



DENEL DYNAMICS



**PROUD INNOVATORS OF COMPETITIVE MISSILE, UAVS  
AND INTEGRATED AIR DEFENCE SOLUTIONS**



## DENEL DYNAMICS

Denel Dynamics has proved itself as an innovative leader in advanced systems technology. Its core business covers tactical missiles, precision-guided weapons, Unmanned Aerial Vehicles (UAVS) and integrated system solutions.

Known for its forward-thinking approach to providing solutions for clients – its track record reflects that most clients start and continue their business journey with Denel Dynamics as it continues to break new grounds to develop, upgrade and integrate world-class products.

Recent successful test flights yet again confirm excellent performance, denoting the desired outcomes and huge return on investment. Denel Dynamics' products find themselves amongst a catalogue of choice by the international defence market.

### A UNIQUE POSITION

Denel Dynamics serves both national strategic and defence obligations; while it strives to be profitable and commercially viable. Supported by the South African Department of Defence (DoD) and SA National Defence Force (SANDF), its products are designed to meet the needs of the South African government - with commercial export opportunities in mind. Satisfying customers in a diversity of markets is the main objective.

### PEOPLE DEVELOPMENT

With South Africa's top engineering minds working for Denel Dynamics, we are in the privileged position of creating exciting opportunities in the fields of maths and science; engineering and technology. Quality skills transfer; engineering opportunity, mentoring and bursaries are of key importance. It enables us to retain South Africa's pool of talent while transforming our business and its people. The bottom line is to keep passing on our intellectual property and build upon our world class expertise.

### SHARING AND PARTNERING

Denel Dynamics has capability and sustainability as a one-stop missiles, UAVS and integrated systems powerhouse. International partnering is an investment that goes far beyond funding, and we have successfully proven our willingness to work together with nations. By adopting a partnering approach, Denel Dynamics spreads the workload and capabilities to the widest possible group of private and public South African companies while still maintaining its relationship with the DoD. It makes good economic sense and is of real benefit to the joint countries.

### INNOVATION EVOLUTION

The true character of the business is advanced technology prowess and the evolution of innovative ideas into quality, reliable, robust products and systems for end users. As a key supplier of defence requirements, one of Denel Dynamics' reputed core competencies locally and internationally, is the fast turnaround of design and development.

**Advanced technology is our business trademark; thoroughly satisfied customers - our ultimate goal**



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ANTI-ARMOUR

AIR DEFENCE

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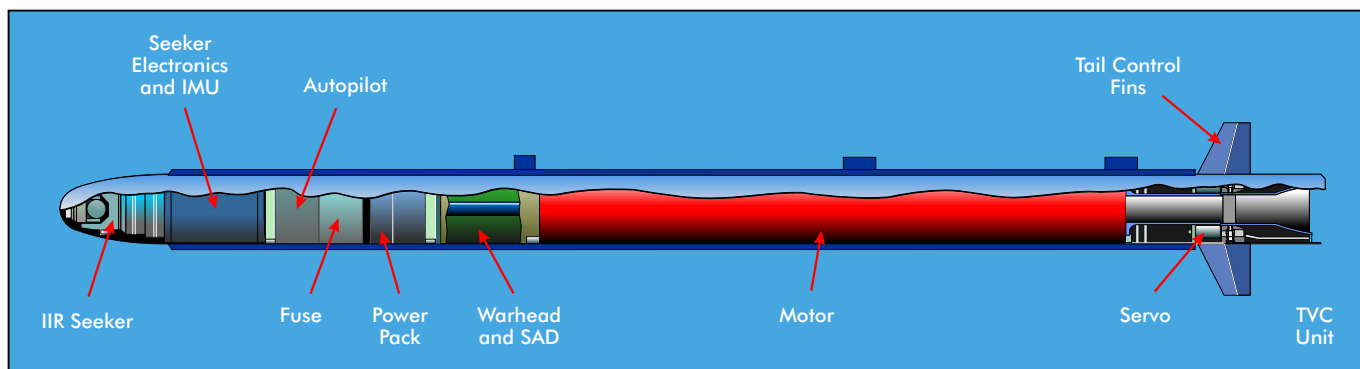


# A-DARTER

## Fifth-generation Air-to-air Missile System



A-Darter is a state-of-the-art, competitive, fifth-generation IIR air-to-air missile system. It is designed to meet the challenges of future air combat against next-generation fighters in a hostile ECM environment.



## WHY A-DARTER IS IDEAL FOR YOUR REQUIREMENT

- A-Darter is a leading wingtip fifth-generation Imaging Infrared (IIR) SRAAM that will enhance your platform's lethality
- Denel Dynamics can be contracted for prime missile integration responsibility on your platforms, as a cost-effective solution
- Designed by Denel Dynamics (co-funded by Brazil), utilizing its 50 years of air-to-air missile experience

## SYSTEM FEATURES

- High agility (thrust vector controlled) to handle the closest of close combats
- A two-colour thermal imaging seeker with high sensitivity and a multi-mode ECCM suite
- Advanced digital processing capability ensures improved performance in terms of image detection, false target rejection, ECCM, guidance and control
- Lock-on after launch and memory tracking capabilities
- A lightweight design compatible with traditional Sidewinder stations

## PRINCIPLE OF OPERATION

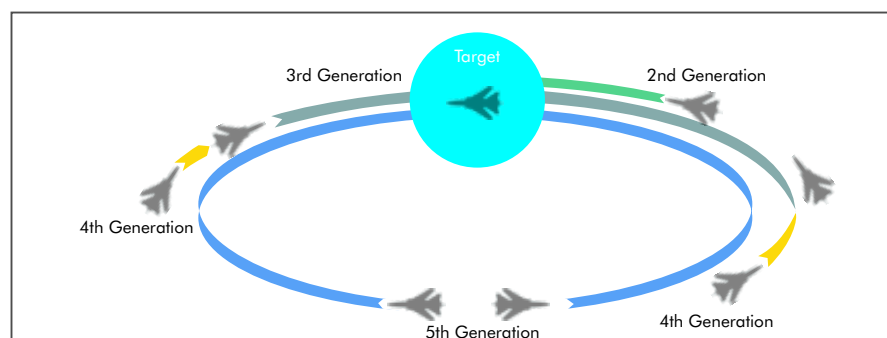
The A-Darter may be designated to a target by using the aircraft's radar, a helmet sight or the missile's very effective autonomous scan feature if radar silence is required. The seeker's large look-angles and the airframe's agility enable high off-boresight helmet-designated firings. Long-range intercepts beyond IR detection range are also possible with the lock-on after launch capability of the A-Darter.

## AIRCRAFT INTEGRATION

The A-Darter missile can be integrated on the latest and older generation aircraft platforms. It has already been integrated on the JAS-39 Gripen. Integration on the Hawk Mk 120 is under way. The wingless missile design promotes a low-risk integration process.

## TECHNICAL DATA

- Length : 2 980 mm
- Diameter : 166 mm
- Mass : 93 kg





# ALRRT-4M INGWE

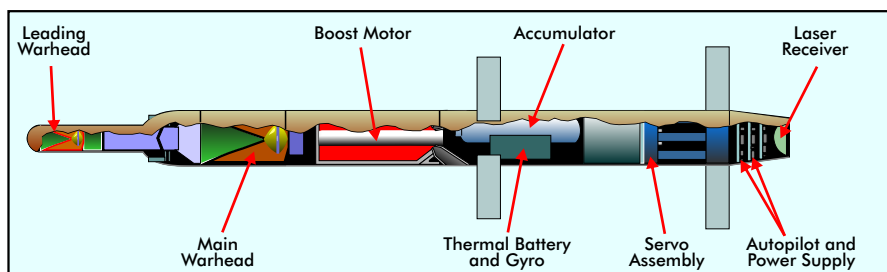
Armed, Long-range, Reconnaissance Turret (Alert)



The ALRRT (Alert) armed, long-range, reconnaissance turret adds to the operational effectiveness of the highly lethal Ingwe anti-armour missile. Available in a variety of configurations (four missiles, two missiles with a 7.62 mm calibre machine gun, etc.), the turret can be integrated on a wide range of vehicles from Light Utility Vehicles (LUV) to heavy Infantry Fighting Vehicles (IFV).

