





ROOIKAT UPGRADE FOR THE SA ARMY



FIRST HAWK TRAINERS TO MAKHADO



NTW-20 **UPGRADE**



ARTILLERY RECORD BROKEN

LAND SYSTEMS & **SOUTH AMERICA**



SAPS HELI **UPGRADES**

Denel Delivers First SA Components for Airbus

A400M

The first set of South Africanmanufactured aircraft parts for the **Airbus A400M military transport** aircraft were delivered to Germany recently for incorporation into the fuselage of the first aircraft.

Denel Aviation of Kempton Park, Johannesburg, recently completed the first set of fuselage top-shells (roof sections) for the Airbus A400M. Denel is a major industrial partner in the multi-national A400M programme, which South Africa joined

The 15-year top-shell manufacturing contract is worth 20 million euros (about R160 million) and currently accounts for between 80,000 and 90,000 man-hours annually. It follows an earlier contract for the design of the top-shells. Each of the 6sq/m top-shells weighs about 100kg and is made from advanced aluminium alloy formed using special 5- and 3-axis machines. As part of the infrastructure for the A400M work Denel has invested in new long-bed machines and a special treatment facility. The top-shells are a vital part of the "roof" of the aircraft, in front and behind the area where the wing is ioined to the fuselage.

Denel is also responsible for the design engineering and manufacture of several other elements of the aircraft, the largest of which is the carbon composite wing-fuselage fairing. "Today is a proud moment for Denel and South Africa," said Shaun Liebenberg, CEO, Denel. "Delivery of this first South African-produced element of the A400M marks the opening of an entirely new and exciting chapter in the evolution of Denel Aviation and which positions South Africa's aerospace industry on a clear, sustainable growth path," he added.



Through its stake in the aircraft programme, South Africa's industry will participate in the design, engineering, industrialisation, manufacture and in-service support of the A400M the world's most modern military transport aircraft. "The delivery of the first top-shells, on time and to specification, confirms the confidence we place in South Africa and our industrial partners, Denel and Aerosud," affirmed Francisco Fernández-Sáinz, Managing Director of Airbus Military.

Denel and Aerosud's participation in the A400M underpins the South African Government's new aerospace strategy which is characterised by a move away from prime contracting and a focus on niche engineering, design, manufacturing and development services for aerostructures and aircraft systems. It also confirms the objective of gaining access to the

As an Airbus Military A400M partner, South Africa has secured a vital and sustainable role for its industry over the next 30 - 50 years as a provider of engineering and manufacturing services as well as customer support for aircraft in service. South Africa will also acquire eight A400Ms from 2010, bolstering its strategic airlift capabilities and enabling it to support national, regional and multi-national peace and humanitarian missions.

The A400M order book currently stands at 192 firm commitments, including the seven European NATO launch customer nations, South Africa and Malaysia. The aircraft will first fly in 2008 with deliveries beginning in 2009. The new airlifter will enable air forces around the world to upgrade their airlift capability for both humanitarian and peace-keeping activities.



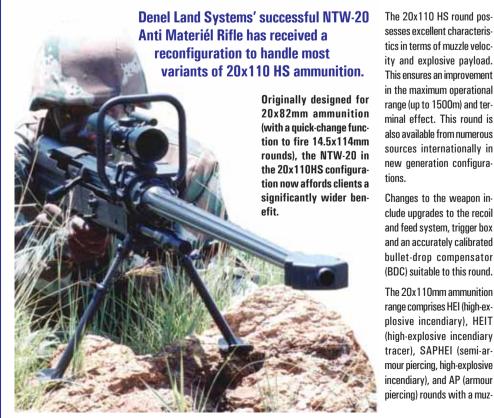
The Airbus Military A400M is a 21st century heavylifter designed to replace the C-130 Hercules, C-160 Transall and former Soviet-era Antonov and Illyushin transports. Seven European nations collaborated to design and build the aircraft, with South Africa coming on-board as the first non-European nation. The first aircraft is scheduled to fly in 2008.



above and below: A400M top-shells under construction at Denel Aerostructures in Kempton Park.



