DMT and MOOG have joined forces to create a drone detection, tracking, and disruption system. Its primary components are DMT’s radar, named the Black Marlin, MOOG’s Mercury S3-550 day/night vision camera. Optional system components include an RF/GPS jammer, RF and Acoustic detectors, and DMT integrated drone command station.

The system has been tested against most commercially available drones as well as some privately built drones.

The product comes in several configurations, from 2 km up to 10 km detection ranges.

DMT’s DCPM is included with the system for stable power and safe communications.
1. Introduction

It used to be commonplace to see radio-controlled airplanes and helicopters enjoyed in select, well-defined fields and clubs around the country. It was a hobby that required flying skills and deep pockets, and the aircraft were hard to fly.

But now quadcopters and other drones are easy to fly and have easy-to-use interfaces. They are affordable to just about anyone who wants one. And the federal laws have relaxed to the point where they can be flown almost anywhere, and they are being flown everywhere.

This creates a wide range of risks for your facility. Someone operating a drone close to your buildings can:

- Record video of who is coming and going;
- Record audio of conversations that take place in certain areas of the building;
- Monitor for RF coming out of the building;
- Intentionally crash into people or objects;
- Drop or release malicious items.

You could spend millions of dollars using military-grade solutions to address these risks. But DMT has brought a complete solution together at a fraction of the cost of military systems.

At DMT, we have determined that most site owners and managers would like a path forward that will allow them to have the flexibility to incorporate the new counter-measures that are becoming available while also taking a decisive step forward at an affordable cost.

For these reasons, DMT has developed with its partner MOOG, a drone detection system bundle. It can be ordered with just the radar, camera, and software, or you can add RF detection, acoustic detection, and jamming systems. Using DMT’s commercial radar product, the Black Marlin as the key detection and tracking system, DMT offers its a la carte c-UAS security solution described in this pages that follow.

All the equipment listed here is available through DMT and is tested together prior to shipment to the customer. DMT warrants the complete system, and offers installation, setup and commissioning, and training. For more information, contact DMT at sales@dmtradar.com.
2. Description

The key Counter-Unmanned Aircraft System (c-UAS) components are:

- DMT Black Marlin radar, which can rapidly scan the entire sky for all types of drones;
- MOOG Mercury S3-550 Thermal and Long-Range Day Camera with video tracking of drones;
- DMT’s DCPM (outdoor enclosure supplying solid-state power and communications to all equipment);
- DMT Remote Client Software, which integrates radar and camera control and comes standard for up to 24 radars and any number of cameras.

The system also includes these options:

- Acoustic Detection System;
- Radio Frequency and GPS Disruption (Jammer) system;
- RF Monitoring System for locating all sources of radio transmissions between drones and handheld controllers;
- Gimbals for other sensors and kinetic defeat systems;
• AIS (Automatic Identification System – used for vessel tracking) and BFT (Blue Force Tracking – used for tracking first responders);
• Command Station with DMT Remote Client Software, all utilities, and all other sensor software installed.

The Black Marlin radar creates a long-range dome (up to 6 km) of protection against drones, and with the DMT Remote Client automatically points the MOOG camera at the drone. At a range of about 2 km, the MOOG camera automatically begins tracking the drone using a built-in tracker and CPU. And between 1 to 2 km away, the optional jammer can stop the drone and force it to land by jamming both the controller signal and its GPS receiver.

Although drones don’t typically fly in foul weather, DMT’s Black Marlin can penetrate precipitation; fog, smoke, and sandstorms to track virtually any threat. The long-range MOOG camera can also see through fog using its black glass filters and thermal imaging. The entire system can be configured for mobile (tripod, trailer, or vehicles), as well as for fixed tower sites.

The systems have been designed to also detect and track:

• Helicopters;
• Ultralight aircraft;
• Walking humans;
• Vehicles;
• Boats (including kayaks, jet skis, fishing boats, commercial vessels).

3. System Component Specifications

3.1 DMT’s Black Marlin Radar

The Black Marlin is a mid-range radar produced by DMT. The system can be ordered in a variety of configurations to perfectly fit many applications and missions, such as:
Figure 3. Black Marlin radar shown here with the radome removed. The top plate spins in azimuth while the antenna scans in the elevation plane.

