



August 2017

## **PUMA DIESEL SURVEILLANCE DRONE COAXIAL HELICOPTER: (VTOL-UAV)**

*Puma: Quiet As a Cat - Stalking Her Prey*

### **PUMA DIESEL VTOL-UAV OBJECTIVES:**

- Provide a rugged, stable, quiet and cost effective all-weather, diesel powered coaxial VTOL-UAV helicopters to handle a wide variance of payload applications. This low-cost VTOL-UAV platform has the capability of flying 308 kg. (681lbs.) of surveillance equipment on Eleven (11) hour missions to handle more reliable and larger sensor packages required for military, agricultural, Utility aerial inspections, including power lines/pipelines, search/rescue (SAR) and radar and thermal night vision FLIR surveillance missions.
- Puma Aero Marine of Florida has developed an inexpensive, quiet, reliable and environmentally friendly COAXIAL VTOL-UAV (drone helicopter).
- The Puma is designed to be easily operated by anyone with computer gaming skills. The Puma VTOL-UAV receives its commands from a computer keyboard and override control by a fly by wire joystick. Operation could be from any operational base, dispatch center, mobile based unit, a vessel or carry around hand held unit.

## Puma VTOL-UAV Overview:

A Coaxial Rotor System (double header) decreases the size of the rotor blades and lowers rotor speed. There is no tail rotor required so there is no tail rotor noise, leading to an ultra quiet helicopter. The Continental Motors CD-245R air/oil cooled diesel power package provides the ultimate in efficiency and reliability. This engine may be fueled with either Jet-A fuel or Ultra-low-sulfur diesel (ULSD) with a usage of about 41.4 liters/hr. (10.94 GPH). Coaxial helicopters are very stable with a very lower rotor vibration and noise level, making the Puma a great platform for surveillance and defense missions.

The PUMA has an extremely low operating cost of about \$150 USD per hour vs. \$1,500 USD for a manned helicopter. Plus, the PUMA is easy to set-up and simple to operate for the “average person” with only minimal training required.

Law enforcement/military agencies are beginning to acquire unmanned systems to perform reconnaissance and surveillance. The idea of a small, low cost, unmanned, vertical take-off and landing from and to moving platforms/helipads is particularly attractive for various applications. The Puma can be deployed from land and sea in almost all types of weather conditions. The Puma VTOL-UAV may be used as a platform for reconnaissance surveillance and/or defense missions using FLIR, HD Doppler radar systems, and/or sonar. The Puma Sea Hawk Doppler radar will permit an operator the ability to see beyond the horizon, without being hampered by sea or ground clutter. The Puma could be utilized to emplace sensors or communications repeaters for enhanced communications coverage, as well voice communications while hovering over head of an objective. Further, it could maintain an over-watch position to provide long term surveillance and to aid in command and control on land or sea, in hazardous or difficult to reach locations. The cost of operating this type of system will be significantly less than the cost of operating a manned helicopter, potentially providing greater availability and safety, plus versatility to operators or agencies.

- The Puma VTOL-UAV receives its commands from a computer joystick and keyboard. The operator could be at any operational base, law enforcement dispatch center and/or mobile based unit.
- Training the clients VTOL-UAV operators and maintenance staff is provided with three months of on-site training, while tailoring the client operating software for their mission(s), The “Puma” is designed to be easily operated by anyone with computer gaming skills.

Operators VTOL-UAV training will be conducted onsite, utilizing a computer based comprehensive flight simulations. The VTOL-UAV operators should have a working knowledge of PC based computers. (Clients/Operators do NOT require any piloting skill as a prerequisite).

Maintenance staff VTOL-UAV training for maintaining and repairing the VTOL-UAV and her major components will be in the classroom and through on the job training. Maintenance crews must have a working knowledge of PC based computers.

- The FLIR M400XR comes standard on the Puma, with the advanced 640 x 480 sensor delivering crisp thermal video images in total darkness and lowlight conditions. An integrated HD Color visible camera and high intensity LED spotlight augment target identification. Once a target or threat is identified, the M400XR will automatically track the target. M400 has a continuous optical thermal zoom lens (up to 4x) that allows operators to see small objects/targets at longer ranges. Active gyro-stabilization ensures a steady image, plus radar tracking keeps potentially dangerous threats/targets in view at all times. Capable of detecting a man at up to 1.3 n miles and vehicles as far away 3.2 miles.