NTW-20 Anti-materiél Rifle Upgrade



sesses excellent characteristics in terms of muzzle velocity and explosive payload. This ensures an improvement in the maximum operational range (up to 1500m) and terminal effect. This round is also available from numerous sources internationally in new generation configura-

Changes to the weapon include upgrades to the recoil and feed system, trigger box and an accurately calibrated bullet-drop compensator (BDC) suitable to this round.

The 20x110mm ammunition range comprises HEI (high-explosive incendiary), HEIT (high-explosive incendiary tracer), SAPHEI (semi-armour piercing, high-explosive incendiary), and AP (armour piercing) rounds with a muzwell as PRAC (practice) and PRACT (practice tracer) rounds. The NTW-20 AMR, weighing 31.5 kg unloaded, is a two-man weapon which is normally fired in the prone position, ensuring maximum stability for long-range shooting. It has an 8 x 56 power telescope with parallax adjustment, fitted to a quickrelease mounting with integral bullet-drop compensation. The sight is mounted to give 250mm eye relief, thus providing the optimum combination of situational awareness, target acquisition and accurate aiming.

The weapon is bolt action, with a three round magazine or by manual feeding through the ejection port. It can be completely field stripped with no tools other than a

round of ammunition, which is used as a tool for removing the barrel.

The NTW-20 can be mounted on Denel's new purpose-built, buffered and damped vehicle mount. This mount has been designed and manufactured to suit the needs of longrange accurate single shot fire from weapons such as the NTW-20 AMR.

Dampers in the mount control the free movement of the weapon during aim. These can be quickly regulated to allow rapid slewing of the weapon.

The combination of the NTW-20 AMR and the vehicle mount provides the user with a highly versatile and powerful payload rifle which, due to its mobility, can be deployed in any number of sce-

Bitter-Sweet Success!



This spectacular photograph records a bitter sweet moment. It shows the destruction of one of our own by one of our own - a Denel Skua target drone by a live Umkhonto surface to air missile launched from the SAS Spioenkop (more on page 2). The test took place at Denel's Overberg Test Range in less than favourable conditions (significant wind and wave action) and at an intercept range exceeding the design requirement by 15%.

The two Denel teams worked very hard to prepare the missile and target drone for the test. Although the Skua came off second best - success was the ultimate outcome. The South African Navy will carry this excellent missile system on all four of its Corvettes.

Rooikat Turret Denel Land Systems is gearing up for major activity as a result of a Rooikat turret upgrade contract

Denel Land Systems received an order from Armscor during February 2006 to the total value of R51.5 million, to upgrade a total of 76 Rooikat turrets. The planned completion date for this upgrade project is May 2008.

The Rooikat is the prime armoured fighting vehicle of the SANDF. As an 8 X 8 wheeled platform, it provides the system with excellent mobility on tarred roads as well as cross-country terrain. This mobility has been envied by defence forces and vehicle manufacturers all over the world. The Rooikat tur-

ret, sporting a 76 mm main weapon and modern fire-control system, provides the system with lethal fire-power and accuracy on the battlefield.

Development of the Rooikat system started in the 1980s. The prime contractor was BAE Systems-OMC (then known as OMC), who also developed the vehicle platform. The turret was developed by Denel Land Systems (then known as LIW). Turret production commenced in 1992 and was completed in March 2000. A total of 244 systems were manufactured and consisted of three basic configurations.

At the time of the initial development of the Rooikat turret, the best available technology was implemented and the performance of the turret was comparable to similar systems worldwide. During the latter part of the 90s however, the SANDF realised that technology had made great strides. It was decided to improve some performance and reliability aspects of the Rooikat, making use of the latest technology. Development orders were placed on OMC for the vehicle and Denel Land Systems for the turret.

