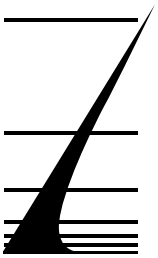
The Market for Anti-Tank Missiles

Product Code #F656

A Special Focused Market Segment Analysis by:



FORECAST INTERNATIONAL

Analysis 1
The Market for Anti-Tank Missiles 2010-2019

Table of Contents

* * *

PROGRAMS

The following reports are included in this section: (**Note:** a single report may cover several programs.)

AGM-65 Maverick
AGM-114A/B HELLFIRE
BGM-71 TOW
Chinese Anti-Tank Missiles
Eryx
FGM-148 Javelin
Future Anti-Armor Missile
HOT/HOT 2/HOT 2T
Joint Air-to-Ground Missile
Kuen Wu 1
MILAN
MSS 1.2 Leo
Nag
Non-Line-Of-Sight (NLOS)
PARS-3/TriGAT
RBS53 Bantam/RBS56 BILL
Russian ATGWs
SPIKE
Swift
Type 79/Type 87

Introduction

The British began development of the "water-carrier," later shortened to tank, as a response to the stalemate on the Western Front during the First World War (1914-1918). This introduction began a duel between tank and anti-tank weapon designers that continues today.

Hundreds of miles of trenches crisscrossed with barbed wire and protected by machine gun nests and artillery caused casualty rates (on all sides) to skyrocket. The Allies and Central Powers were desperately searching for weapons capable of breaking through these defenses and into open country, thus ending the stalemate. The development of such weaponry would turn the war back into one of movement, one that both sides thought they could quickly win.

The British tanks entered combat for the first time on September 15, 1916, during the Battle of the Somme. French tanks followed in April 1917. Massed formations of tanks were first used in the Battle of Cambrai (November 20, 1917) and then at the Battle of Amiens. These tanks, supported by infantry, broke through an entrenched German position, spreading panic among the defenders. Although problems with reliability caused high attrition rates in combat, the Germans suffered considerable shock when Allied tanks were introduced for which they lacked effective counter weapons.

The introduction of the tank, like the development of strategic bomber aircraft, caused all sides to commence work on counters. At first, the Germans had no means of defeating Allied tanks. Small cannons and large caliber rifles proved almost useless against these early tanks. Light "anti-tank" guns, more maneuverable than the standard field artillery piece, were soon operational. Germany never fielded tanks in large numbers, but after the war, some German officers foresaw this new weapon dominating future battlefields.

At the beginning of the Second World War, many lightweight anti-tank guns, typically 37mm, were in use. Heavier tanks soon rendered these guns ineffective (the Germans found their anti-tank guns useless against Soviet heavy tanks in 1941). More and more powerful anti-tank guns were introduced as the war progressed: 50mm, 57mm, 75mm, 88mm, and 90mm. The Russians deployed 100mm and 122mm anti-tank guns.

The growth in the size of anti-tank guns caused a drop in their mobility, lessening their effectiveness. To provide infantry units a more mobile anti-tank weapon, the Germans and Americans developed man-portable rocket systems: The U.S. Army fielded the Bazooka; the German Army fielded the Panzerschreck (similar to the Bazooka) and the Panzerfaust.

The Panzerfaust (Armor Fist) provided German infantry units with a lightweight and effective counter to Allied tanks (this weapon is believed to have inspired the development of the RPG by Russia). Even young children could successfully use the Panzerfaust, and many proved themselves to be efficient and ruthless tank killers.

The Soviets suffered around 3,000 casualties (some sources say 5,000) between April 1 and the end of the war. Authors disagree but a large percentage may have been victims of Panzerfaust-wielding German soldiers, especially during the street fighting in Berlin (the German troops also found the Panzerfaust effective at destroying fortified structures).

X-7 – Technical Data

Length, Maximum	95 cm
Length, Main Body	46.5 cm
Diameter	15 cm
Wingspan	60 cm
Weight	9 kg
Engine	Two-stage rocket

Germany also looked to technology to offset the Allies' numerical superiority. The "wonder weapons" projects included one focused on anti-armor missiles.

Early German research into missiles was focused on countering the Allies seemingly endless supply of fighter and bomber aircraft and striking at convoys. The first missiles deployed by Germany were radio-controlled anti-ship weapons, the Fritz X and Hs 293.

Germany's first anti-tank missile (Panzerabwehrrakete) was a modified version of the X-4, a wire-guided air-to-air weapon.

Development commenced in 1941 at BMW, but trials did not begin until 1944. (Prior to this, Germany thought it was winning the war and did not need anti-armor missiles.) Work on an infrared transmitter to replace the wire guidance system was performed.