## SYSTEM FEATURES

- Stabilized for reconnaissance and fire-on-the-move capability
- Remote-controlled from inside or outside the vehicle
- Lightweight and unmanned (non-intrusive), allowing integration on a wide range of vehicles
- Full day and night capability coupled to automatic target-tracking
- Advanced state-of-the-art man-machine interface with colour displays
- Easy to use, with low maintenance cost
- High accuracy and advanced countermeasure resistance



## PRINCIPLE OF OPERATION

Ingwe uses laser beam-riding guidance. The missile automatically determines its own position in the laser beam and manoeuvres onto the line of sight. The missile follows the line of sight until the target is hit. The warhead ensures effective target neutralization.

The sighting system can vary from a non-stabilized optical sight to a more complex and integrated stabilized day/night sight for moving platforms. Automatic target-tracking modules can be added to ensure fully automatic missile guidance after target lock-on by the operator.

## TECHNICAL DATA

- Mass:
 

Turret only	: 290 kg
Turret armed (four missiles)	: 400 kg
- Dimensions:
 

Height	: 668 mm
Turret swept circle diameter	: 1 630 mm
Launcher swept circle diameter	: 2 600 mm
Ring gear diameter	: 960 mm
- Elevation angles :  $-10^{\circ}$  to  $+25^{\circ}$
- Sight Performance:
 

Recognition  
(target: tank, visibility > 23 km) :

3 x TV fields of view:

- WFOV	( $12^{\circ}$ )	: 950 m
- IFOV	( $4^{\circ}$ )	: 2 700 m
- NFOV	( $1.2^{\circ}$ )	: 6 300 m

2 x TIS fields of view:

- WFOV	( $6.25^{\circ}$ )	
- NFOV	( $1.3^{\circ}$ )	: 7 350 m
- Integrated Auto-tracker
- 24 V Electrical interface
- Adaptable to two missiles and light machine gun configuration (2M-MG) turret





# INGWE

## Precision-guided Missile



Ingwe (African for 'leopard') is a jam-resistant, beam-rider missile with a tandem warhead that will penetrate up to 1 000 mm of Rolled Homogeneous Armour (RHA) after a single layer of reactive armour. It is designed to operate with the minimum of logistics support, making it ideal for severe or isolated battle conditions. It is suitable for deployment by infantry, armoured and helicopter forces.



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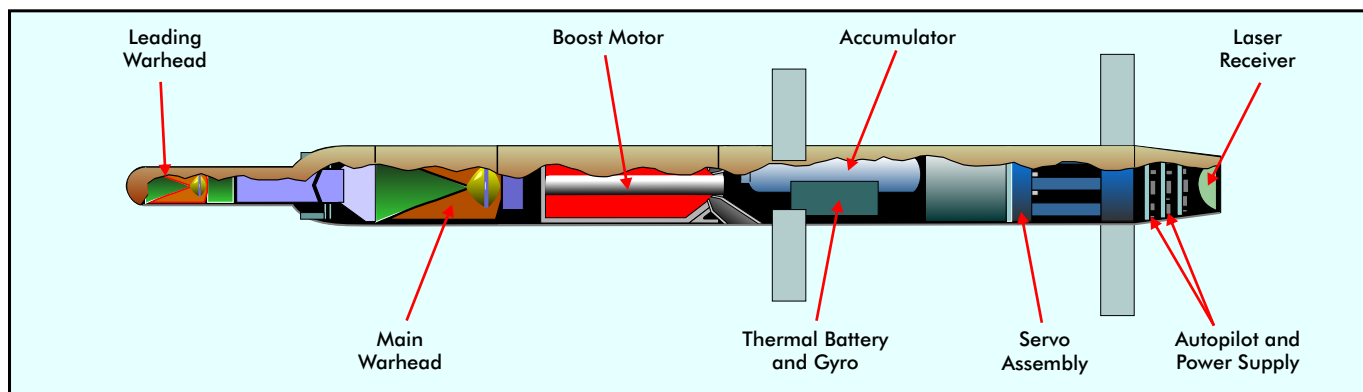


Photo: Courtesy Jane's



Actual Penetration in RHA

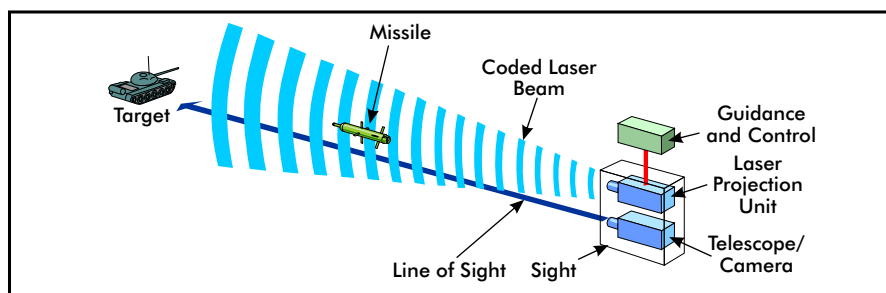
## SYSTEM FEATURES

- Multi-purpose missile for use by infantry, armoured or helicopter forces against modern threats
- Crossfire capability from adjacent platforms
- High-speed launch from helicopter platforms
- Fire-on-the-move from land platforms
- High countermeasure resistance
- High-accuracy laser beam-riding guidance
- Short- and long-range application (250 m to 5 000 m)
- Easy to use, with automatic target tracking
- Low maintenance cost

## PRINCIPLE OF OPERATION

Ingwe uses laser beam-riding guidance. The missile automatically determines its own position in the laser beam and manoeuvres onto the line of sight. The missile follows the line-of-sight until the target is hit. The warhead ensures effective target neutralization.

The sighting system can vary from a non-stabilized optical sight for light vehicles to a more complex and integrated stabilized day/night sight for moving platforms such as helicopters. Automatic target-tracking modules can be added to ensure fully automatic missile guidance after target lock-on by the operator.



## SYSTEM DESCRIPTION

The system is designed to ensure that it can be installed easily on most aircraft in either standard two- or four-missile configuration.

Electrical integration with aircraft avionics is achieved with standard serial communication interfaces.

Other platform options include heavy IFV turrets fitted with stabilized sighting systems, to light vehicle- and even tripod-mounted solutions.

## TECHNICAL DATA

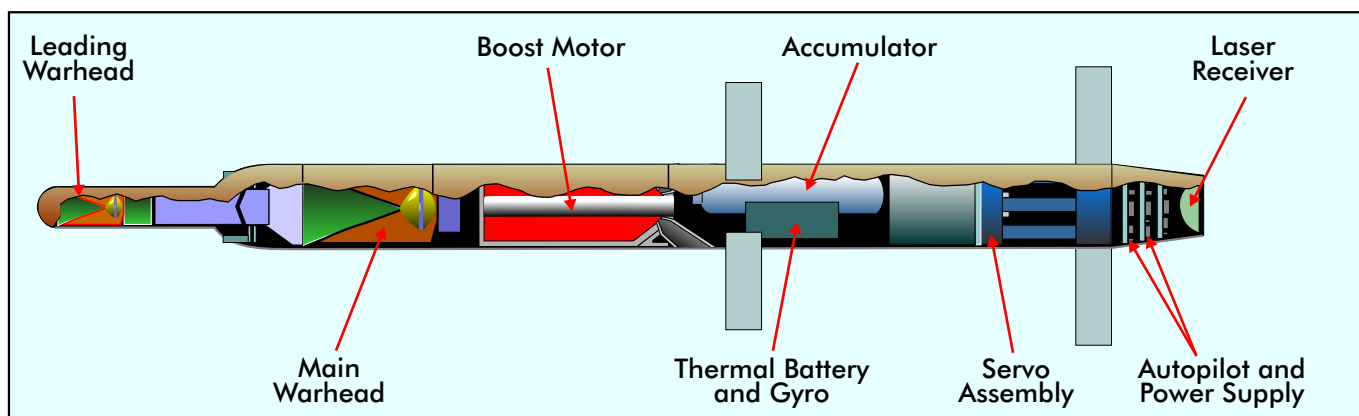
- Missile mass : 28.5 kg
- Missile diameter: 127 mm
- Missile length : 1 750 mm
- Penetration : up to 1 000 mm in RHA (with ERA)
- Range : 250 m to beyond 5 000 m

# IPLS INGWE

Ingwe Portable Launch System (IPLS)



The IPLS (Ingwe Portable Launch System) brings further flexibility to the already proven operational capability of the highly effective Ingwe anti-armour missile. The portable launch system provides a cost-effective anti-tank solution when installed on a Light Utility Vehicle (LUV) without compromising on performance.