- Airport Security
- Port Security
- Base Security
- Border Security
- Oil Platform Security
- Drone Detection, and more

The radar is a pulsed-Doppler system, which enables a variety of algorithms to remove unwanted returns (clutter) from generating alarms, such as: windblown grasses and bushes, moving water, blowing trash and debris. It is also what enables the radar to scan over trees and urban areas for drones without false and nuisance alarms. Transmitting at 9.25 GHz (X-Band) and Doppler processing also permits the radar to see through even severe weather. And the Nomex radome seals the radar from sand and moisture, while special coatings on the radome protect it from oil, gas, solvents, UV, saltwater and other hazardous chemicals. Under the radome is the antenna, which can tilt from -35 to +90 degrees (straight up). This is great for drone “hunting” in both urban (such as from roof tops and looking up between buildings) and rural areas. Onboard CPU’s support detection and tracking, which reduces communication bandwidth to the command stations. And the CPU also acts as a server, so many command stations can log onto the same radar without the need of expensive outdoor cabinets and computer servers. The radar amplifiers determine its range and are available from 100 to 800 Watts.
The *Black Marlin* has an instrumented range of 49 km, but the processing loads associated with Doppler and the effective range to around 15 km when spinning 360 degrees. A walking person of average height and build would be detected at about 2-3 km for the 100 W system, depending on the severity of the weather, the terrain, and the mounting height of the radar. In average water conditions, a small boat would be seen from 3 to 6 km. An 800 W system will see a walking person from 6-9 km, and a car much farther. A small boat will be seen in excess of 12 km. Drone detection range varies with drone size and amplifier selection. Ranges of up to 2 km are possible with the 100-300W systems, and up to 6 km with the 800W system for common drone types. Using Doppler analysis, the *Black Marlin* radar can be used to characterize threats, such as man, vehicle, vessel, and drone.

The *Black Marlin* radar comes with an outdoor enclosure (named the DCPM) that supplies conditioned DC power to the radar and includes weatherproof RJ/45, multimode, or single mode fiber ports. Cameras can also be powered from this device. Other add-ons are available, such as AIS and GPS Tracking (Blue Force Tracking).

The *Black Marlin* has 100% field replaceable assemblies, so the radar can be repaired at the installation site. The operating system on the radar is Windows 7 Embedded, so DMT’s radar application can be easily updated using the drag-and-drop feature within Windows’ Remote Desktop. The radar software has built-in test software and hardware for identifying problems with all aspects of the radar.

For longer range applications, use DMT’s XRDS, (Water or Land) LDSR (Land) and Spearfish (Water) radar systems. DMT recommends a combination of the DMT XRDS and DMT Black Marlin Radars for critical sites. The XRDS can search the horizon to 12 km for drones, and the tracked drones can then be handed off to the Black Marlin while the XRDS continues its search for more drones approaching.
## Black Marlin Specifications