The X-7 never made it into service, although a small number were produced before the end of the war (a few may have actually been used in combat, but no one is sure). Even if it had, this missile would not have been able to turn the tide so late in the war. Nevertheless, the X-7 did help to inspire the development of similar post-war systems in Europe, the U.S., and Russia.

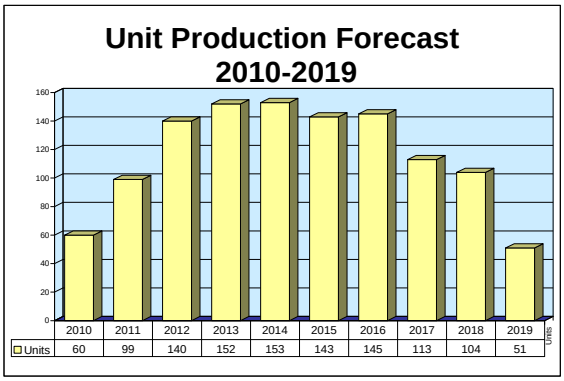
The concept of anti-tank missiles first appeared during World War II, but it was nearly three decades later on a

Continued…

Swift

Outlook

- In production
- South Africa's defense industry continues to struggle
- Series production of Mokopa delayed again
- A lack of customers for the Rooivalk attack helicopter hurting ZT-6 Mokopa
- Denel working on a ZT-35 Ingwe follow-on and a small missile to arm unmanned aircraft



Orientation

Description. Anti-armor missile system.

Sponsor. The South African Defence Ministry.

Status. Production of ZT-35 Ingwe and ZT-6 Mokopa missiles is under way. These missiles will arm the SAAF's Rooivalk attack helicopters. A ground-launched version of Mokopa will be offered to the SANDF and export clients.

Total Produced. Approximately 6,000 ZT-3 Swift, 2,593 ZT-35 Ingwe, and 74 ZT-6 Mokopa anti-armor missiles were completed or in production by the end of 2009. Production of the ZT-3 began in the mid-1980s.

Application. For the destruction of armored vehicles; installation on combat vehicles and helicopters and deployment by infantry formations.

Price Range. No specific price for the Swift has been provided by Denel, although estimates have placed it around $39,900 each.

Contractors

Prime

Denel Dynamics, (formerly Kentron)	http://www.deneldynamics.co.za, PO Box 7412, Nelmapius Ave, Centurion, 0046 South Africa, Tel: + 27 12 671 1911, Fax: + 27 12 671 1779, Email: market@deneldynamics.co.za, Prime

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

	Metric ZT-3	Metric ZT-35	Metric ZT-6	U.S. ZT-3	U.S. ZT-35	U.S. ZT-6
Dimensions						
Length	115 cm	138 cm	168 cm	3.8 ft	4.5 ft	5.5 ft
Diameter	127 mm	127 mm	178 mm	5 in	5 in	7 in
Weight	18 kg	21 kg	52 kg	39.6 lb	46.2 lb	114.4 lb

Swift

	Metric ZT-3	Metric ZT-35	Metric ZT-6	U.S. ZT-3	U.S. ZT-35	U.S. ZT-6
Performance						
Speed (max)	330 m/s	220 m/s	530 m/s	1,082.4 ft/s	721.6 ft/s	1,738.4 ft/s
Range	5,000 m	5,000 m	8,500 m	16,404.2 ft	16,404.2 ft	27,880 ft
Penetration	650 mm	1,000 mm	1,400 mm	2.13 ft	3.28 ft	4.6 ft

Propulsion. An unspecified, solid-propellant boost and a separate sustainer motor are used by the Swift.

Control & Guidance. The Swift uses a semi-active command to line-of-sight guidance method through the employment of a laser. The missile uses an optical tracker and a laser command link to provide flight course corrections. The operator designates a target, either moving or stationary, using the telescope. This establishes the line of sight from the launch platform to the target. After launch, the angular deviation between the missile and the line of sight is measured by the goniometer with the aid of a pulsed infrared source in the tail of the missile.

The angular deviation or error angle information is processed by the guidance unit. Corrective commands produced by the guidance unit are encoded and transmitted to the missile via the laser transmitter, in the form of pulsed laser commands. The laser receiver in the tail of the missile detects and decodes the pulsed laser commands and feeds the information to the onboard flight control unit, which transforms it into servo commands. The servos are connected to the control fins at the rear of the missile. The flight control unit sends commands to the control fins in order to maneuver the missile.