## SYSTEM FEATURES

- Manual operation with Day View Optical (DVO) telescope
- Crew portable in tripod configuration
- Easy to use with low maintenance
- High accuracy with advanced countermeasure resistance
- Upgrade options:
  - Thermal imager for night capability
  - Servo driven remote control
  - Two missile launcher
  - Auto tracker
  - Laser Range Finder (LRF)



## PRINCIPLE OF OPERATION

Ingwe uses laser beam-riding guidance. The missile automatically determines its own position in the laser beam and manoeuvres onto the line of sight. The missile follows the line-of-sight until the target is hit. The warhead ensures effective target neutralization.

The sighting system can vary from a non-stabilized optical sight for light vehicles to a more complex day/night sight. Automatic target-tracking modules can be added to ensure fully automatic missile guidance after target lock-on by the operator if a thermal imager is fitted.

## SYSTEM DESCRIPTION

The IPLS is a manually operated system adding to the operational effectiveness of the Ingwe Anti-armour Missile.

The IPLS is a cost-effective, portable single missile launch system. It offers flexible integration on light vehicles and is dismountable onto a tripod.

## TECHNICAL DATA

- Mass:  
LRUs are manportable
- Dimensions  
Swept circle diameter: 1 770 mm
- Elevation angles : -20° - +20°
- Sight performance:  
DVO: 12 x magnification
- 24 V Electrical interface
- Adaptable to two missiles





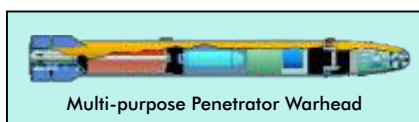
# MOKOPA

Long-range Precision-guided Missile



Mokopa is a long-range, precision-guided missile that utilizes the semi-active laser guidance concept. Its high-performance, large-calibre tandem warhead will destroy any foreseen armoured threat.





Multi-purpose Penetrator Warhead

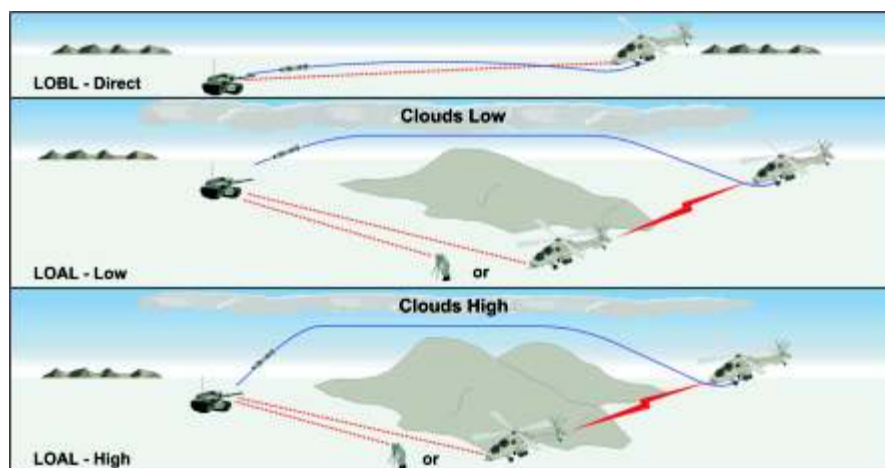


## SYSTEM FEATURES

- Multi-purpose, precision-guided missile may be used against a variety of targets and launched from various platforms
- Semi-active laser guidance upgradeable to fire-and-forget
- Excellent price/performance ratios
- Multiple warhead capability, including state-of-the-art tandem warhead (1 350 mm penetration)
- Modular airframe facilitates future upgrades as a common missile

## DESCRIPTION

Mokopa is a state-of-the-art, long-range, precision-guided, anti-armour missile. It may, however, be used effectively against other high-value ground, air or naval targets from a variety of launch platforms such as land vehicles, shore battery installations, naval vessels and fixed-wing aircraft. The modular design of the missile allows for different warheads (e.g. penetration, fragmentation or anti-armour), optimized for the type of target. Furthermore, the modularity of the missile system facilitates pre-planned upgrades, such as mmW and IIR seekers, ensuring a continued presence in the market.



## SYSTEM OPERATION (SAL VERSION)

Prior to launch, target information must be supplied via the on-board sighting system or from an external source. After launch, the missile flies towards the target area, using the selected trajectory and fly-out method. During the terminal phase, the target must be illuminated by the on-board sighting system or a remote designator.

## SYSTEM DESCRIPTION

The Mokopa system consists of the following major components:

- 178 mm missile
- Launcher (two or four missiles)
- Support equipment

## TECHNICAL DATA

- Missile mass : 49.8 kg
- Missile diameter : 178 mm
- Missile length : 1 995 mm
- Seeker : Semi-active laser homing
- Warhead : Tandem HEAT
- Penetration : > 1 350 mm RHA
- Range : 10 000 m

# MONGOOSE

A Family of Hard-kill, Active-protection Munitions



The Mongoose family of hard-kill, active-protection munitions enhances the protection of a variety of armoured vehicles or high-value targets when integrated with an active-protection system.



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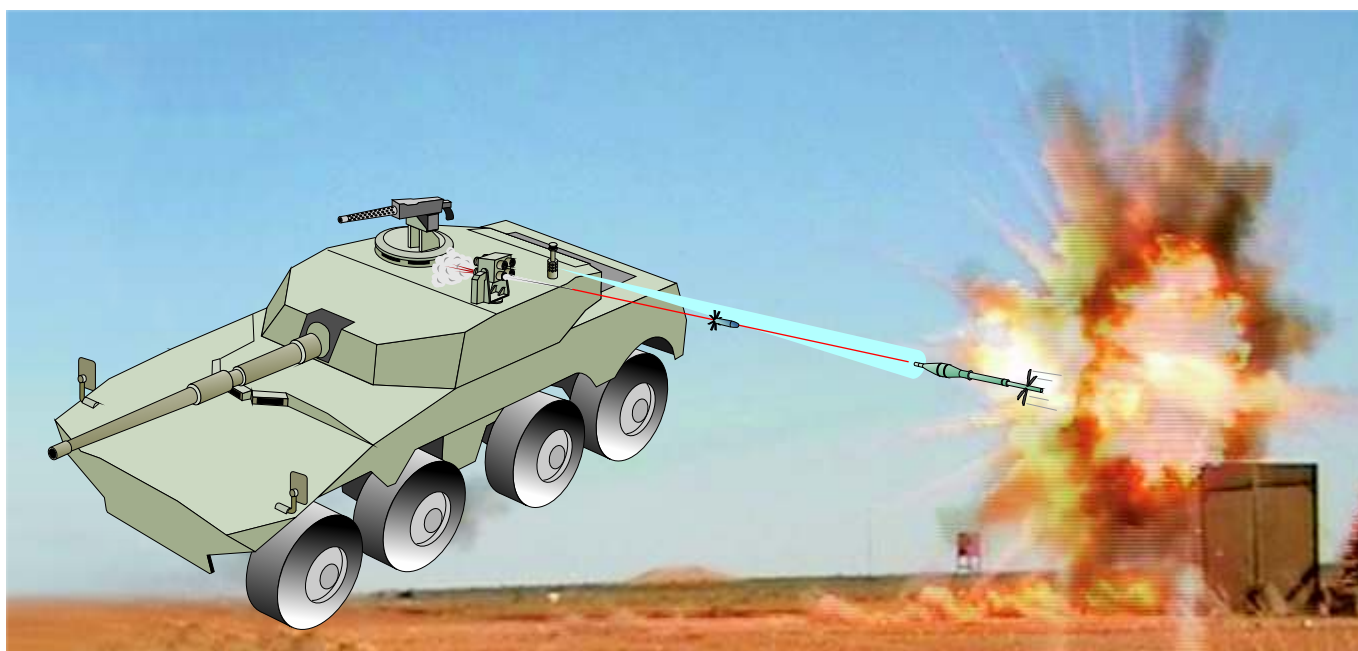
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# THE HARD-KILL CONCEPT