## **Puma UAV-VTOL A Number of Applications are Available:**

- Wildlife Surveillance Studies to benefit wildlife and provide security from poachers (in wildlife preserves/parks/conservatories).
- Agricultural: aerial crop evaluation
- Livestock surveillance and herding
- Anti-piracy, anti-smuggling and/or anti-terrorist missions
- Radar Environmental Surveillance: Sea Hawk SHN-X9 Radar accurately searches vast areas in a short time for detecting oil spills/surface sea life activity/surface ice flows (growlers), floating debris/excellent for detecting small craft such as RIBs. A very high definition radar which can detect water surface tension and sea birds for fish finding
- The ultimate for Search and Rescue (SAR) missions (Rescue of personnel and animals)
- Fisheries protection
- Surveillance (11 hour plus mission capability)
- Tactical Wireless Commutations Repeater
- Long Range Acoustic Device (LRAD). Non-lethal tactical crowd control tool, communication device, acoustic hailing and siren.
- Night Lighting Tactical Operations
- Agricultural aerial applications: Crop Dusting and/or Spraying, crop monitoring
- Exterior lift: mobile sky crane for small payloads up to 308 kg. (681lbs.)
- Airborne Laser Mine Detection System
- Dipping side scan sonar devices to detect sea life
- Weather Surveillance
- Wind Diesel & Power Line cleaning and De-icing
- Public Works: roads, bridges, dams, power lines, pipelines and building evaluation
- Night Lighting for Tactical Operations
- Affordable Safety/Law enforcement/military missions, security surveillance and inspection for borders, harbor, cities and coastal surveillance. A great deterrent for people that may want to cause harm.
- Military/Defense, possible equipment: Two under wing points for external fuel and/or a center line armed with Minigun or 50' cal M3 heavy machine gun or M60D Machine Guns 7.62 NATO round.

## Design Features of Puma Coaxial VTOL-UAV

### **High Useful Load:**

The absence of a tail rotor from the Coaxial permits all of the engine power to be used by the rotor system for lifting purposes. Therefore, in comparison with a tail rotor configuration, the useful load of the Coaxial is higher. What about Multi-rotor configurations? The substantially lower weight and the lower transmission and shaft power losses of the Coaxial as compared to the tandem configuration gives the Coaxial a useful load advantage over the tandem or any other multi-rotor configuration.

### **Safe Deck and Ground Characteristics:**

In cross winds on a rolling pitching and heaving ship's deck, or on the ground, the following make the handling of the Coaxial much simpler than any other type:

- (1) The inherent torque neutralization characteristics of the Coaxial Rotor System eliminates dangerous inertia and torque effects, ground looping and cross wind effects during quick starts and stops of the rotor system.
- (2) The use of the semi-rigid rotor system assures freedom from ground resonance
- (3) The automatic gust locks in the Coaxial Rotor System prevent blade flapping at low rpm

### **Low Empty Weight:**

The feature that makes the fuselage independent of the lifting system dynamics permits the design of the fuselage to be strictly functional as related to mission requirements. Accordingly, the size of the coaxial rotor system fuselage for the same useful load is smaller than any other type and structurally simpler, resulting in lower fuselage weight. Consider these other weight savings:

- (1) The weight of the Coaxial transmission system for a given horsepower is lighter than the total weight of the two or more transmissions systems utilized in either an anti-torque tail rotor or tandem rotor configuration.
- (2) The total blade area of the Coaxial Rotor is essentially equal to the blade areas of the main rotor of a comparable single rotor and it is slightly higher as compared to other multi-rotor systems.
- (3) The total weight of the fuselage, transmission, and rotor system of the Coaxial Rotor Helicopter is found to be slightly lower than that of an equivalent engine horsepower of a tail rotor configuration and substantially lower than of the tandem or other multi-rotor configurations.

### **Complete Symmetry of the Rotor System:**

The symmetry of the Coaxial Rotor System permits the same aerodynamic efficiency and controllability for flight in any direction; a feature only found in the coaxial.

### **Simplified Rotor System:**

The Coaxial utilizes the semi-rigid type of rotor system without the need for use of mechanical stabilizing devices, thus resulting in a simpler rotor system design and possessing excellent flying qualities. The Puma upper rotor blades are controlled by four internal rods within the perimeter of the upper rotor drive shaft. The simplicity of design yields benefits, such as lower structural weight and reduced manufacturing, and maintenance costs. In addition, this rotor system makes the helicopter **free from ground resonance**. The size of

the rotor diameter in the Coaxial is totally independent of the fuselage. This feature, of disassociating the rotor diameter size from the fuselage, becomes considerably important in the lift capabilities of a coaxial.

### **Freedom from Control Cross-Coupling:**

Control cross-coupling exists in all other rotor configurations, causing control complexity, dangerous flight attitudes, and vibration. Lack of control cross-coupling in the Coaxial Helicopter yields the following advantages:

1. For translational flight along any axis, the movement of only ONE control is required;
2. Control along each axis is powerful, symmetrical, and unaffected by the controls along the other axis;
3. Comparable translational accelerations in all directions are obtainable;
4. Precision handling ability with excellent control– even under adverse cross wind conditions
5. Exact hovering positioning is excellent due to the symmetry of the Coaxial Rotor System.

### **Maintenance:**

- Easier system maintenance, with "black box" or cable change out/swap program
- Detailed diagnostic codes downloaded to a PC for quick, easy troubleshooting
- Dependable diesel power, direct injection requires no tune-ups.

### **Overhaul and Replacement:**

Major Components (Engine, transmission, rotor-head & rotor blades) require overhaul and/or replacement every 2,000 flight hours. (Approximate cost is \$150,000 USD or \$75.00 USD per hour of operation).

Every 2,000 flight hours, the Puma is required to be sent to an authorized facility for overhaul.

- Overhaul: Engine, transmission, rotor head and accessories
- New components: Rotor blades and batteries.
- Upgrades: all current software upgrades are made.

Note: The transmission and rotor head is the same type that is used on Puma Aero Marine heavy lift VTOL-UAV, the "BOSS".