Launcher Mode. The Swift is fired from a tube and can be integrated with a tripod, the Ratel infantry combat vehicle, and attack helicopters (like the Rooivalk). The system is also offered in a tripod mounting for infantry units.

Warhead. The missile is equipped with a 127mm hollow charge, high-explosive, contact-fuzed warhead capable of penetrating 650mm of armor. A new warhead has demonstrated 900mm penetration power and is effective against reactive armor. Development of a tandem warhead is also being considered.

Source: Denel

Variants/Upgrades

Denel is developing a line of anti-armor weapons, including the ZT-3, ZT-35, and ZT-6 missiles. The ZT-6 is a modular system that can be equipped with a variety of seekers. For additional information on these systems, please see the pertinent entries in the **Program Review** section.

Denel Aviation is involved in the integration of the missile with airborne launch platforms. Houwteq, Cape Town, may also be involved in the Swift program.

IST Dynamics is offering the Missile Stabilized Platform (MST) for installation on light armored vehicles such as the Panhard and RG32. The MST is designed to fire the Ingwe anti-armor missile.

Denel is offering the Armed Long-Range Reconnaissance Turret (ALRRT) for use on light wheeled vehicles. This turret can carry four Ingwe missiles.

Program Review

Background. The Republic of South Africa has long attempted to become self-sufficient in as many areas of arms production as possible. This desire manifested itself in 1990 with the unveiling of the new Swift anti-tank missile system, also known as ZT-3 Swift.

The Swift has been integrated with the Ratel 6x6 wheeled armored vehicle produced by Sandock-Austal Beperk Ltd, Boksburg, Transvaal, Republic of South Africa.

South Africa's Rooivalk attack helicopters will carry the ZT-6 Mokopa anti-armor weapon system. Originally, the Swift was being integrated, but South Africa decided that a weapon in the HELLFIRE category was needed. Up to 16 missiles will be carried on the outer pylon launch station of the helicopters in two to four missile configurations. A helmet-mounted sighting system similar to that used with the V3A/B Kukri and V3C Darter air-to-air missiles will be installed on these anti-armor-configured helicopters.

South African Missile Enters Service in 1980s

Some European sources indicate that the Swift has been in operational service with the South African National Defence Forces since the mid-to-late 1980s, and may have been combat-tested in Angola. Supposedly, the South Africans used the Swift with a good deal of effectiveness, destroying more than 90 armored vehicles.

New Missile Needs. South Africa is interested in upgrading its anti-armor capabilities across the board. Several near-term requirements remain open, but will probably be funded as soon as money becomes available. One involves the acquisition of new man-portable anti-armor weapons, possibly upgraded MILANs, and a new unguided rocket-based system.

South Africa is beginning to plan for the eventual replacement of the ZT-3 and ZT-35 missiles. However, this will not occur until late in the first decade of the 21st century. South Africa may be planning to introduce this new missile with its new tank destroyer, which could enter service by 2014.

Missile Models. South Africa is slowly widening its line of anti-armor missile systems to include the ZT-3, ZT-35, ZT-4, and ZT-6.

ZT-3 Swift. This missile is a long-range anti-armor weapon using semi-automatic command to line-of-sight guidance. A laser command link is used. The ZT-3 has been adapted for launch from modified Ratel infantry combat vehicles or helicopters.

ZT-35 Ingwe. Denel has developed two versions of the Swift: the original ZT-3 laser-guided anti-tank round, and the improved ZT-35 missile (sometimes called a ZT-3B). Like its predecessor, the ZT-35 has a 5,000-meter range and can be fired from helicopters, armored vehicles, or tripod launchers. Also like the ZT-3, the new missile uses continuous line-of-sight laser guidance, but has been fitted with an autopilot that can be loaded with target information prior to launch.

According to Denel, the reduction in gathering time afforded by this circuit improves accuracy at ranges between 150 and 500 meters to better than 90 percent. The accuracy over longer ranges remains unchanged at 95 percent. The missile also has an autopilot capability that can be programmed with target information prior to launch.

Other enhancements include the addition of a forward-looking infrared system (FLIR) on the launcher for passive night target acquisition, and an improved 127mm warhead with a stand-off probe for 1,000mm armor penetration. Further development of the warhead may lead to the inclusion of a laser proximity fuze for optimal stand-off detonation.

As already mentioned, there are two primary launcher configurations for the Swift: one for ground-launched

applications, the other for installation on helicopters. The missiles are believed to be the same except for the modifications necessary for operation with different launch platforms. In mid-2000, Denel said that it had completed final flight testing of the helicopter-launched Ingwe.

A large export order is rumored to have been placed for the Ingwe, but the client remains unidentified.