## SYSTEM FEATURES GENERAL

- Unique anti-warhead warhead coupled with intelligent fuzing technology, results in an extremely high-kill probability
- Quick reaction allows for superior performance against short-range threats using a high-speed directed launcher
- Low collateral damage allows for urban operations

## MONGOOSE 1

- Unguided, quick-reaction munition
- Pre-confirmed threats intercepted at approximately 5 m
- Self-destruction at 20 m
- Fuze timing determined by threat characteristics and set prior to munition deployment
- Induction initiation
- Compatible with Galix smoke grenade dispensers

## MONGOOSE 3

- Boosted to a speed of 300 m/s in 120 ms
- Inertial mid-course guidance utilizing vehicle sensor data provided via a data link
- Active micro-radar seeker with top-attack neutralizes multi-path or low-flying threats
- Terminal accuracy around 100 mm
- Wide-angle, long-range protection

Munition	Effective Range	Threat Protection
<b>Mongoose 1</b> 	5 m to 20 m	<ul style="list-style-type: none"> <li>• Rocket-propelled Grenades (RPG) family</li> <li>• Light infantry anti-tank missiles</li> </ul>
<b>Mongoose 3</b> 	5 m to 300 m	<ul style="list-style-type: none"> <li>• Rocket-propelled Grenades (RPG) family</li> <li>• Light infantry anti-tank missiles</li> <li>• Heavy, long-range anti-tank missiles</li> <li>• Rocket, artillery and mortar rounds</li> <li>• Laser-guided bombs</li> <li>• Kinetic energy (KE) rounds (including long-rod penetrators)</li> <li>• Air-to-surface missiles</li> </ul>

# UMKHONTO-IR

Surface-to-air Missile System



The Umkhonto-IR missile is a vertically-launched, high-velocity, infrared homing missile specifically designed for providing all-round defence against simultaneous air attacks from multiple combat aircraft (fixed-wing or helicopter) and missiles.

The missile and associated subsystems are supplied as a missile group for easy integration into naval combat suites or ground-based air defence systems.



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## SYSTEM FEATURES

- Multiple-target engagement (up to four targets)
- Ease of integration
- High-kill probability (23 kg warhead)
- Countermeasure resistance
- Absence of line-of-sight limitations
- Ease of maintenance (high BIT coverage)
- All-round (360°) coverage (with vertical launch)

## SYSTEM OPERATION

- Target is acquired and tracked by 3D target acquisition radar
- Missile is launched and flies to a lock-on point, using an on-board inertial navigation subsystem
- IR seeker locks on and missile intercepts target under seeker control
- Continuous updating of target course from surface radar during missile flight, via a telecommand link, to enable engagement of manoeuvring targets

## SYSTEM SPECIFICATIONS

### Physical Characteristics

- Missile length : 3 320 mm
- Missile diameter : 180 mm
- Wingspan : 500 mm
- Launch mass : 135 kg
- Canister length : 3 800 mm
- Canister maximum: 650 mm diameter

### Performance Characteristics

- Range : 15 000 m
- Ceiling : 8 000 m
- Maximum Mach No. : 2
- Time of flight to 8 km: 18 s

# UMKHONTO GBL

## Ground-based Launcher System



The Umkhonto Ground-based Launcher (GBL) is a versatile, compact and mobile surface-to-air missile vertical launching system providing all-round defence against simultaneous air attacks from multiple combat aircraft (fixed- or rotary-wing) and missiles. The GBL is based on the proven naval system as used by local and international clients, and carries a combination of eight Umkhonto-IRMkII and Umkhonto-R missile rounds. The GBL is supplied as a stand-alone effector system for easy integration into bigger ground-based and naval air defence systems.



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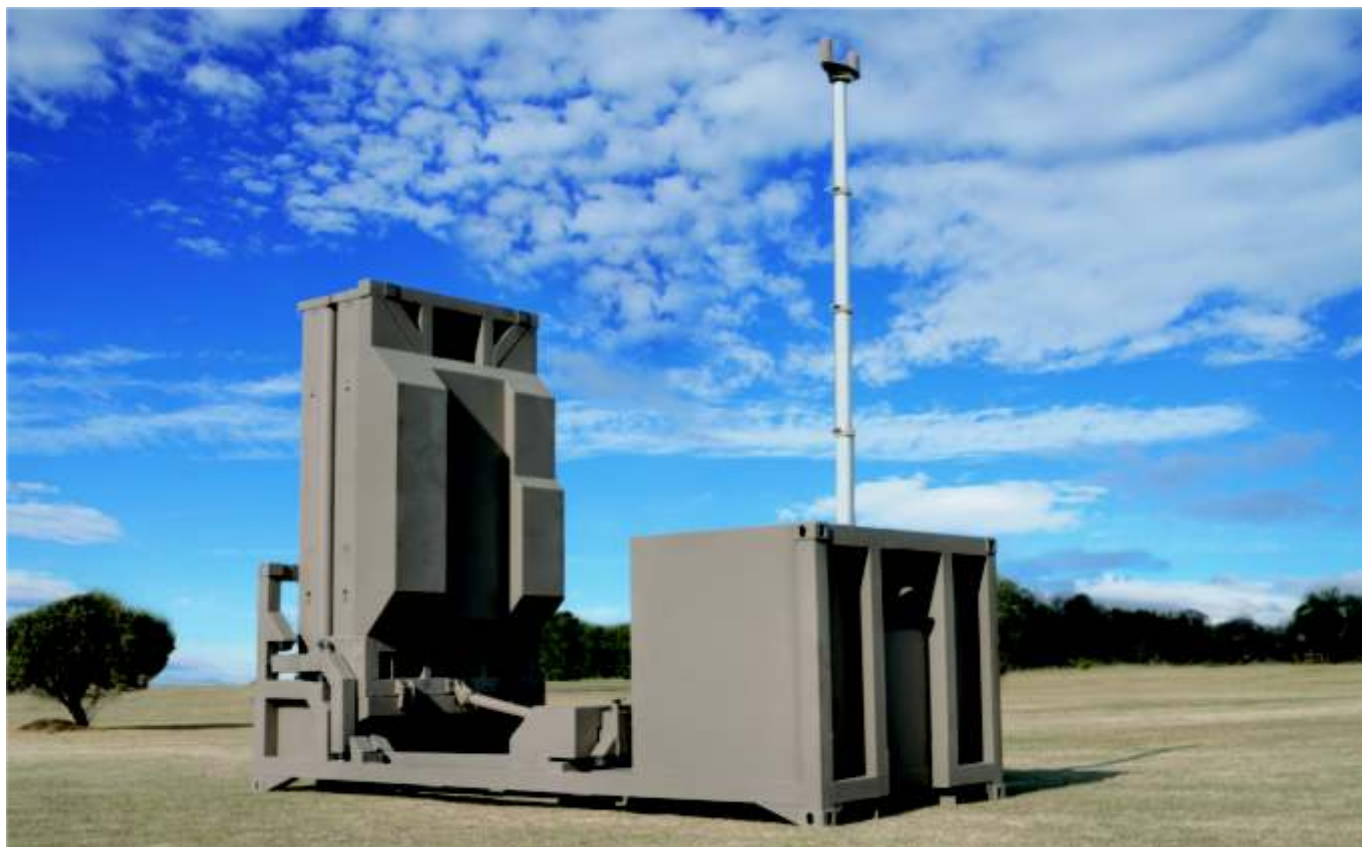
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## SYSTEM FEATURES

- Multiple simultaneous target engagement.
- Ease of integration with next level Command and Control Systems.
- Absence of line-of-sight limitations.
- ISO 668 Lock and STANAG 2413 hook-lift compliant.
- Transportable by land, sea and air (C130 and helicopter lifting).
- All-round (360°) coverage (with vertical launch).
- Rapid encampment/decampment possible due to highly mobile and autonomous features.
- Design allows for rapid reloading.
- Deployment on vehicle or stand-alone.
- Surface attack mode

## SYSTEM OPERATION

- The GBL can be deployed either on a vehicle or stand-alone, and is connected to the Command and Control centre via radio, hard-wired or fibre-optic links.
- The GBL can be deployed on various ISO and STANAG 2413 compliant vehicles.
- The GBL operates autonomously for extended periods without significant replenishment requirements.
- The GBL is specifically designed to launch the well-known Umkhonto range of missiles using the designated homing principle.