The major objective of the turret upgrade was to:

- Improve the gun drive system and fire-control computer to provide better weapon stabilization and target acquisition characteristics
- Improve some man-machine-interface functions
- Improve the performance of the commander sight
- Develop new commander and loader hatches with new functionalities
- Improve the commander seat
- Implement some additional minor modifications to the



The main focus of the development was on the improvement of the gun-control and fire-control systems. As the supplier of the Integrated Fire Control System (IFCS) for the Rooikat, RDL was contracted by Denel Land Systems to complete this

To achieve the more stringent stabilization requirements, new Fibre Optic Gyros (FOG) were developed to replace the existing mechanical gyros. It was also decided to supplement the weapon gyro with an additional Feed Forward Gyro. Minor modifications were implemented on the elevation gearbox to reduce backlash and improve stiffness. This upgrade also required extensive upgrade to the control software.

During Phase 1 of the development, it was found that the capacity of the existing computer was not sufficient to cater for this upgraded software. A second development phase was then initiated to allow for the development of new processor and interface cards. The new processor cards had to interface with the older hardware in the computer.

The success of the upgrade development was proven during a successful firing trial with the development system in February 2005. After completion of this firing trial, four additional Rooikat systems were upgraded as part of the industrialisation phase.

All four systems completed the factory acceptance successfully and were subsequently delivered to the SANDF for evaluation during a user Operational Test and Evaluation (OT&E). As a result of the successful development work, the SANDF decided to contract Denel to retrofit all 76 Rooikat turrets.

Police Air Wing Gets Denel "Eyes in the Sky"

The South African **Police Services** (SAPS) Air Wing **Unit has awarded Denel Optronics a** contract for the supply of the Goshawk 350 multi-sensor electro-optic and infrared system for SAPS helicopters.

The scope of this contract includes a full turnkey solution for the supply, installation and certification of four Goshawk 350 systems. As with other variants of Denel's renowned family of gyro-stabilized airborne surveillance systems, the Goshawk 350 is fitted with Denel's Kenis continuous zoom thermal imager, daylight TV camera and auto tracking. The SAPS contract also provides for internal equipment (including an operator console with integrated LCD monitor and VCR), external role equipment and the supply and interface to digital microwave downlink systems.

This virtual "eye in the sky" system will allow the SAPS to deploy their helicopters for all weather and day / night crime prevention, law enforcement and border surveillance operations.

Denel Optronics won the SAPS contract against stiff international competition, involving thorough independent tender and hardware evaluation. This achievement bears testimony to the competitiveness of Denel Optronics products.

The SAPS had released an open international Request for Quotation last year with nronosal submissions scheduled for November 2005. Ground and airhorne evaluations of the short-listed bidders took place in February

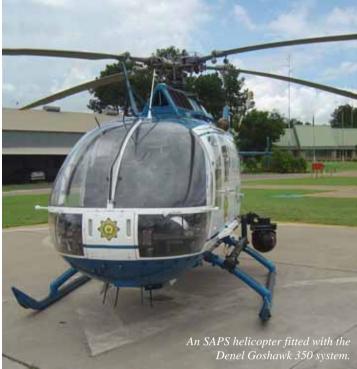
The Goshawk 350 system is the system of choice where a compact, low mass, highreliability solution with payload sensor variety and modularity are required. It has a proven track record with Unmanned Aerial Vehicle (UAV) manufacturers

worldwide and has recently undergone a delta development to incorporate Denel Optronics' LEO-II laptop control unit with a view to enter the fixed-wing and helicopter market.

The Goshawk 350 is one of a family of electro-optic stabilised airborne observation and surveillance systems developed and manufactured by Denel Optronics. Others in the portfolio are the LEO (civilian and police applications), and Argos (military applications). The latter has been fitted to the SA Navy's Super Lynx 300 naval helicop-

Sophisticated gyro stabilization in all these systems ensures exceptionally stable and crisp images, despite the vibration and movement of the helicopter. They are fitted with a daylight TV zoom camera, as well as a thermal imager that gives it 24-hour all-weather capability.