ZT-4. The ZT-4 subsonic missile may have been a further modified and upgraded version of the ZT-3 proposed as part of the South African bid for the U.K. attack helicopter requirement. This missile may have been a South African response to U.S. unwillingness to allow the HELLFIRE to be used with its bid. Other sources state that the ZT-4 was merely a misdesignation of the ZT-6, and that the missile offered throughout the U.K. competition was always the ZT-3.

Heavy Anti-Armor Missile for Attack Helicopters

ZT-6 Mokopa. Work on the ZT-6 may have been under way for some time. Rumors of the potential development of a longer-range anti-armor missile by South Africa first surfaced in 1993, but no specifics appeared until 1994 (full-scale development started in 1996). Initial reports stated that the South African Air Force was interested in a heavier, longer-range missile equipped with a command guidance system. The SAAF has strong reservations about using fire-and-forget weapons on its attack helicopters because of the risk of fratricide. Originally, a non-line-of-sight attack profile using fiber optics was proposed, but was apparently abandoned in favor of a semi-active laser homing system and a supersonic speed capability (eventually becoming the ZT-6).

A prime motivator behind this program was the U.K.'s attack helicopter competition. South Africa was offering its Rooivalk to the United Kingdom as part of an overall international competition. However, the U.K.'s requirement called for a longer-range anti-armor capability than that provided by South Africa. South Africa considered offering Rooivalk with HELLFIRE or Brimstone, but was stopped by U.S. opposition. The Brimstone is a millimeter-wave-guided missile based on the HELLFIRE developed in cooperation with BAE Systems. With the U.S. refusal to allow the use of HELLFIRE technology, South Africa was basically out of the competition. To remain a viable player in this market, South Africa had to come up with an alternative to its attack helicopters with HELLFIRE.

The ZT-6 is designed as a modular system that can accommodate various seekers, including semi-active laser (to be provided by Thales) and active millimeter-wave radar homing (from the BAE Systems Brimstone missile). Imaging infrared and millimeter wave seeker-equipped versions have also been mentioned. The missile will be outfitted with a tandem warhead for use against reactive armor-equipped tanks, with a high-explosive, blast-fragmentation warhead option available.

The semi-active, laser-guided version of ZT-6 has a lock-on-before-launch range of 6.9 kilometers and a lock-on-after-launch range of 8 kilometers. Flight time to maximum range is 35 seconds at 530 meters per second. Dimensional data on this missile are unclear. Its length is 1.68 meters, with a diameter between 178mm and 180mm and a weight of 47-52 kilograms. The ZT-6 is capable of penetrating 1.2-1.4 meters of rolled homogeneous armor. The active millimeter-wave-equipped version has the same performance except that its lock-on-before-launch range is 1 kilometer (0.621 mi). This version will also be equipped with four additional maneuver surfaces.

Denel completed the third series of test firings in early 1999. The first and second series of tests focused on the missile aerodynamics and propulsion. The third group tested the missile's flight controls along a preprogrammed flight path. The next set of tests involved a complete missile and ran through November 2000.

In November 2005, Denel officials said further work was necessary to complete development of the Mokopa. According to Denel officials at the Dubai Air Show, thanks to an infusion of cash by the South African government, completion of development was possible. The funding provided was largely to complete work on the Rooivalk attack helicopter, but some cash was available for the Mokopa program.

Series Production Start Still Awaits

South African officials said low-rate production of the Mokopa missile was already under way when the previous remarks were made. Further reports said the South African Air Force took delivery of some Mokopa missiles in 2005.

This contradicts other statements saying the South African military had yet to order this missile. This "low-rate" production may have been to meet certain development needs and was not a precursor to the start of series manufacture. The "final development work" mentioned remains unspecified.

Previously, South Africa mentioned a land-based version of the Mokopa. This version is for mounting on combat vehicles or small naval attack craft. Sources say South Africa's procurement plan focuses on the air-

launched version, only. By 2008, Denel was saying that delivery of the series production missile would start in 2009. However, South Africa did delay the start of this phase.

Related News

Denel Awaits Decision from Government on Equity Sale to MBDA – Denel Dynamics, the Denel Group's missile unit, wants to sell a share of itself to MBDA, the European tactical missile giant. Denel Dynamics sees the sale as key to its new effort to market its missiles – especially in penetrating new markets – and to sustain profitability. Denel Dynamics has hovered between breaking even and a marginal loss for years. Denel Dynamics needs the approval of the South African government for this sale to go forward.