## SYSTEM SPECIFICATIONS

### Physical Characteristics

- Length : 6 058 mm
- Width : 2 438 mm
- Height : 2 000 mm
- Mass : < 4 500 kg (empty)
- Mass : < 7 100 kg (with eight IR missiles)
- ISO 668 Lock and STANAG 2413 hook-lift compliant

### Performance Characteristics

- Range of Umkhonto missile accommodated by the GBL:
  - Infrared (IR) missile: 15 000 m (ceiling 8 000 m)
- Reaction time : 2.5 s
- Salvo interval time : 500 ms



# RAPTOR II

Long-range, High-precision Guided Weapon



Raptor II is a long-range, high-precision guided weapon that can be launched from a variety of aircraft to achieve pinpoint accuracy for the destruction of high-value targets.

The modularity of the system ensures mission flexibility for optimum launch aircraft survival and target destruction.

Various system upgrades such as improved stand-off range and alternative seeker types are in progress.



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## SYSTEM FEATURES

- Extreme high precision
- Modularity allows for mission flexibility
- Heavy calibre warheads (600 kg)
  - Fragmentation (with airburst capability)
  - Penetration



- Multiple simultaneous target engagement
- Variety of seekers:
  - GNSS/INS
  - LLTV
  - IIR (with ATR)
- All-weather attack capability
- Ease of integration with older (strap-on) and new generation aircraft
- Enhanced robustness against GNSS jamming and spoofing
- In-flight target re-programming capability



## SYSTEM DESCRIPTION

The Raptor II system flies autonomously to the target and is then designated on the intended point of impact by the operator. The Communications Pod is mounted on the launch aircraft or on a second aircraft, which allows for the control of the weapon over a separation distance of up to 200 km.

A set of cockpit display symbology indicates weapon and mission status.



The weapon allows for two methods of operation, depending on the Seeker used:

- MITL – The weapon will fly autonomously to the target. The operator designates the precise point of impact by means of an advanced auto-tracker.
- Fire-and-forget – GNSS/INS aided navigation.

## AIRCRAFT INTEGRATION

Raptor has been integrated on the Mirage III/V, Mirage F1, Cheetah and SU-24. The system can also be integrated with other suitable aircraft, e.g. MiG-29, SU-27/30, Mirage 2000, and Tornado.



## SIMULATION AND TRAINING

Mission planning is performed by means of the Ground-based System (GBS) utilizing geographic maps and/or photo-strips.

Operator training of the aircrew is also performed on the GBS, simulating the entire mission.



A low-cost multi-mission Airborne Trainer allows for cost-effective operator training. This trainer can be integrated on smaller light fighters for cost-effective operations.



# AL-TARIQ

Precision-guided Bomb Kit



Al-Tariq is a family of strap-on bomb kit systems, used on Mk81, MK82 and MK83 bombs. Al-Tariq provides the user with all-weather, day or night operational capabilities, utilizing GPS/INS guidance.



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## DESCRIPTION

Al-Tariq is a family of strap-on bomb kit systems, used on MK81, MK82 and MK83 bombs. Al-Tariq provides the user with all-weather, day or night operational capabilities, utilizing GPS/INS guidance. Improved targeting accuracy can be achieved by using an Imaging Infrared (IIR) with complete Automatic Target Recognition (ATR) capability, or a Semi-active Laser (SAL) seeker. The system can also be fitted with an RF proximity fuze for area targeting, using a pre-fragmented warhead.

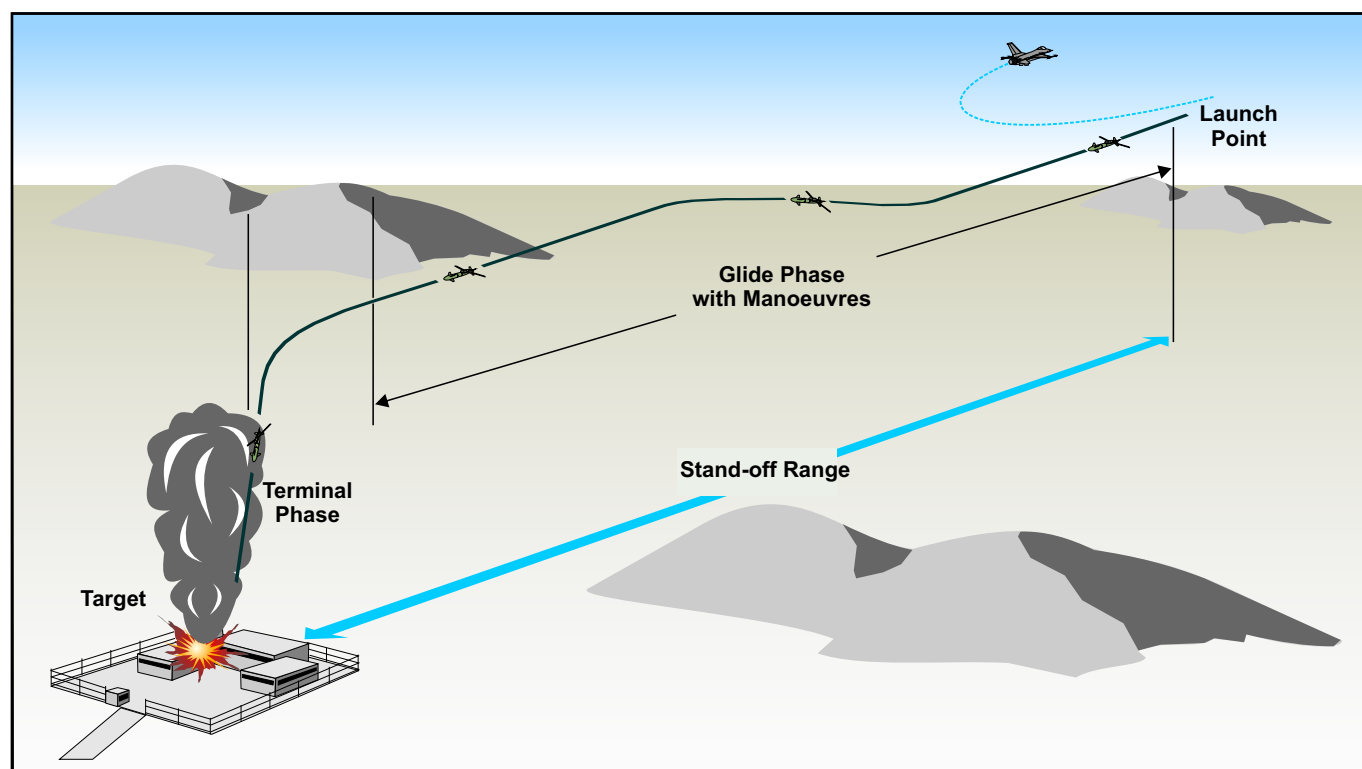
The Al-Tariq guided bomb kit forms part of a joint venture company (Tawazun Dynamics) between Denel and Tawazun in the United Arab Emirates aimed towards the international market.

## SYSTEM FEATURES

- Autonomous target acquisition with long stand-off range
- Wing kit or motors may be added to increase stand-off range and low-level (straight and level) launch capability
- Programmable attack angle up to 90° (straight from above)
- Different adaptations possible, including seekers, fuzes and warheads, utilizing a common airframe

## CHARACTERISTICS

- Range up to 120 km (depending on configuration)
- Accuracy as low as 3 m CEP (laser or IIR)
- Warhead: MK81, MK82 and MK83 and variants
- Large launch envelope
- Wireless integration capability with the launch aircraft
- Fully autonomous operation once released
- Modular system
- Low maintenance and life-cycle cost
- Minimal logistics equipment
- Ease of use
- Extended Range (ER) module can increase range to 200 km



## TYPICAL MISSIONS AND TARGETS

- Offensive counter-air, e.g. hardened aircraft shelters, runway cratering, runway denial, aircraft on tarmac
- Battlefield interdiction, e.g. air defence units, surface-to-air missile launchers, supply columns (trucks)
- Deep battlefield interdiction, e.g. buildings, bridges and refineries, industrial areas
- Close air support, e.g. troops, artillery

توازن دينا ميكس  
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# SEEKER II+

## UAV Surveillance System



### RECENT ENHANCEMENTS

The Seeker II Tactical Unmanned Aerial Vehicle (UAV) Surveillance System has been in operational use for more than 30 years. The system has been continuously upgraded to the current Seeker II+ configuration, which includes:

- New aero engine with improved service intervals of >250 h resulting in greatly improved LCC, lower noise levels (<70 dB WOT at 1 000 ft AGL), improved endurance, reduced take-off distance (~300 m at sea level) and improved rate of climb (~750 ft/min).
- Automatic Take-off and Landing (ATOL).
- New state-of-the-art avionics (Autopilot and Attitude Sensor including a power PC with backup sensors).
- New Goshawk II multi-sensor payload combining EO/IR (day and night) and equipped with a Laser Designator (LD) and Laser Rangefinder (LRF).
- Numerous state-of-the-art features added in the Ground Stations, MCU and TGS (up to 16 waypoints, corridor flying capability, alternative loiter patterns, Digital Elevation Model (DEM)/Map datum, analogue video encryption, drawing feature on electronic maps and several printing features).