Its advanced multi-sensor imaging technology makes it ideal for law enforcement operations. Denel's most recent international customer of the LEO II is the Buenos Aires Police in Argentina. Denel's LEO system is successfully used by Police Air Support Units on five continents - from the Americas to Europe, Middle East and Asia Pacific - in some twenty countries around the world.



Finland Signs for the Umkhonto

Following successful trials of the Umkhonto-IR surface-to-air missile in South Africa, Finland's navy signed a contract with Denel Aerospace Systems to acquire the Denel missile system for its Squadron 2000 project.

Chief of the Finnish Navy, Admiral Holstrum who attended the trials at the OTB Test Range near Bredasdorp in the Western Cape Province, expressed satisfaction with the Umkhonto missile's performance.

The SAS Spioenkop, the SA Navy's second Meko-class

fitted with a live warhead) on 27 March 2006. It intercepted and completely destroyed a Skua target drone in less than favourable conditions (significant wind and wave action prevailed at the time). This successful outcome was achieved at an intercept range exceeding the design requirement.

The fact that Finland, as a member of the European Union (EU), opted to activate the Umkhonto-IR contract creates a solid platform for future marketing and sales of Denel's products elsewhere in the world.

ready selected the Umkhonto-IR system in 2002 for its Squadron 2000 project, it activated an option in the original contract for installation of the missiles in Finland.

Denel had in the in-With the SA Navy's terim executed the contract to missile launch on 27 supply the onboard fire control system on Finland's new

Hamina and Hameenma class vessels. The Finnish Navy will now receive the first batch of the Umkhonto-

IR missiles for integration on the six vessels over a period of 15

> were also carried out from the first Finnish vessel in mid Typically the Umkhonto-IR surface-to-air missile system

acts as a ship's primary de-

fensive weapon against in-

coming sea-skimming missiles and other air threats like

March it completed its Um- now proven performance and khonto system evaluation on special features, notably its siles (up to eight or more) can the second corvette. In par- multiple target and vertical be launched at different tarallel, successful firing trials launch capability, combined gets simultaneously. with a competitive proposal, counted in favour of the Denel product.

Missile System

The missile is launched from a set of sealed and pressurised cylindrical launch canisters installed aboard the vessel. Launched vertically with autonomous flight control, the Umkhonto-IR missile the ship. A number of mis-

Equipped with an IR (infrared) seeker and sophisticated guidance systems, including a digital autopilot, the Umkhonto-IR missile homes in on its target after launch. Such in-flight guidance, known as "lock-on-after-launch", saves time thus allowing for superior protection of the vessel.

The Umkhonto-IR missile is a verticallylaunched, high-velocity, infrared homing missile specifically designed to provide allround defence against simultaneous air attacks by both fixedwing and rotarywinged aircraft, and missiles.

The missile and its associated subsystems can easily be integrated into naval combat suites and groundbased air defence sys-



MODULAR COMBAT VEHICLE FOR PROJECT "HOEFYSTER"

At a recent function hosted by Denel Land Systems, LMT and Patria, stakeholders had the opportunity to experience the impressive MCV first hand.

Project Hoefyster is an Infantry Fighting Vehicle (IFV) programme to replace the SA Army's fleet of Ratel 6x6 armoured fighting vehicles (AFVs).

The Ratel, which originally entered service 30 years ago, was a world-leader at the time and included a number of variants including vehicles equipped with a 20mm cannon, a 90mm gun, anti-armour missile launchers, mortar vehicles, and fire support vehicles.

Despite being upgraded more than once, the Ratels are becoming obsolete, as there has been much progress in the design and manufacture of armour and AFVs since they were originally built.

Hand-held anti-armour weapons like the well-known, Soviet-era RPG-7, have evolved their armour-piercing capabilities to a level where they are capable of disabling vehicles such as the Ratel and the US Bradley AFV.

This does not bode well for the SA Army which is increasingly being committed to peacekeeping and monitoring operations in the rest of Africa -hence the need for a more modern AFV that offers better protection.