### **Spares:**

Recommended spare parts required for equipment installed on the VTOL-UAV.

### **Warranty:**

All fabrication work unconditionally guaranteed for 12 months. Installed equipment by Manufacture's Standard Warranty guaranteed for 500 hours of flight.

### **Support:**

Provisions made to provide tools and equipment to support the VTOL-UAV operation. All specialty tools and maintenance manuals to include but not limited to operational flight software provision for particular missions.

# PUMA DIESEL VTOL PRELIMINARY SPECIFICATION

- \* Simple to Operate: Heavy Lift Drone Coaxial Helicopter at “Very Low Cost”
- \* Fuselage aluminum welded frame with reinforced Kevlar hand-layup vacuum infused composite skin.
- \* Rotor: 2 X 4 bladed coaxial rotor system with 204 cm by 3.04 meter blades
- \* Blades: Extruded-aluminum rotor blades (NACA 0012 Airfoil)
- \* Endurance – 11 flight hours mission capability
- \* Fuel: Diesel and/or Jet-A Capacity 464.8 liters (123 US gallons)
- \* Operating speed zero to 92 knots
- \* Data Link Range – line of sight from any repeater or via satellite link
- \* Power – Continental Motors CD-245R Turbocharged Diesel 183 Kw (245 hp)
- \* Quiet rotor system and engine
- \* Exhaust splits into twin silencers. The exhaust is augmented with cool air, reducing engine compartment temperature, reducing engine noise and lowering the total heat and noise signature.
- \* Auto Pilot – by Micro Pilot MP2100 series provides:
  - Fly by wire
  - GPS sensing
  - Mission Program flight plans
  - Terrain Awareness & Warning System (CAS)
  - Collision Avoidance System (TAWS)
  - PID feedback loops for camera gyro-stabilization



## Dimension:

- Length overall: 7.14 meters (23' 4")
- Body Length: 6.07 meters (19' 9")
- Height overall: 2.27 meters (7'5")
- Headroom below blades: 1.64 meters (5' 5")
- Rotor Diameter: 6.73 meters (21' 8")
- Main gear wheel width: 2.35 meters (7' 9")



## Weights and Capacity:

- Current estimated empty wt: 506 kg. (1,115 lbs.)
- Gross takeoff wt: 1191 kg. (2,625 lbs.) @ sea level /ISA +20<sup>c</sup>
- Basic Payload with full fuel: 308.9 kg. (681 lbs)
- Fuel (11 hours @ cruise reconnaissance) 376.1 kg. (829 lbs)

## Performance

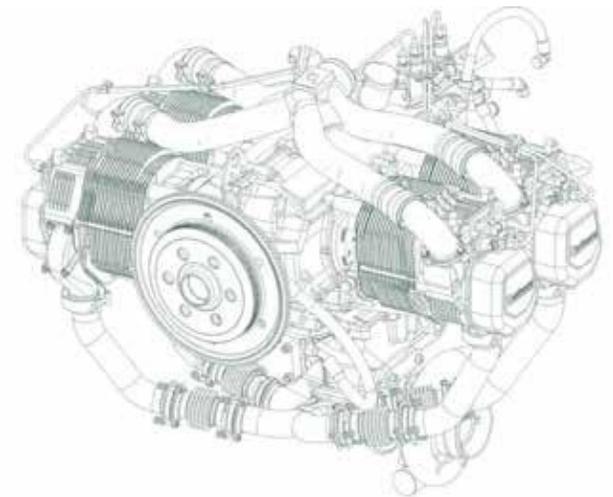
- Reconnaissance speed: 138.9 kilometers per hour (75 knots)
- Cruise speed: 161.1 kilometers per hour (87 knots)
- Maximum speed: 170.4 kilometers per hour (92 knots)
- Service ceiling: 5,334 meters (17,500 ft.)
- Hovering Performance in-ground effect: 3,596 meters (11,800 ft.)
- Six (0:06) Minute Time to Climb: 3,049 meters (10,000 ft.)

## THE MAJOR SYSTEMS:

**Power by:** Continental Motors CD-245R Turbocharged Diesel with outstanding durability and reliability. Diesel engines by design operate continuously in an effective manner, therefore do not require cleaning the emissions of lead. Nitrogen oxides or carbon hydride is reduced significantly. The CD 245R is a horizontal opposed air/oil cooled 4-cylinder turbocharged diesel. The exhaust is augmented with cool air, reducing engine compartment temperature, reducing engine noise and lowering the total heat signature.

### **Engine Technical Specifications:**

- Shaft Power 183 Kw (245 hp)
- Four Electric automatic thermostatically control cooling fans
- Full Authority Digital Electronic Control (FADEC) Unit
- Automatic Clutch Engagement
- Serial Port for Data Retrieval
- Over-speed Protection
- Over temperature Protection
- Low Oil Pressure and High Oil Temperature Protection
- Low levels of vibration and Low Noise level.
- Fuel Type: Jet-A fuel or Ultra-low-sulfur diesel (ULSD)
- Fuel Burn at cruise/reconnaissance power is about 41.4 liters/hr. (10.94 GPH)
- Electrical System: 28VDC / 160 amp alternator Electric Starter
- Start and Operate to 17,500 ft (5,334 m)

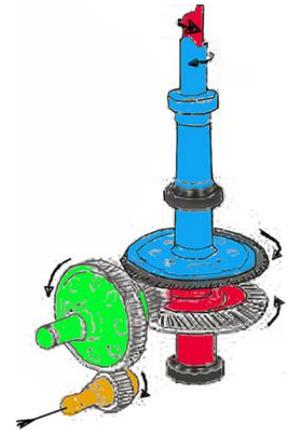


### **Optimal Main Rotor Transmission Design:**

In a Coaxial configuration, the inherent feature of splitting the power input into two paths results in a transmission design internally-balanced, compact and capable of handling greater horsepower input than any other configuration.