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## THE SYSTEM

The Seeker II+ System operates at ranges of up to 250 km from base and provides:

- Real-time day and night reconnaissance
- Target location
- Artillery fire support
- Electronic intelligence

Its reliable communication link, modular design, high mobility and self-contained support provide an advanced system that has passed the real test of operational use.

The system comprises:

- Four to six unmanned aerial vehicles
- Mission control unit
- Tracking and communications unit
- Payloads
- Field support equipment
- Optional tactical ground station



## SYSTEM FEATURES

- Slant range surveillance: 250 km line-of-sight communication
- Redundant data links (two control links, one status and video link and one emergency link)
- Range and azimuth tracking for operation under GPS denial conditions
- Endurance: up to 10 h; 5 h over target at 250 km
- Service ceiling: up to 18 000 ft
- Multi-mission payload, excluding fuel: up to 40 kg
- Range extension capability via passing control of the UAV to the Tactical Ground Station (TGS)
- Deployment and flight preparation turnaround time of < 2.5 h



## UAV

The Seeker II+ Unmanned Aerial Vehicle (UAV) variants have an all-composite, low-drag airframe that ensures optimum performance. The UAV's highly efficient engine and large fuel capacity provide up to 10 h endurance. This, combined with a service ceiling of up to 18 000 ft and a payload capacity of up to 40 kg, puts it in a class of its own.

An on-board directional antenna gives high resistance to jamming and enables real-time communication up to 250 km from base.

## MCU

The Mission Control Unit (MCU) is the main interface between the mission control crew and the UAV. It provides for:

- Mission planning
- UAV control and monitoring
- Communications control
- Payload control - optical and Electronic Support Measures (ESM)
- Mission simulation

Workstations have identical hardware, with dedicated software enabling specific functions.

## TCU

The Tracking and Communications Unit (TCU) contains the tracking and communications equipment that maintains contact with the UAV. It is an unmanned, separate unit that can be located up to 80 m from the MCU, enabling it to be positioned for optimum line-of-sight communication.

## PAYLOADS

The Seeker II+ UAV can carry several different payloads by using a 'plug and play' methodology.

Goshawk II LD multi-sensor payload combining EO/IR (day and night) with integrated laser designator and laser range-finder to 20 km, containing a single CCD with x20 zoom, a 3rd generation 3 - 5  $\mu$ m IR camera with continuous zoom lens, automatic video tracker, azimuth and elevation gimbal, <20 mrad stabilization. Four new autotrackers are available (histogram, edge, correlation and scene-based).

An Electronic Surveillance Payload (ESP) is available for emitter location, with a high probability of interception of radars (0.5 to 18 GHz, angle of arrival measurement, 120° sector to port and starboard, on-board emitter library). The man-machine interface for the ESM is integrated into the ground control station. This provides the system with an Enemy Electronic Order of Battle (EEOB) through emitter identification.

## TGS

The Tactical Ground Station (TGS) is a self-sufficient, compact, mobile UAV control station, with functions similar to those of the main Seeker II+ MCU and TCU. It takes over UAV control.

The optional TGS extends the range of Seeker II+ with ground stations placed up to 400 km apart.

The TGS allows control of the Seeker II+ UAV and its payloads, providing total mission independence.



# SEEKER 400

## UAV Surveillance System



### For enhanced situational awareness

The Seeker 400 evolved from the battle-proven Seeker II Unmanned Aerial Vehicle (UAV) System.

The new system offers:

- High-definition capability
- Multiple sensor payloads
- COMINT and voice relay capability
- Real-time data acquisition and transmission to remote receivers
- Long range
- Long endurance
- Persistent surveillance
- Armed reconnaissance
- Target designation
- Synthetic aperture radar



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AIR-TO-AIR

ANTI-ARMOUR

AIR DEFENCE

SOW

UAVS

DISS



## THE SYSTEM

The Seeker 400 System operates at direct Line-of-sight (LOS) ranges of up to 250 km from the base station and provides:

- Real-time day and night reconnaissance
- Target location
- Target designation
- Artillery fire support
- Electronic Intelligence (ELINT) and Electronic Support Measures (ESM)
- Border patrol
- Maritime patrol

Dual up and down communications links, modular design, high-mobility and self-contained support provide a flexible system that has passed the real test of operational use.

The system comprises:

- Four to six UAVs
- Mission control unit
- Tracking and communications unit
- Payloads
- Field support equipment
- Optional tactical ground station



## WEAPONS

- Capable of carrying two Denel Dynamics laser-guided missiles
- Missile stand-off range 10 km



## SYSTEM FEATURES

- Direct LOS range of 250 km and 700 km with passing of control via the tactical ground station
- Up to 16 h endurance with internal fuel
- Up to 18 000 ft service ceiling
- Up to 100 kg multiple mission payloads (excluding fuel)
- Dual uplinks and downlinks
- Brake-assisted ground operation
- Piloted and autonomous flight capability
- VHF and UHF FM Tactical Communications Radios
- Mode S Transponder and VHF AM Air Traffic Control (ATC) radio for ATC interfacing



## UAV

The Unmanned Aerial Vehicle (UAV) has a modular all-composite, low-drag design that ensures optimum performance. The UAV's highly efficient engine and large fuel capacity provide up to 16 h endurance with extended service intervals. This, combined with a service ceiling of up to 18 000 ft and payload capacity of up to 100 kg, provides a versatile and capable platform.



## MCU

The Mission Control Unit (MCU) is the main interface between the mission control crew and the UAV. Its functions include:

- Mission planning
- UAV control and monitoring
- Communications control
- Payload control - dual payload capability
- Mission simulation
- Workstations have identical hardware, with dedicated software enabling specific functions.

The standard ground control station provides the above functions for more permanent deployments. The tactical ground station provides a rapid deployment and range extension capability through passing control of the UAV.

## PAYLOADS

Capable of carrying dual imaging payloads with the images being transmitted to the ground control station via the dual video downlinks. Customer-preferred electro-optical payloads with diameters of up to 530 mm can be accommodated. This typically includes the following sensor combinations on a gimbal:

- Colour daylight camera with zoom lens
- Infrared thermal imager with step fields of view
- Day colour or monochrome spotter camera
- Night spotter camera
- Laser rangefinder
- Laser illuminator

An Electronic Surveillance Payload (ESP) for ELINT/ESM missions is available for detection and location of radar emitters.



# HUNGWE

## Unmanned Aerial System



NOT TO SCALE

The UAV has an all-composite, low-drag design that ensures optimum performance. It is fitted with a day or night payload. The communications link on-board the UAV enables real-time communication up to 100 km from base.

The UAV is catapult-launched and skid-landed.



