera is for driving the robot and the third camera is on the grapple arm, so that the grapple can be operated with the closest possible margins. The claw can lift 45 kilograms, which is just what is needed to carry an artillery shell away.

#### Several ways

There are several ways to disarm a suspected object. One is to drive up and put a plastic explosive charge on the object. The charge is then activated when the robot has been withdrawn. Or a weapon can be mounted on one of the robot's two tool holders.

"This could be an impact tool, which disintegrates the object with an extremely powerful water jet. It could also be a shotgun," says Jan. This is fired by sending an electrical impulse to a solenoid which pulls the trigger.

X-ray equipment can also be installed on the tool holders. Only still image X-ray equipment is available at present, but there are plans to acquire real-time equipment, so that the screen can show whatever the suspected object is hiding.

Today the three robots are available for both national and international assignments. Inside Sweden, they will be primarily used to support police work.

COPY JERRY LINDBERGH  
PHOTO JERRY LINDBERGH

# LEASE AN AIR FORCE

In stiff competition with four other countries, Sweden won the contract to lease aircraft to the Czech Air Force. It took the working group from the Swedish Defence Materiel Administration (FMV) three months of work on the tender and almost six months of negotiations before the deal was closed.

The news that Sweden had won the evaluation came at the right time. The Swedish Air Force centenary was celebrated on 17 December 2003 by His Majesty the King and a long line of guests. Just as coffee was being served, the news arrived – the Czech Republic had decided to enter into exclusive negotiations with Sweden about leasing aircraft for their defence forces.

“This was fantastic. We struggled with the tender for three months, and it was something of a partial victory to just get as far as the negotiation table,” says Roland Albinsson at FMV, who lead the Swedish project group.

It was a partial victory, but the final victory was still far off. It was to take another six months of tough negotiations before the contract was signed. The negotiations could have been broken off

several times by the Czechs since several criteria had to be fulfilled, or as they expressed it: “you have to move through the eye of a needle, or we will move on to the next candidate”!

#### Five countries

The countries who competed for the tender were the Netherlands, Belgium, the USA, Canada and Sweden. In other words, it was not the company known as Gripen International who received a request in July 2003 to submit a tender. It was the country of Sweden. The reason was that the Czech Republic wanted a wider contract that included support and guarantees.

The assignment for representing the Government in preparing a tender and negotiations was given to FMV. A project group was formed in August 2003. The

tender had to be ready by the last day of October.

“Enormously tough demands” was how Roland Albinsson summarised it. “The Czechs had a locked, limited budget. Not only that, the delivery time for the aircraft was unbelievably short, as was the time allowed for preparing the tender.”

Depending on the tasks in focus, the project group has consisted of between seven and 17 people from FMV, the Combined Defence Forces and consultant companies. Rolf Höglund, normally a commercial attaché at FMV, was the negotiation leader. He says that they made a correct strategic decision in the tender.

“Our attitude was that we must get as far as the negotiation table. To do this, we had to comply with all the demands at the same time as we differentiated ourselves.”



In the group, they realised that the other countries would offer old aircraft. For this reason, they created a solution where they offered new aircraft.

"This was the decisive factor," says Rolf Höglund. "At the same time we created a financial solution containing a leasing model which used a fixed price in Czech currency. We got where we wanted to get, to the negotiation table."

**Intensive work**

The news that the Swedish tender had been selected by the Czechs arrived on the 17 December as we said. On the 22 December, a group travelled down for a first meeting and to arrange the negotiations. There were to be numerous journeys before the contract was signed.

"We had our sights set on three months, but it took almost six months of very hard work," Roland Albinsson said.

The project group occupied the library at the Swedish embassy in Prague, where they worked between negotiations. On Fridays, they returned to Stockholm for a meeting with the steering committee and representatives from the Ministry of Defence, the Finance Department, the Foreign Office



After the contracts were signed, a press conference was held, attended by the Gripen International Managing Director Ian McNamee, FMV's interim General Director Jan-Olof Lind, Sweden's Minister of Defence, Leni Björklund, the Czech Minister of Defence, Miroslav Kostelka, Vice Prime Minister Jaroslav Koprika and the Commandant of the General Staff, Pavel Strefka.