The symmetry of the rotor system and the transmission reduces approximately by one half the total numbers of individual components.

The spiral bevel gears forged from 8620 gear steel and heat treated is an important component on coaxial rotorcraft drive systems. These components are required to operate at high speeds, high loads, and for a large number of load cycles. In this application, spiral bevel gears are used to redirect the shaft output from the engine to the vertical rotor.



### **Autopilot:**

MicroPilot's Helicopter Drone Autopilot provides extraordinary user definability.

- Integrated GPS (including GPS receiver, gyros, all sensors and GPS antenna)
- Autonomous takeoff and landing supported by AGL
- User definable PID feedback loops (for camera stabilization etc)
- RPV and UAV modes
- Change altitude at waypoint, change airspeed at waypoint
- User definable holding patterns
- User definable error handlers (loss of GPS, low battery etc.)
- Equipped with an ultrasonic altitude sensor, supports autonomous takeoff and landing
- 150 mips RISC processor accommodates your current needs and tomorrow's requirements
- GPS waypoint navigation with altitude and airspeed hold
- Powerful command sets
- Fully integrated with 3-axis gyros/accelerometers, GPS, pressure altimeter, pressure airspeed sensors, all on a single circuit board
- Extensive data logging and telemetry collects the data you need
- Includes HORIZON<sup>mp</sup> ground control software.

**Transponder:** Transponder and WAAS GPS ADS-B out and in linked back to the operator.

### **High Intensity LED Flood Lighting:**

The high intensity LED flood lights produce 860 lumens each, are arranged in two rows and paired with high purity optics to produce a 20 degree spread spot beam approximately 228 meters (750') long by 23 meters (75') wide.

### **Operator's Camera**

Operator's POV (Point of View) Mounted in the nose, a fixed mounted FLIR day and night camera for the drone's operator.

### **Air to Ground LRAD**

Long Range Acoustic Device (LRAD). Power Sonix 2X1200 watt PSAir32N a non-lethal crowd control tool, communication device, acoustic hailing and siren. See: <https://www.youtube.com/watch?v=1P3FsLMKwJE>

### **Thermal Night Vision Technology:**

The FLIR M400XR comes standard on Puma with an advanced 640 x 480 sensor, delivering crisp thermal video images in total darkness and lowlight conditions. An integrated HD Color visible camera and high intensity LED spotlight augment target identification. Once a target or threat is identified, the M400XR will automatically track the target. M400 has a continuous optical thermal zoom lens (up to 4x) that allows operators to see small objects/targets at longer ranges. Active gyro-stabilization ensures a steady image, plus radar tracking keeps potentially dangerous threats/targets in view at all times. Capable of detecting a man at up to 1.3 n miles and vehicles as far away 3.2 n miles. See: <https://www.youtube.com/watch?v=wgTqVNkHd24>



### **Tactical Operations Recognition Lights:**

High intensity strobe lighting system (Blue & Red) to identify in day and night conditions that the “Puma” is on a Police Tactical Operation or mission if required.



## **SOME OPTIONAL EQUIPMENT AVAILABLE:**

**Cargo Hook:** C2-K-HC DART C-Series Remote Cargo Hook 907 kg. (2,000lbs.) lift capacity – Keeperless with Cage

**VHF/UHF Communications Repeater:** To enhance communications coverage between personnel taking part in an all types of operations.

### **Agricultural Aerial Application and Oil Spill Response:**

Aerial Application and oil spill response utilize a system by Simplex Aerospace with spray boom spans up to 8 meters (26 ft.). Boom's are equipped with computer controlled flow meter atomizer nozzles. Further control of the liquid is provided by the 24 VDC electrically driven spray pump from an optional 227 liters (60 US gallons) hopper tank. .

### **Radar Environmental Surveillance:**

Sea Hawk SHN-X9 Surveillance Radar: for detecting oil spills and Small Surface Targets

- Top of the range displaying performance.
- All IMO display features you would expect.
- Advanced surface detection.
- Small target detection features.
- Oil spill detection features.
- Polar Ice Navigation.

The Sea-Hawk radar SHN X9 is one of the most advanced radars in Sea-Hawk's product line with extreme detection performance characteristics, and in particular in rough weather conditions. This radar is designed for users with very high demands for surface detection such as small and low reflecting objects travelling at high speeds (e.g. RIB's, Zodiacs, jet skies etc.), ships/vessels travelling at high speed, oil spill detection capabilities etc.

Typical users for Sea-Hawk radar SHN X9, on large, High Speed Craft, special task vessels and vessels operating in congested areas, such as Straights and approach areas with special requirements.