Without this deal, Denel Dynamics will need more government support. The South African government will also need to accept that locally developing missiles will come at a high price, according to Denel. Denel Dynamics and Brazil are working on the A-Darter air-to-air missile, which is still three to four years away from going to market. (AllAfrica, 5/10)

Denel Completes Capability Qualification of Mokopa Missile – The Mokopa anti-armor missile is moving closer to entering service. Denel Dynamics is developing this missile as part of Project Impose, an effort that is responsible for South Africa's Rooivalk attack helicopter. The missile completed its capability qualification in late 2009.

The South African Ministry of Defense (MoD) mentioned spending levels on the Mokopa program in 2007. Through June 2007, South Africa said it had spent ZAR120 million on the Mokopa development program. A further ZAR4.6 million was part of planned spending during the 2007-2008 financial year. The MoD said in 2007 that another ZAR98.25 million would be spent to complete development of this missile, with a further ZAR70 million earmarked for purchasing Mokopa missiles once development was completed, according to an MoD statement in 2007.

Whether all this funding remains available is unclear. Now, Denel will qualify the weapon on helicopters other than the Rooivalk, such as the Mi-24 Hind and other Russian helicopters, Eurocopter platforms, and the AgustaWestland Lynx.

The bulk of the interest in the Mokopa is for its use against targets other than tanks and armored vehicles. The short-term sales opportunities of the Mokopa for land-based applications are limited. (DefenseWeb, 5/10)

Malaysia Buys Missile-Armed Turrets from South Africa – The Malaysian Army will equip some of its armored vehicles with South African-made turrets. Denel Land Systems will provide these armored turrets for installation on Malaysian-operated 8x8 wheeled vehicles. Denel and other firms will form a joint venture for the manufacture of these turrets. A Malaysian defense firm that is involved is Deftech. Deliveries of these turrets will take place over seven years. In addition to machine guns, the turret will carry South African-made Ingwe anti-armor missiles. (AllAfrica, 4/10)

South Africa and Brazil Test Joint Missile – South Africa and Brazil have successfully tested a short-range air-to-air missile. The two nations are working jointly to develop this A-Darter missile. The ground-launched missile tests took place in Sweden. The partners can now transition to air-launch flight tests.

Denel Dynamics is the prime contractor for this project, which is worth ZAR1 billion. The missile will be ready for full production by 2012. Both the South African and Brazilian air forces will acquire this missile. Denel is also working on the Umkhonto (Spear) air defense, the GPS guided Umbani (Lightning) long-range surface-to-surface missile, and the Ingwe (Leopard) anti-armor missiles. (*Business Day*, 4/10)

South Africa Must Provide Money to Continue Missile Program – Denel says it will need strong government support to continue its missile program, and cannot continue producing missiles without more funding or a strategic equity partner, according to Denel Group CE Talib Sadik. The company expects another loss for the financial year ending March 31, 2010. Denel Dynamics' viability is undermined by its small order book and hurt by the high cost of researching and developing modern missiles. The South African National Defense Force has a tendency to order missiles in small numbers, meaning these weapons' production runs are too small to offset research and development costs. (DefenseWeb, 2/10)

Swift

Denel Told to Stop Wasting Money on Needless Weapons – Members of the South African Parliament are calling on Denel to stop wasting money on unneeded weapons systems. This call came from certain members of the Standing Committee on Public Accounts (SCOPA). The committee said Denel should cease producing loss-making weapons. Denel, a state enterprise, has been losing money for 10 years and is working on a turnaround strategy.

SCOPA members took aim at the Rooivalk helicopter, which they called a wasteful project. They do not think South Africa has any use for the Rooivalk, nor can it compete with the foreign-built helicopters. (Eyewitness News, 2/10)

South African MP Opposes 'Dodgy' Arms Sales – David Maynier, a member of the South African Parliament from the Democratic Alliance, said he will not reveal the sources of information on "dodgy" arms deals. Consequently, the African National Congress (ANC) said it might remove him from the defense committee. Maynier went public with information about South African arms sales to countries with poor human rights records, including Iran, Libya, Syria, Zimbabwe, and North Korea. He also criticized pending sales that may soon be approved.

Maynier says some of these deals were illegally approved by officials. The arms sales involved glide bombs and grenade launchers to Libya, grenade launchers to Syria, and grenade launchers and assault rifles to Venezuela. There are also pending sales of aviator G-suits to Iran, sniper rifles to Syria, and ammunition to Zimbabwe. (AllAfrica, 8/09)

Funding

South Africa has spent ZAR120 million ($16.2 million) on the Mokopa program through mid-2007. A further ZAR98 million will be spent to prepare the missile for production. South Africa plans to spend ZAR70 million on the initial production batch of missiles.