## SYSTEM FEATURES

The UAV has an all-composite, low-drag design that ensures optimum performance. It is catapult-launched and skid-landed. Hungwe offers the following features:

- Direct Line-of-sight (LOS) range of 100 km
- Up to 6 h endurance
- Up to 12 000 ft service ceiling
- Up to 5 kg day and night mission payload (fuel excluded)
- Piloted and autonomous flight capability

The system comprises:

- Two Unmanned Aerial Vehicles (UAVs)
- One Ground Control Station (GCS)
- Two payloads
- A launcher
- Field support equipment



## GROUND CONTROL STATION

The GCS is portable, quick to set up and easy to use. It consists of the following components:

- Flight Management System, used for:
  - Mission planning
  - UAV control
  - Payload control
  - Status monitoring
  - Video display
- Antenna tripod, used for:
  - Transmission and reception of the radio frequency signal
  - Tracking the UAV



## APPLICATION

A few applications of the Hungwe are:

- Border patrol
- Anti-piracy operations
- Game park surveillance
- Battlefield support
- Law enforcement
- Search and rescue
- Pipeline surveillance

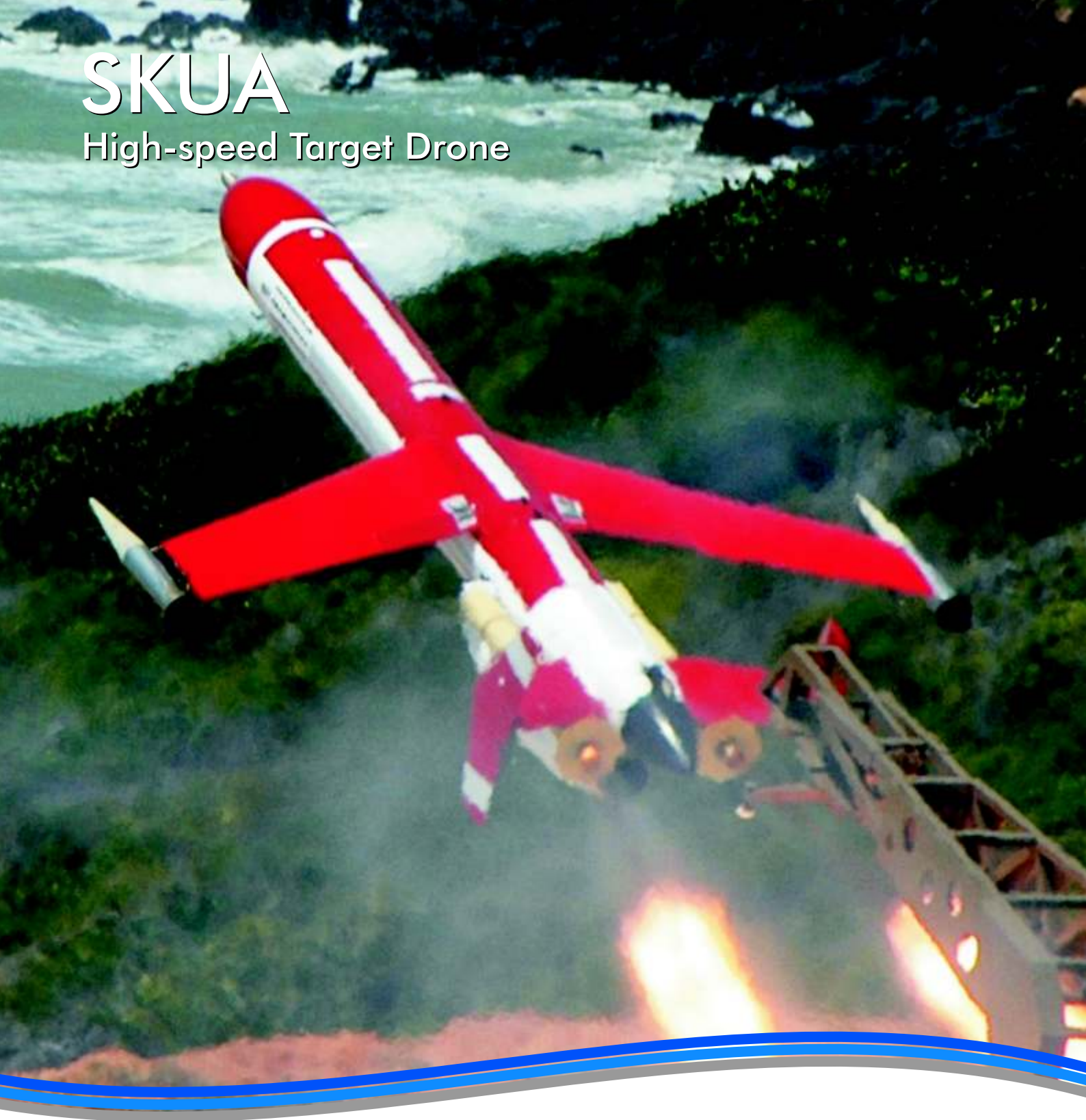
## LOGISTICS

The UAS:

- Can be operational within one hour of arriving at the deployment site
- Can be disassembled and transported within less than an hour
- Is capable of being operated by a crew of two
- Hungwe is transportable in one single commercial 4 x 4 vehicle
- Overall dimensions of 3.0 m wingspan, 2.0 m (L) and 0.45 m (H) ensures portability and a small footprint

# SKUA

## High-speed Target Drone



The Skua is a high-speed target drone designed to simulate high-speed attack aircraft during weapon development as well as land, sea and air combat training.



## THE SYSTEM

The system comprises:

- Four to eight target drones
- Launcher
- Mobile ground control station
- Ground support equipment

### Drone

The Skua is a high-speed target drone designed to simulate high-speed attack aircraft during weapon development as well as land, sea and air combat training. The Skua has an all-composite, low-drag airframe with a wingspan of 3.57 m and length of 6 m. Wing hard-points are provided to carry up to 130 kg of tow-targets and signature augmentation equipment. An internal bay can house a payload of up to 30 kg.

### Launcher

The zero-length launcher is easily deployed. It includes self-loading and engine-starting facilities.



### Ground Control Station

The mobile ground control station houses the control interfaces, telecommand and telemetry equipment required to control the drone. Tracking is done via position feedback from the drone's navigation system.



## SYSTEM FEATURES

- Reliable communications link
- Easy deployment and recovery
- Large payload capacity
- Programmable missions
- Radar and infrared tow targets



## PERFORMANCE

- Maximum speed:  
Mach 0.86 at 10 000 m
- Controllable range:  
200 km (line-of-sight)
- Altitude:  
150 m to 11 000 m
- Endurance:  
60 min at 6 000 m and  
Mach 0.7
- Manoeuvrability:  
5 g at 1 500 m

## OPERATION

### Deployment

The system is easily transportable by land, sea and air, and can be deployed in less than a day. No sophisticated range equipment is required for system operation.

### Flight Control

Following launch, all flight path and drone manoeuvres are controlled by a telecommand and telemetry link between the drone and ground station. The drone can also fly autonomously to a programmed mission plan.

### Recovery

A two-stage parachute system is used to recover the drone. The drone lands in an inverted horizontal position on pneumatic landing bags. It can also be recovered over water.



# SABLE

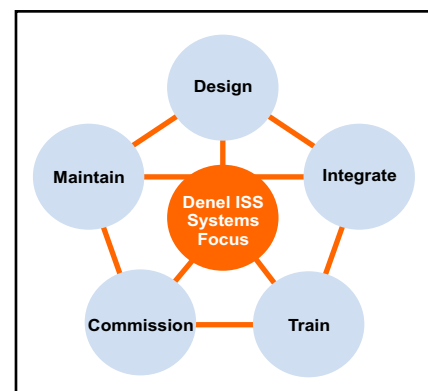
## Ground-based Air Defence System (GBADS)



The Sable Air Defence System provides an advanced, integrated air defence capability based on proven products. Significant upgrade potential is provided through a design that will accommodate interfaces with future developments, both local and international.

Denel ISS, as prime contractor and system integrator, provides the following advantages:

- Focus on capability delivery in accordance with the client's requirements.
- Single point of entry for the contracting of complex systems.
- Single point of accountability.
- Seamless integration of local and international participation.
- Architecture design, systems integration system engineering, baseline management and life-cycle support.