Programme stakeholders were invited to the Gerotek testing facility west of Pretoria. They were offered the opportunity to actually ride in the MCV during high-speed runs, over rough ground designed to test the vehicle suspension, and to experience the MCV's phenomenal climbing capability during incline testing.

Armscor issued a request for proposals for Project Hoefyster early in 2004. A consortium comprising Denel, Land Systems OMC, European conglomerate -BAE Systems Land Systems and Finnish vehicle designer and manufacturer Patria, put together a bid based on the Patria 8x8 Armoured Modular Vehicle (AMV) chassis with a Denel turret.

The Patria AMV has the advantages of being a new design, and one that is already in production in Europe. To date, the Finnish army has ordered 124 and the Polish

army 690. The AMV is a family of vehicles, comprising three models. The AMV basic model, the AMV system platform, and the AMV module carrier.

The basic model can be adapted to a number of roles, hence the modular concept. These include an armoured personnel carrier, infantry fighting vehicle, command vehicle, ambulance, fire support vehicle, tank destroyer (armed with missiles or guns), and mortar carrier.

The system platform model has a large rear compartment and can be fitted as a workshop vehicle, headquarters vehicle, or larger ambulance.

The vehicle is fitted with a Denel Land Systems turret equipped with day/night sights and laser-range finding capability. A number of choices are available for the main armament ranging from a medium calibre cannon to mortar and missile options.

Our team had to integrate the turret with the Patria AMV chassis in record time to meet the Armscor requirement in time.

Gerotek

Scenes from the

demonstration at













Denel shatters artillery records



In a continuing drive to improve its acknowledged lead in tubed artillery systems, Denel shattered all previous artillery records by firing 75km earlier this year. This range improvement was achieved on 11 April 2006 with the latest G6-52L, Denel's extended range version of its renowned G6 self-propelled artillery system. It fired V-LAP projectiles which use both base-bleed and rocket-assist technology to extend the range.

The ammunition was conditioned at $50\,^{\circ}\text{C}$ as part of a safety qualification for an upcoming manned user trial. The gun fired at an elevation of 1 000 metres above sea level at the Alkantpan firing range near Prieska in the Northern Cape Province. What makes this achievement more remarkable is the excellent consistency achieved, with a probable error of only 0.38% of range fired.

"We'll be able to further improve on this accuracy in future by applying range correcting fuse technology on which Denel has started to work," explained Mr. Bastiaan Verhoek, Executive Manager: Business Development at Denel Land Systems

Artillery systems in many parts of the world, such as within NATO, are specified to fire shorter ranges, mainly in the interest of standardization. "For these requirements we do supply guns and ammunition systems too, but because we use the same design technologies, Denel can do so with much more confidence and greater margins of safety," he added.

"With these latest firing trials, Denel showed that it remained the world leader in development of long range artillery ballistic systems," Verhoek concluded.

FIRST HAWKS DELIVERED TO AFB

MAKHADO

The first Hawk Mk120 lead-in fighter trainers for the South African Air Force (SAAF) took off from Denel Aviation on 24 May 2006 for AFB Makhado, witnessed by the media and members of the SAAF, Armscor and industry project teams.

Delivery of the two aircraft mark a significant milestone in the fulfilment of South Africa's 1999 joint procurement order for 24 Hawk and 28 Gripen fighters. Since then further batches of the Hawks completed at Denel were flown to Makhado to start the SAAF's training programme there.

With the exception of Hawk SA 001, the flight test and development aircraft built in the United Kingdom, all of the SAAF's other Hawks were assembled at Denel's Kempton

In terms of an Industrial Participation agreement with BAE Systems, Denel is the exclusive manufacturer of tailplanes, airbrakes and flaps for the Hawk, with these components already being incorporated onto aircraft operated by or being built for South Africa, India, Bahrain and the UK's Royal Air

Other South African aerospace companies, notably ATE, Aerospace Monitoring Systems (AMS) and Tellumat are also involved in the programme. They provide the Hawk's combat avionics and navigation suite, flight recorders (often referred to the aircraft's "black box" recorders), Health Usage Monitoring Systems (HUMS) and identification transponders that enable pilots to distinguish hostile aircraft from friendly ones.