No information is available on what South Africa is spending on its other anti-armor missile programs. One source said the South African government does not plan to purchase the Mokopa. South Africa is looking for foreign partners to help develop new missile systems.

The increasing commitments to regional peacekeeping operations have been creating problems for the South African military. These obligations can only be funded by redirecting money destined for training activities, equipment procurements, and infrastructure maintenance.

	FY2007	FY2008	FY2009	FY2010	FY2011
South African Defence Budget					
Billions of U.S. Dollars	3.69	3.49	3.73	4.03	4.30
Billions of Rand	26.15	28.23	30.88	33.36	35.59

Contracts/Orders & Options

In Mar 2004, South Africa placed its first order for the ZT-6 Mokopa anti-armor missile. This contract is worth $4.2 million (ZAR29.58 million) for an initial batch of missiles.

Timetable

Month	Year	Major Development
	1970s	Initial design concepts studied
	1970-80s	Development of a South African anti-tank missile
Late	1980s	Swift used during South African incursion into Angola
	1980s	Swift possibly supplied to Angolan UNITA resistance forces
	1990	First public showing of the Swift anti-tank missile
	2004	ZT-6 order placed by South Africa
	2009	South Africa continues production of anti-armor missiles

Month	Year	Major Development
	2012-14	Mokopa enters production

Worldwide Distribution/Inventories

South Africa has been reluctant to discuss export plans for its anti-armor missile systems, but it is offering them for sale overseas. Denel believes there is demand for its missiles in **Asia**, especially those countries interested in acquiring new attack helicopters. South Korea wants to procure new attack helicopters. Denel is offering missiles to South Korea to arm these new helicopters. South Korea could receive a production line as part of this deal.

South Africa is also making a major market push for the Rooivalk in **Latin America**. The Rooivalk offers a less expensive alternative to European and American helicopters. **Brazil** has shown an interest in various South African anti-armor missiles and even the Rooivalk attack helicopter. Also, **Turkey** wants new anti-armor missiles. The Turkish Army requirement is the Medium-Range Anti-tank Weapon System (MRAWS). Ankara could procure 80 launchers and 800 missiles, with another 72 launchers and 800-1,000 missiles on option. Potential competitors include Denel, Rafael, Raytheon, and Rosoboronexport.

China may equip its armed forces with South African weaponry. Beijing has yet to directly purchase South African-made arms. Still, some Chinese weapons resemble those made by South Africa. The Chinese PL-ASR is similar in appearance and performance to the A-Darter air-to-air missile. Officials at Denel, which designed the A-Darter, suspect China reverse-engineered its A-Darter missile. China's Norinco is interested in Denel's Mokopa anti-armor missiles. These negotiations have produced no results. Through 2009, Denel said it had made no substantial progress on any of these projects.

User Countries. The Swift is in the inventory of the **South African National Defence Force** and that of **Algeria** (on its upgraded Mi-24 Hind attack helicopters). There are rumors that the Swift was provided to the former **UNITA resistance forces** in Angola, but these have not been confirmed. Algeria is also said to have purchased the Ingwe and Mokopa missiles.

Forecast Rationale

South Africa is facing a difficult situation. The global economic crisis is forcing the government to re-examine its defense strategy. Put simply, there is just not enough money to support every research and production program under way in South Africa.

Denel Dynamics, the local missile manufacturer, continues to have a rough time. Under the apartheid regime, South Africa strived for self-sufficiency in defense. The company's transition to the post-apartheid era has been difficult. The fall of the apartheid government ended the monopoly local industry had on the South African market. Suddenly, Denel Dynamics and other local firms faced competition from American and European international giants, as well as a host of smaller companies. Although the world market opened up to South African firms, it did not offset the money lost from the drop in domestic orders.

Denel Dynamics has hovered between breaking even and a marginal loss for years. The company said the South African government must accept these facts: locally developing and building missiles comes with a high price; and Denel Dynamics cannot continue producing missiles without more funding. Since the South African National Defense Force (SANDF) does not have the financial resources to buy missiles in any significant quantities, Denel Dynamics is looking to foreign partners for the money it needs. The company is already cooperating with Brazil in the development of the A-Darter short-range air-to-air missile. Denel is attempting to interest Brazil and other countries in similar cooperative efforts. The company is even looking to sell a share of itself to MBDA, the European tactical missile giant, to survive in this market.

Denel Dynamics needs foreign money if it is to put the Mokopa missile into series production. The Turkish decision not to procure the Rooivalk attack helicopter was a blow to the Mokopa. The South African government did come through with additional funds with the aim of completing development and putting the Mokopa into series production. Still, there are reports South Africa does not plan to purchase the Mokopa. Nevertheless, this missile may yet arm the South African Air Force's Super Lynx helicopters. The South African Navy is also considering possible shipborne applications.