PHOTO: CZ MOB.

and the Combined Defence Forces, a tightly scheduled working week containing travel, hotel nights, negotiation and evening work at the embassy.

"I have never experienced such an intense period of work," says Rolf Höglund. "There was no time to do anything but work."

On the other side of the negotiation table, the Swedes met a group of lawyers whose task was to get the Czech Republic a better deal than was offered. Rolf Höglund says that the question of the price was a feature for a long time during the negotiations, as was the question of finance and the penalties which would be incurred by any delays in deliveries. Another important issue that took a lot of time was the question of responsibility for the aircraft if there were any accidents.

**Several contracts**

When asked what made the process take so long time, Roland Albinsson explained that apart from the leasing contract, there were a number of other contracts that had to be put in place. Contracts between counties are generally at quite a general level, but this was a detailed commercial contract. A Memorandum of Understanding was also signed between the two countries' defence ministers, plus an offset contract for industrial collaboration, a confidential secrecy contract, a contract between SAAB and FFV for modification of the planes and a contract between FMV and the Combined Defence Forces for theoretical and practical training. To this was added a contract that gives the Czech Republic access to various research results.

The project group was rewarded

for their pains on 14 June when the leasing contract was signed. But it was not until the ink had dried that they could stop holding their breath. For example, the Czech Parliament passed a law a week before the contract was signed that allows the Government to enter into the type of leasing contract that the deal was based on. The alternative would have been that Sweden would have had to sign a contract with a separate company. But this is something that the Swedes objected to.

"We have put a lot of time into convincing the other side about this, but all the time we had alternative solutions prepared in case the law was not passed," says Rolf Höglund.

**Third export**

Getting a third country to use the Gripen in the face of stiff competition is of course a success. But if the work in preparing the tender and holding the negotiations was tough, the next challenge will be just as tough, if not tougher.

"We must be able to deliver," Roland Albinsson says. "The first planes must be on site in May 2005, with all that this means in the way of configuring equipment and training pilots and flight mechanics. This work is already in full swing."

COPY HANS IVANSSON  
PHOTO KATSUHIKO TOKUNAGA



This is the cockpit that will be part of the Czech fighter pilot's every-day life.

PHOTO: JERRY LINDBERGH / N-G WIDH

**From MIG to Gripen**

The Czech Republic needed to renew a fleet of aircraft consisting of MIG 21s belonging to the same generation as the J35 Draken. Five countries offered tenders, and Sweden won the contract. FMV represented the Kingdom of Sweden in negotiations with the Czech Republic.

The contract which was signed on 14 June means that the Czech Republic will lease 14 (12 single-seat and 2 twin-seat) of the latest version of the Gripen aircraft, the JAS 39 C/D, for a period of 10 years (2005-2015).

Thanks to the leasing contract, the Czech Republic will be the first member country in NATO to operate the Gripen, a fourth-generation aircraft system in order to comply with national and NATO defence requirements. The Gripen aircraft that the Czech Republic will receive have the designations C and D, from interim series 3, which means that the aircraft are fully NATO interoperable. The aircraft will be delivered during the period from May – August 2005.

As part of the leasing contract, Sweden will provide the Czech Air Force with comprehensive operative and tactical training of both pilots and technical personnel. This training will take place in Sweden and will be provided by the Swedish Air Force. Training will start in August, directly after the holiday period at the F14 and F7 air force bases.

A certain amount of configuration of the aircraft to comply with Czech requirements will be done by Saab AB, which will also provide technical support during the entire leasing period. Sweden will also provide the necessary maintenance equipment, simulators, spare parts, technical and tactical support systems together with comprehensive, integrated logistics support during the entire leasing period. The Czech Republic is responsible for providing its own pilots, technical personnel for normal maintenance of the aircraft at the air force bases, and consumables, mostly aircraft fuel. More comprehensive maintenance of the aircraft, maintenance and repairs to the engines and other equipment will be done in Sweden.

FMV, in the assignment given to it by the Swedish Government, is responsible for ensuring that all costs which arise in connection with the deal are dealt with under the terms of the contract.

The total value of the deal is CZK 19.650 million (about SEK 5.7 billion).





PHOTO: LARS ALWIN, BOFORS DEFENCE, SVENJÅKE HÅGLUND / FBI

## TECHNOLOGY FOR SWEDEN'S SECURITY