Small BEE firms are part of the local supply chain on the Hawk programme, with support equipment on the Denel final assembly line having been built by several SMME companies.

SAAF Director Air Force Acquisition, Brig Gen. Philip Willcock, commended all the contractual parties, including Denel, for completion of "the enormous task to date." He said the delivery event of the first two Hawks "demonstrates that the Hawk project is progressing well."

Mr Mike Rennardson, BAE Systems Project Director, said he was very proud that "Hawk is the first jet aircraft ever to be

built in the democratic South Africa... and that these aeroplanes and their constituent components represent the labours and dedication of a whole new generation of young, talented and professional South African men and women, black and white."





above: The Hawk assembly line at Denel Aerostructures.

right: SAAF Hawks - 051 and 052 are prepared for their delivery flight to AFB Makhado.



The first two SAAF Hawks fly in

close formation en-route to their

new home





The German army recently visited our shores with their PzH2000 self-propelled artillery system to try out Naschem's

world-class V-LAP 155mm ammunition.

Munich, April 17, 2006 - The Howitzer 2000 Tank fired the long-range V-LAP ammunition from Denel over a distance of more than 56 kilometres during ammunition tests in South Africa. This result was achieved with six DM72 propellant system modules. This new benchmark for the PzH2000 represents an increase of more than 40% compared to ranges of 40 kilometres previously achieved with base-bleed artillery

The performance certificate was arranged by the German Federal Office of Defence Technology and Procurement (BWB) on behalf of Krauss-Maffei Wegmann at the Alkantpan test range (South Africa). Site boundaries of the testing grounds limited the elevation to a maximum of only 737 mils.

Based on sea-level standard conditions, the system has a potential range capability of more than 60 km using an elevation of 980 mils. This capability extends the operational envelope of the Howitzer 2000 Tank as a classic 155mm/52 artillery weapon into the domain previously reserved for rocket artillery.

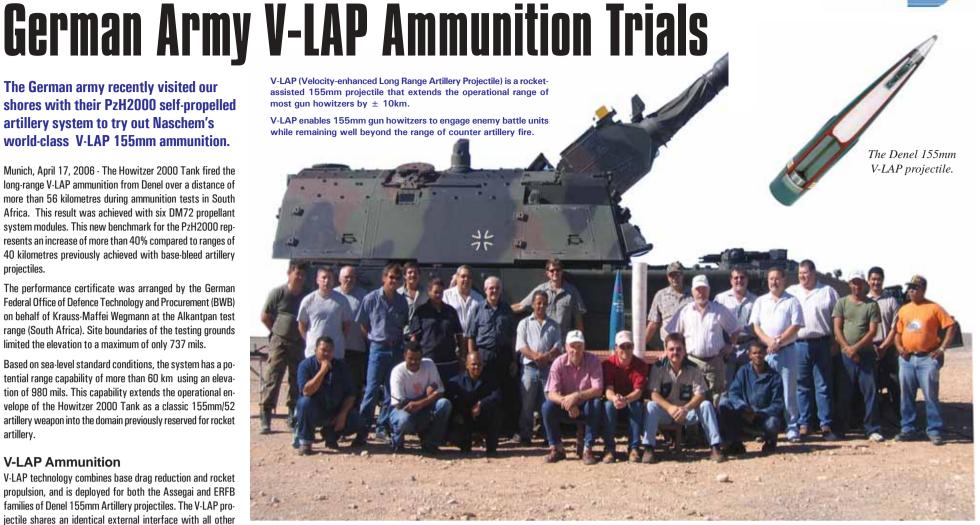
V-LAP Ammunition

V-LAP technology combines base drag reduction and rocket propulsion, and is deployed for both the Assegai and ERFB families of Denel 155mm Artillery projectiles. The V-LAP projectile shares an identical external interface with all other projectiles from each particular projectile family.