The South African Air Force wanted to have the first production Mokopa available in 2009, but this did not

occur. Work on this missile is not complete, despite previous statements to the contrary.

A possible bright spot for Denel Dynamics is the sale of missile-armed turrets built by Denel Land Systems to Malaysia. The Malaysian Army will equip some of its new 8x8 wheeled armored vehicles with these turrets. Certain turrets will perhaps feature the ZT-35 Ingwe anti-armor missile. The total number of missiles Malaysia will buy is unknown, but could be around 200-400 units.

For now, production of anti-armor missiles is proceeding, but annual quantities remain low. Manufacture of the ZT-35 continues, but for how much longer remains to be seen. The South African National Defence Force (SANDF) may procure a few more units, but international orders are key to preserving this production line. However, few countries are expressing overt interest in this missile.

South Africa is working on new systems, perhaps even replacements, for the ZT-3 and ZT-35 missiles. A next-generation missile could appear at any time, but probably later than once thought. A new missile might be available around 2015. Also, Denel could offer a small missile capable of firing from unmanned air vehicles in the future.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program		**High Confidence**				**Good Confidence**			**Speculative**			
	Thru 2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Total**
Denel Dynamics												
ZT-35 <> Ingwe <> Malaysia												
	0	55	74	71	69	57	43	31	0	0	0	400
ZT-35 <> Ingwe												
	0	0	0	27	30	39	40	49	51	44	0	280
ZT-6 <> Mokopa <> South Africa												
	74	5	25	42	53	42	40	45	37	35	33	357
ZT-6 <> Mokopa												
	0	0	0	0	0	15	20	20	25	25	18	123
Subtotal	74	60	99	140	152	153	143	145	113	104	51	1,160
Total	74	60	99	140	152	153	143	145	113	104	51	1,160

FORECAST INTERNATIONAL

ORDER FORM

FOR PROPER SHIPPING, PLEASE PROVIDE ALL OF THE FOLLOWING INFORMATION.

Name _____ Title _____

Company _____

Street Address _____

City _____ State/Prov. _____ Country _____ Zip _____

Phone _____ Fax _____

E-Mail _____

Cardholder Name _____

Card# _____ Exp. _____ csc# _____

Billing Address (if different from above) _____

_____

☐ Check Enclosed
☐ Bill Company
(Purchase Order # and Signature Required)
☐ Quotation Requested
☐ VISA ☐ MasterCard
☐ American Express

Name of Product/Service	Code	E-Mail Address	Qty.	Price

Please include your e-mail address to receive twice-weekly E-Market Alert Newsletters.

E-Market ALERT

Subtotal _____
Shipping _____
In Connecticut add 6% sales tax _____
Grand Total _____

SHIPPING AND HANDLING RATES

	U.S.	World
Market Intelligence Services		
Binder	$45	$85
DVD	$50	$95
Binder & DVD	$95	$180
Binder & RT	$45	$85
Worldwide Inventories		
Aerospace Systems		
CD	$50	$95
Weapons Systems		
Hard Copy	$45	$85
CD	$50	$95
Power Systems		
Hard Copy	$45	$85
Focused Market Segment Analyses		
Hard Copy	$25	$45

	U.S.	World
Market Intelligence Libraries		
Complete Library (Civil/Commercial & Military)		
Binder	$1,575	$2,975
DVD	$50	$95
Military Market Library		
Binder	$1,440	$2,720
DVD	$50	$95
Civil/Commercial Library		
Binder	$360	$680
DVD	$50	$95
Market Intelligence Group Libraries		
Aerospace		
Binder	$360	$680
DVD	$50	$95
Electronics		
Binder	$360	$680
DVD	$50	$95

	U.S.	World
Governments & Industries		
Binder	$540	$1,020
DVD	$50	$95
International Military Markets (A Subset of G&I above)		
Binder	$270	$510
DVD	$50	$95
Naval		
Binder	$90	$170
DVD	$50	$95
Power		
Binder	$90	$170
DVD	$50	$95
Weapons		
Binder	$180	$340
DVD	$50	$95

NOTE: No charge for Real-Time format.

2011 Historic Art Calendar $5.95 $12.95

NOTE: ORDERS CAN TAKE UP TO 5 BUSINESS DAYS TO SHIP.