Important features:

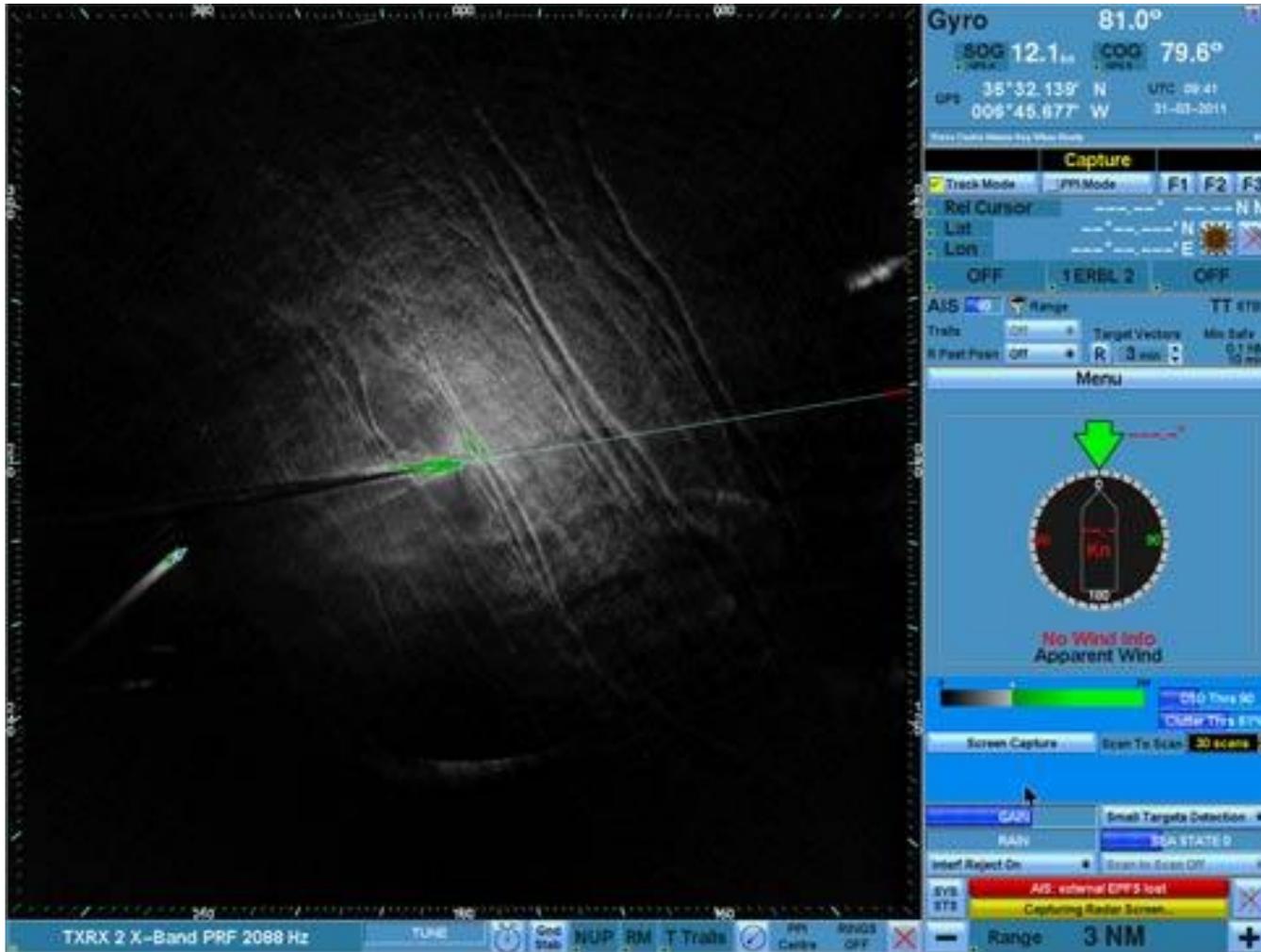
- Extreme detection performance, also in rough weather conditions such as white breaking seas and heavy precipitation
- High Performance Dynamics (i.e. its ability to detect and follow the smallest object/movement at the same time as detecting large objects)
- Detection of small high-speed objects (which often is "lost" in standard navigation radar systems, if detected at all)
- Detection of small and/or low reflection objects on the surface
- Weather protection / reliable operation / long service intervals / life cycle costs
- Also designed for operation in Ex-zones (areas exposed to inflammable gases etc.)
- Easy access to Ray dome for sheltered service/maintenance (bottom mounted)

Anti-piracy detection is also important in windy conditions. In sea-state 4 or higher, small targets become even more difficult to detect for a standard marine radar. Unlike normal X-band radars, Sea-Hawk still provides detailed and reliable data during wind, storm and rain.

Superior surface detection:

If you are looking for superior surface detection for your vessel, a polarimetric radar antenna should be your best choice. The Sea-Hawk radar is your future anti-piracy radar system.