*"The right system is not so much chosen as created"*

Barnes Wallace: Inventor and Engineer



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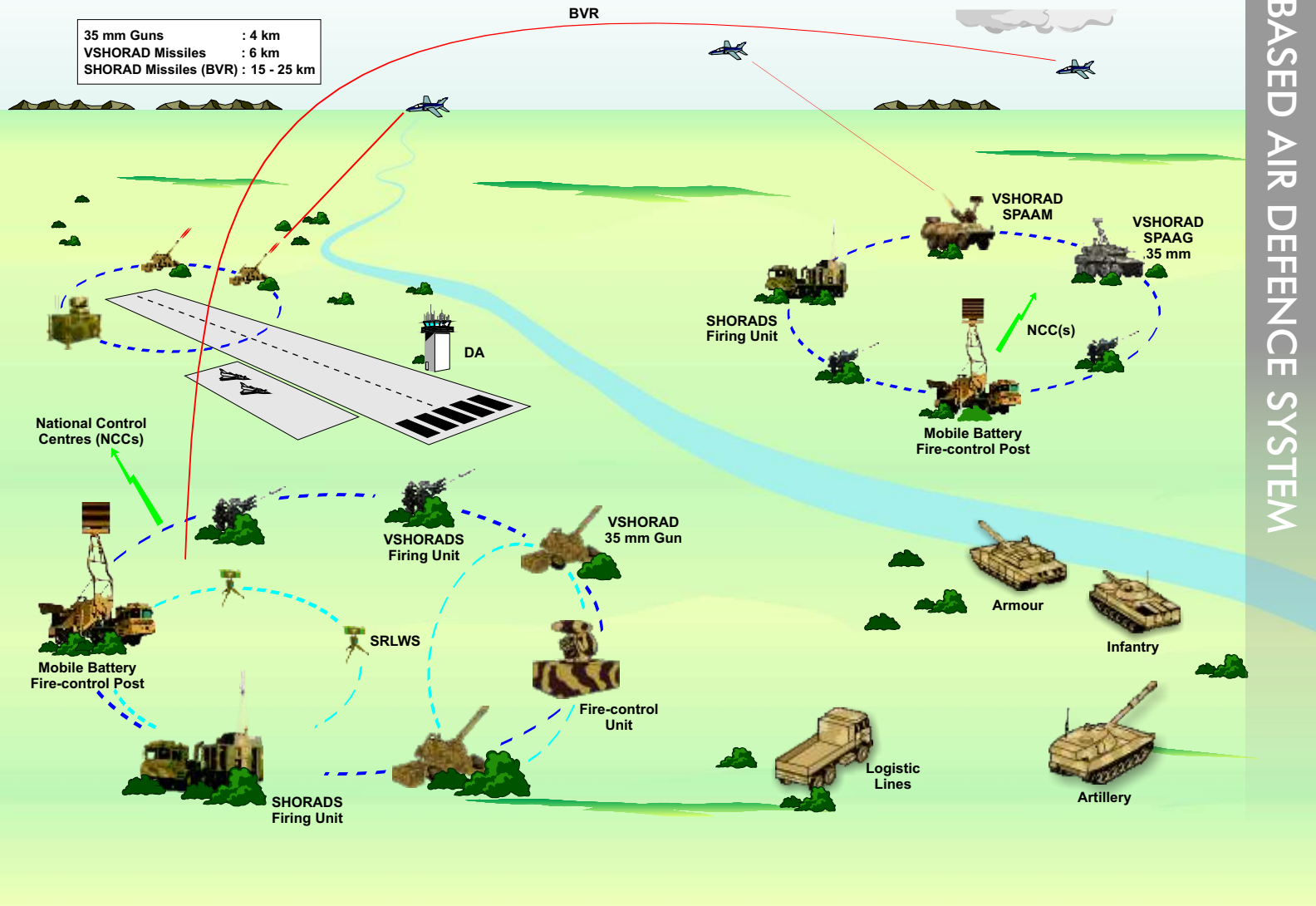
SOW

UAVS

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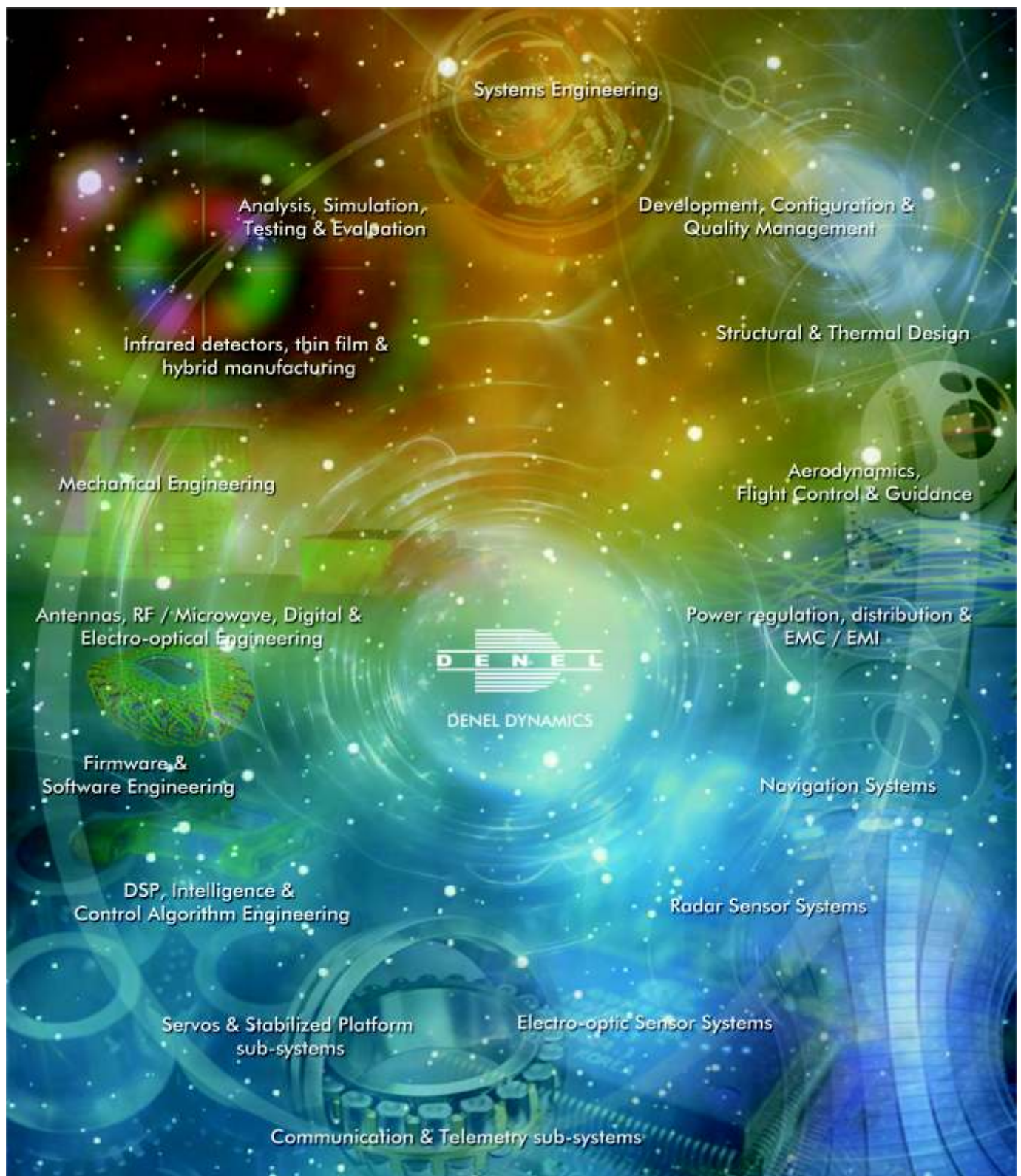
# SYSTEM OPERATION



## SYSTEM FEATURES

- Modern, fully integrated, layered GBADS for joint operations
- User-defined mix of missiles and guns in VSHORAD, SHORAD and extended SHORAD
- Operational features
  - Integrated BMC<sup>4</sup>I
  - Multi-layer air defence
  - Positive to procedural control (spectrum)
- Centralized and decentralized control
- Air-droppable subset
- High mobility
- Mechanized growth path
- Built-in management of redundancy/degradation
- Cost-effective
- Very high measure of safety (including prevention of fratricide)
- Comprehensive logistics support and training systems
- Modular system allows:
  - Phased or scaled acquisition
  - Incremental growth
  - Combination of latest technology with legacy systems





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**DENEL DYNAMICS, a Division of Denel SOC Ltd.**

Nellmapius Drive, Irene. PO Box 7412, 0046, Centurion, South Africa

T: +27 (0) 12 671 1911; F: +27 (0) 12 671 1779; E: [market@deneldynamics.co.za](mailto:market@deneldynamics.co.za)