V-LAP projectiles use the identical fuses, charges, packaging, storage and logistics that are required for the total projectile family. The Assegai V-LAP projectile includes an insensitive warhead main filling as well as PFF (Pre-Formed Fragmentation) warhead technology and is compatible with most 39-, 45- and 52-calibre artillery systems.

Howitzer 2000 Tank

The Howitzer 2000 Tank, a product of Krauss-Maffei Wegmann, is currently the most modern tube artillery system in the world. It is used by Germany, Greece, Italy, and The Netherlands, which is why the Howitzer 2000 Tank is also referred to as the Euro-howitzer.



The joint Denel and German team poses alongside the 155mm-52, PzH2000 "Euro-

The Howitzer 2000 Tank is characterized by complete autonomy in navigation and fire control, high shooting cadence, and a previous range of more than 40 kilometres.

A highly precise weapons aiming system and stable weapons platform enable a high cadence and precise striking position. The Howitzer 2000 Tank is an essential element of combat support, even in future application and crisis scenarios.

Krauss-Maffei Wegmann press release

The A400M and South Africa



Land Systems Successful in **South America**

Denel Land Systems (DLS) recently landed a hard-fought tender to supply SS77 machine guns and M4 mortars to the Colombian army.

Denel Land Systems (DLS) was awarded a tender to supply the Colombian army with 1 000 SS77 machineguns and a large number of M4MK1 mortars after a nail-biting adjudication process involving stiff competition.

Beating the nine companies that participated in the tender process wasn't easy but we did it. At the time of signing the contract was worth R81 million.

This contract is Denel's biggest single machinegun order.

The Colombian army had been waiting for the delivery of a previous order for 350 mortars before they could announce their decision on this order.

The army has also requested a presentation on the possible joint manufacturing of mortars, and SS77 machineguns between South Africa and Colombia.





On 28 April 2005 the South African government signed a contract with Airbus Military making the country a partner in the A400M airlifter programme. The final contract, signed in Pretoria by Minister of

Defence, Mosiuoa Lekota, followed a Memorandum

of Intention signed at the end of 2004.

Through its stake in the aircraft programme, South Africa's industry will participate in the design, engineering, industrialisation, manufacture and in-service support of the A400M. The partnership agreement coincides with the launch of an initiative to secure and further develop South Africa's aerospace manufacturing capabilities and capacities, as announced by the Minister of Public Enterprises, Mr. Alec Erwin, in his 2006 Budget Vote Speech to Parlia-

Minister Erwin said, "we are not an ordinary buyer of this aircraft. We are part of the production consortium." It has been estimated that more than 3 160 jobs could be created locally through the Airbus deal.

According to Airbus Military, in signing-up as a partner in the Airbus Military A400M programme, South Africa is securing a vital role for its industry in this international programme. This initiative will see South Africa joining in at ground-level, delivering sustainable opportunities for export oriented industrial activity over the next 30 to 50

"Such is our esteem for South Africa as a partner, that we have accepted South Africa's investment in the A400M programme under similar terms to those of the seven Eu-



ropean launch nations," said Francisco Fernández-Sáinz, Managing Director of Airbus Military. "On the basis that South Africa will take delivery of 8 aircraft, we will place work packages with industry worth at least 400 million Euros".

Negotiations between the Government and Airbus Military have led to design and manufacturing contracts as we report in the front page article. Denel and Aerosud have engaged Airbus Military to develop the details of industrial partnership contracts around specific dedicated work-share

The Government has committed to procure and take delivery of between 8 and 14 aircraft as the programme matures between 2010 and 2014. The cost of 8 aircraft would be 837 million Euros. In addition to the industrial benefits, the South African National Defence Force will receive a modern transport aircraft that will provide vital strategic airlift capability in support of South Africa and the African continent. The first delivery to the South African Air Force is scheduled for 2010.

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