Sea-Hawk polarimetric radars are multi polarized, resulting in far more detailed detection ability than traditional radar systems. Sea-Hawk can detect very small, fast moving objects and would therefore increase your anti-piracy capabilities to a level you could only dream about until recently



## Different Targets

These small and fast targets are obviously very different. It could be a skiff with a powerful outboard motor or perhaps a rapid RIB. In what shape the pirates materialize doesn't matter. They appear on the screen.

Polarization is the key. The size, shape and distance of the moving targets of course reflect the radar signals differently. However, they all generate a wake, which you will easily detect with a Sea Hawk radar, before the target is detected itself.

## Superior small target detection:

If you are looking for superior small target detection for your vessel or for your offshore location, a polarimetric radar antenna should be your best choice. The Sea-Hawk radar is your future small target detection system.

## All kinds of small targets:

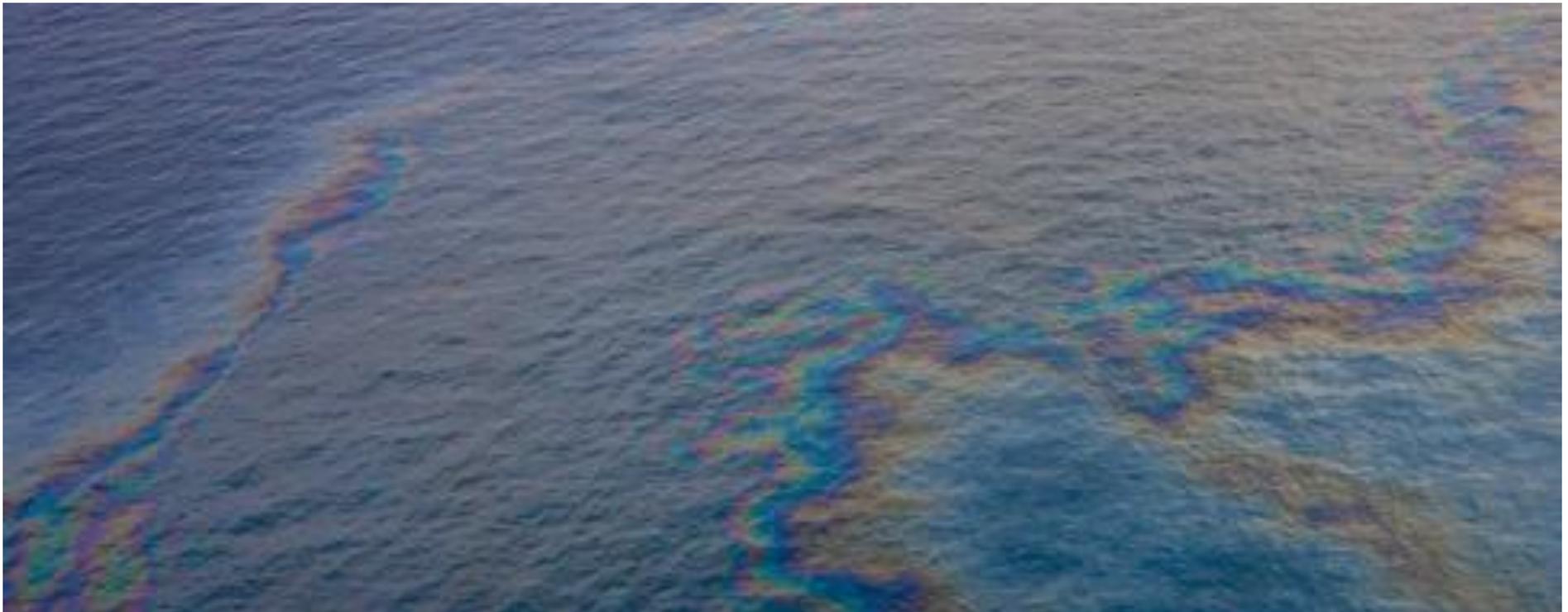
Small targets are obviously very different. It can be a person in the water, a life raft, a little fishing boat, a sailing boat, small fishing markers, driftwood or flotsam/ jetsam (like drifting containers with only one corner visible above the surface).

Polarization is the key. The size, shape and distance of the moving targets of course reflect the radar signals differently. The targets generate fluctuations in the surface. They also generate significant background clutter, in addition to the echo from the target itself.

## Oil spill detection:

Sea-Hawk Radar can detect Oil slicks on the surface, in addition to debris from shipping in harbors and refineries.