22 Commerce Road, Newtown, CT 06470 USA • Phone: 203.426.0800 • Fax: 203.426.0223
Toll-Free (U.S. and Canada): 800.451.4975 • E-mail: sales@forecast1.com • Website: www.forecastinternational.com

WORLDWIDE SALES OFFICES

HEADQUARTERS USA

FORECAST INTERNATIONAL INC.
22 Commerce Road, Newtown, CT 06470 USA
Phone: 203.426.0800 Fax: 203.426.1964

SALES/CUSTOMER SERVICE/MARKETING
Phone: 203.270.0633 Worldwide
Toll-Free: 800.451.4975 U.S. & Canada
Fax: 203.426.0223
E-Mail: sales@forecast1.com
E-Mail: info@forecast1.com
E-Mail: customerservice@forecast1.com

PROPRIETARY RESEARCH & CONSULTING
Phone: 203.426.0299 Fax: 203.426.1964
E-Mail: consulting@forecast1.com

EDITORIAL
Phone: 203.270.0111 Fax: 203.426.4262
E-Mail: queries@forecast1.com

TECHNICAL SUPPORT
Phone: 203.270.0629 Fax: 203.426.0223
E-Mail: support@forecast1.com

WEBSITE ADDRESSES
www.forecastinternational.com
www.fiplatinum.com

HEADQUARTERS EUROPE
(INCLUDING RUSSIA)
HAWK ASSOCIATES LTD.
UNITED KINGDOM
Templehurst House
New Street, Chipping Norton
Oxon, OX7 5LJ, U.K.
Phone: (44) 1608 643281
Fax: (44) 1608 641159
E-Mail: support@hawkinformation.com
Website: www.hawkinformation.com
Contact: Mr. Michael Hobbs

HAWK ASSOCIATES LTD.
FRANCE
6 Rue de Levis, Paris 75017 FRANCE
Phone: (33) 1 4294 0693 Fax: (33) 1 4294 0433
E-Mail: france@hawkinformation.com
Contact: Mr. Edward Hobbs

CHINA AND SOUTHEAST ASIA
CHINA NATIONAL PUBLICATIONS
I & E GROUP CORPORATION
PO Box 88
16 Gongti East Road
Chaoyang Beijing 100020 CHINA
Phone: (86) 10 6506 6688 ext. 8307
Fax: (86) 10 6586 6970
E-Mail: xiaoxiao0640@hotmail.com
Contact: Mr. Xiaoxiao Zhang

JAPAN
AVIATION RESEARCH INSTITUTE
1-427-2 Takano
Misato City Saitama Pref
Tokyo 341-0035 JAPAN
Phone: (81) 489 71 5040
Fax: (81) 489 55 7151
E-Mail: max@arijapan.com
Website: www.arijapan.com/forecast
Contact: Mr. Kenichi Oyama

REPUBLIC OF KOREA
PAMANONG TRADING COMPANY
275-2 Yangjae Dong
Seocho-Gu Seoul 137-722 KOREA
Phone: (82) 2 572 4349 or (82) 2 572 4371
Fax: (82) 2 572 4370
E-Mail: nhk@forecast1.com
Website: www.forecast1.co.kr
Contact: Ms. Nam Hee Kim

TERMS AND CONDITIONS

DISCOUNT PRICING
Discount Pricing – Codes prefaced by CH, RH, Z, P or RTPS, and multi-user subscriptions, include a discount that is reflected in the marketed cost.

BOOKSELLER DISCOUNTS
For information, call 203.270.0633 or 800.451.4975 (Toll-Free U.S. & Canada). E Mail: info@forecast1.com.

NEW CLIENTS
Payment in full is required with the initial order.

TERMS
Net 30 days. For overdue accounts we reserve the right to assess interest of 12% annually, and add collection fees.

PURCHASE ORDER
If company requires, please submit a purchase order to ensure timely delivery.

RETURNS OR REFUNDS
Due to the nature of our products, no returns are accepted and no refunds are provided.

FORMS OF PAYMENT
We accept VISA, MasterCard, American Express, or a company check drawn on a U.S. bank in U.S. dollars. Wire Transfer Details: Contact customerservice@forecast1.com or call 203.270.0633.

Please ensure bank charges are not deducted from the total amount due. Note: Include the quotation or invoice number with your payment.

DATA USAGE
Photocopy/Copyright Permission: Forecast International observes all Copyright laws. Reproduction and distribution of any product is prohibited by law. To obtain a release, please call 203.270.0633 or contact customerservice@forecast1.com.

ELECTRONIC DATA LICENSING
All products provided on DVD or CD, or in Real-Time, are sold and licensed for single-site, single-user applications. Multi-site, multi-user licensing is available. Call 203.270.0633 or contact sales@forecast1.com to discuss your requirements.