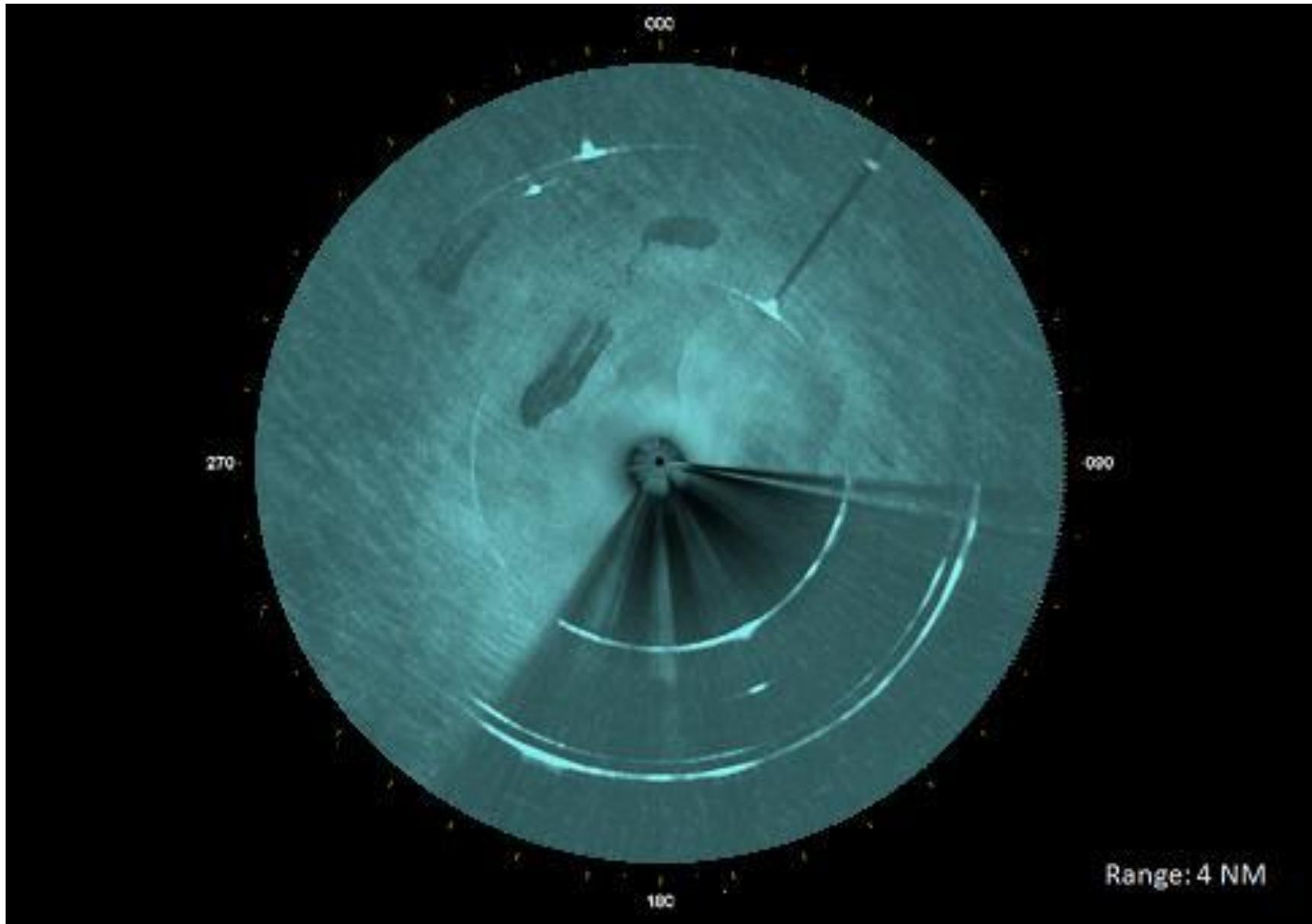
A valuable essential for SARs missions to help locate downed aircraft and ships which have sunk, by their oil slick left behind



Time spilled = oil spilled

Night view – of course

The image shows three oil slicks in the water. This was part of an exercise in the North Sea, where oil was deliberately poured into the sea in order to detect the spill, follow the spreading oil, and finally collecting the oil.



### Behind the scenes:

If you are looking for very detailed surface detection for your vessel, a polarimetric radar antenna should be the solution for you. That is what Sea-Hawk radars are exclusively equipped to do.

Sea-Hawk can detect the surface within the radar horizon, displaying it similarly to an unusually detailed aerial photo. We bring radar detection to a new level, which was unobtainable until recently.



The surface is constantly changing. The Sea-Hawk radar displays oil, dispersants and small work boats simultaneously, thanks to the multi polarized radar and advanced display system. Polarization is the key. The varying distribution of oil on the surface and the different kinds of small targets will produce different radar reflections and hence, different presentations on the radar screen.

If we add windy weather to the scenario described above, with sea-state 4 or higher, surface detection becomes more important. An oil spill quickly becomes more hazardous as the oil spreads faster.

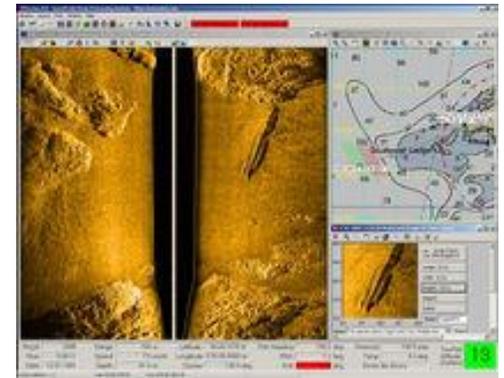
It has been verified that a polarimetric Sea-Hawk radar is able to detect anything on the surface at a much longer distance than a standard navigational radar. The reason for the polarimetric radar's superior detection ability is the combined utilization of different polarizations (horizontal, vertical and circular), while standard navigation radars only utilize horizontal polarization. Furthermore, we are able to process the background clutter from the antenna, and the turbulence and fluctuations naturally produced by the sea.

In calm weather, a vertical polarized antenna is superior for surface detection. The surface echoes are significantly stronger in the vertical plane than in the horizontal plane utilized in ordinary X-band radars.

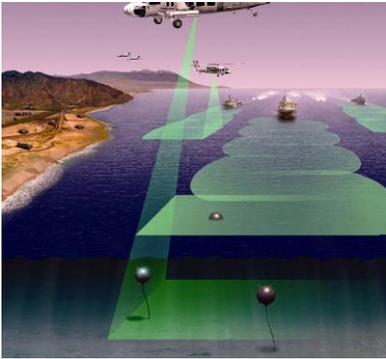
We have verified that Sea-Hawk will detect an extremely thin skim of oil or chemicals, also in calm weather. Again, it is the capability to use the sea clutter information that comes into play here.

### **Side Scan Sonar (high resolution)**

L-3 Communications KLEIN SYSTEM 3000H presents the latest technology in digital side scan sonar imaging. The dual-frequency operation is based on new transducer designs, as well as the high-resolution circuitry recently developed for the Klein multi-beam focused sonar. The System 3000H performance features 445 and 900 kHz frequencies for a variety of applications, including those requiring high resolution operations. The side-scan sonar transducer lowers on a 50-meter (150 foot) cable below the Puma.



### **Airborne Laser Mine Detection System (ALMDS),**



In combination with a high-powered blue green laser fan beam, the system utilizes the forward motion of the Puma in a push broom configuration to generate volume images of surface and near-surface mines. The images are processed by automatic target recognition (ATR) algorithms. This configuration does not have moving parts and allows high system reliability. ALMDS is capable of day and night operations without any equipment modifications.

### **Weather Surveillance Radar**

Twin Garmin GWX 70 Doppler weather radar, one mounted in the nose and a second rear facing unit in the tail. These are an advanced solid-state transmitter design eliminating the need for life limited magnetron tubes, the Garmin GWX 70 comprises the very latest and most reliable technology in onboard weather radar.

#### **Scan with Doppler Accuracy**

Bringing full-color storm cell tracking to your compatible Garmin multifunction display, this Doppler-capable weather avoidance tool combines excellent range and adjustable scanning profiles with precision target definition — for accurate, easy-to-interpret, weather analysis. With operator-adjustable horizontal scan angles of up to 120°, you can easily focus scanning on the areas you want to watch, while vertical scanning lets you focus on storm tops, gradients and cell buildup at various altitudes. Plus, Weather Attenuated Color Highlight (WATCH™) can identify areas beyond the radar's capability that may contain even more hazardous areas of precipitation.

#### **Reduce Mission Operators Workload**

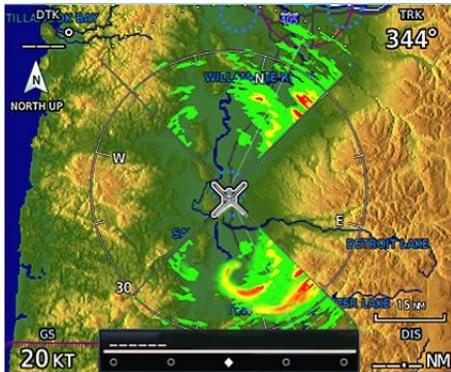
On compatible displays, altitude compensated tilt in the GWX 70 reduces workload by needing to manually adjust the radar's tilt; simply set it once to the tilt angle you want, and it will automatically adjust with any change in altitude. Also, when interfaced with drones, autopilot gyro or AHRS system, the GWX 70 offers full radar stabilization to 30 degrees of pitch and roll. The GWX 70 also has a ground mapping mode that can assist in a number of applications -- including navigation. Ground mapping mode provides a real-time depiction of the terrain below.

## Experience Solid-State Reliability

With its digital design, the GWX 70 provides reduced power consumption and extended life when compared to previous generations of magnetron-based radars. While magnetron tubes degrade or burn out over time, the solid-state technology in the GWX 70 maintains a consistent weather picture its entire lifecycle – all while only using 40 W of power.

## Advanced Features

unlock a wealth of new functionality in your GWX 70, such as ground clutter suppression\*, which identifies radar ground returns and removes them from the display – taking the guesswork out of interpreting what's on your screen. And has turbulence detection\* which can determine areas of turbulence that might contain particulate, like rain or hail.



- **Performance index:** 18-Inch Antenna: 227 dB
  - **Weather avoidance:** 18-Inch Antenna: 320 nm max.
  - **RX sensitivity:** -126 dBm MDS
  - **Manual gain:** +12 to - 64 dB
  - **Antenna bandwidth:** 18-Inch Antenna: 5.3 degrees
  - **Horizontal scan angle:** Operator adjustable; 20, 40, 60 or 120 degrees
  - **Scan centerline:** Pilot adjustable
  - **Scan rate:** 12 looks per minute
  - **Manual tilt:** +/- 15 degrees
  - **Vertical scan angle:** 60 degrees
- Horizontal Scan: Both Units @ 90 degrees



**Vertical Scan Angle:** Both Units @ 60 degrees



**Hangar Nine**  
**1005 Bunker Avenue**  
**Green Cove Springs, FL 34043**  
**Tel: 1 904 638-5888**  
**Email: Sales@PumaMarine.com**  
***www.PumaMarine.com***

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