<table>
<thead>
<tr>
<th>Parameter/Capability</th>
<th>Value/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitted Frequency:</td>
<td>X-Band, 9.25 GHz</td>
</tr>
<tr>
<td>Radar Type</td>
<td>Pulsed Doppler</td>
</tr>
<tr>
<td>Peak Radiated Power:</td>
<td>The radar can be ordered with the following amplifiers:</td>
</tr>
<tr>
<td></td>
<td>100-Watts: -400 Watts</td>
</tr>
<tr>
<td></td>
<td>200-Watts: -500 Watts</td>
</tr>
<tr>
<td></td>
<td>300-Watts: -800 Watts</td>
</tr>
<tr>
<td></td>
<td>Amps are gated, solid-state GaN amplifiers</td>
</tr>
<tr>
<td>Antenna Beamwidth:</td>
<td>Azimuth beamwidth 7 degrees, Elevation beamwidth 7 degrees, Gain: 28 dB or</td>
</tr>
<tr>
<td></td>
<td>Azimuth beamwidth 4 degrees, Elevation beamwidth 12 degrees, Gain: 28 dB</td>
</tr>
<tr>
<td></td>
<td>Azimuth beamwidth 4 degrees, Elevation beamwidth 7 degrees, Gain: 30 dB (default,</td>
</tr>
<tr>
<td></td>
<td>and recommended for drones)</td>
</tr>
<tr>
<td>Polarization:</td>
<td>Select on order: Horizontal or Vertical Polarization for 7 x 7 antenna,</td>
</tr>
<tr>
<td></td>
<td>Horizontal Polarization for 4 x 12-degree antenna, H or V Pol for 4 x 7-degree</td>
</tr>
<tr>
<td></td>
<td>antenna</td>
</tr>
<tr>
<td>Pulsewidth:</td>
<td>&lt;50ns to &gt; 500 nanoseconds (select from GUI)</td>
</tr>
<tr>
<td>PRF Rate:</td>
<td>2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 kHz (selectable from GUI;</td>
</tr>
<tr>
<td></td>
<td>others available on request)</td>
</tr>
<tr>
<td>Scanning:</td>
<td>• Continuous 360 degrees rotation, or</td>
</tr>
<tr>
<td></td>
<td>• Sector Scanning (scanning between two angles of 1 to 360 degrees)</td>
</tr>
<tr>
<td>Tilt (Elevation):</td>
<td>Optional Tilt Motor will scan -30 to +90 degrees with 7x7 degree antenna and -30</td>
</tr>
<tr>
<td></td>
<td>to +60 degrees for 4 x 12 and 4 x 7-degree antenna</td>
</tr>
<tr>
<td>Range Gates:</td>
<td>1.5, 3, 6, or 12 meters (select from GUI)</td>
</tr>
<tr>
<td>Range Accuracy:</td>
<td>&lt;&lt; 10 meters</td>
</tr>
<tr>
<td>Maximum Range:</td>
<td>49 km (practical range limit is 15 km)</td>
</tr>
<tr>
<td>Doppler Resolution:</td>
<td>Nominal setting for most installations: &lt;&lt; 3 cm/s</td>
</tr>
<tr>
<td>Radar Positioner:</td>
<td>• Uses Greaseless motors with &gt; 15 year MTBF and Kevlar (or similar) belts for</td>
</tr>
<tr>
<td></td>
<td>long life (&gt; 4 years for most sites)</td>
</tr>
<tr>
<td></td>
<td>• Maximum rotation speed: 300 degrees per second</td>
</tr>
<tr>
<td></td>
<td>• Variable Speed Motors, with two modes of operation:</td>
</tr>
<tr>
<td></td>
<td>o Select from 1 to 300 degrees per second from GUI</td>
</tr>
<tr>
<td></td>
<td>o Select Autoscan, which sets the best motor speed</td>
</tr>
<tr>
<td></td>
<td>dynamically based probability of detection and range</td>
</tr>
<tr>
<td></td>
<td>for any given look direction</td>
</tr>
<tr>
<td>Minimum Doppler Detectable</td>
<td>0 m/s</td>
</tr>
<tr>
<td>Maximum Doppler Detectable</td>
<td>Based on PRF selected from GUI</td>
</tr>
<tr>
<td></td>
<td>Example: 7 kHz yields +/-127 mph (+/-204 km/h)</td>
</tr>
<tr>
<td><strong>Speed Measurement Accuracy:</strong></td>
<td>Dependent on settings for PRF and number of pulses integrated. Typically, it is to within 0.25 mph (0.4 km/hr). Higher accuracy maybe set through the GUI.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Pulse Integration:</strong></td>
<td>Coherent pulse integration of 64, 128, 256 (default setting), 512, or 1024 pulses.</td>
</tr>
<tr>
<td><strong>Communications:</strong></td>
<td>Weatherproof RJ/45 connector for TCP/IP network connections. (See External Enclosures)</td>
</tr>
<tr>
<td><strong>Operating Temperature:</strong></td>
<td>-40 to +65 degrees C</td>
</tr>
<tr>
<td><strong>Operating Wind Speeds:</strong></td>
<td>In excess of 300 kph sustained</td>
</tr>
</tbody>
</table>
| **Power Requirements:** | • 110 and 220 VAC 50, 60 Hz  Autosensing  
• Option: 48 VDC |
| **Size:** | 77.12 cm (28 inches) in diameter, 66.04 (26 inches) in height |
| **Weight:** | 30 to 34 kgs (66-75 lbs), varies depending on options |
| **Modes of Operation:** | • Autonomous (continuous 360 degrees or between start and stop angles)  
• Search zones (defined by drawing on coverage area on a map using a mouse)  
• Point-to-Click (point on map to point radar) |
| **Tracking Internal Radar Operating System:** | Multiple track algorithms selectable from GUI  
Windows 7 Embedded |
| **User Interface Software:** | • Windows standard software interface (Windows 7, 8.1, 10 (32-bit or 64-bit)  
• Map, drawing or aerial image/photo overlay of data  
• Video from Cameras also can be displayed in interface  
• Slew-to-cue of cameras (automatic pointing of camera)  
• AIS Feeds can be viewed and are correlated with radar tracks  
• GPS Tracking Devices can be viewed and are correlated with radar tracks |
| **Mission Option Buttons** | Customer can construct any number of missions, which may be assigned to mission option buttons. When selected by the operator, the missions automatically sets radar parameters, search areas, motor speeds and tracker settings. |
| **Compliancy:** | • TACCS Priority 5  
• Mariner CommandBridge  
• Boeing VSOC  
• Harris C4ISR  
• Lockheed C4ISR  
• RaptorX  
• ICD-0100, ICD-0101  
• NMEA 0183  
• DMT Open Format  
• REST web service |
| **Data Recording:** | Available recording:  
• Raw I, Q Data (on radar only)  
• Detections and Tracks |
| **Alarm logs:** | Date, time, position, bearing, range, strength, speed, track maturity |
| **Doppler Signatures:** | Radar is capable of generating the full Doppler Signature of detected objects in real time. |
| **Scheduling:** | Event scheduler, which includes weeks, weekends, daily, start/stop time, sweep patterns, blanking zones, radar setup. This should be part of the software interface. |
### Brackets:
A Rohn 2 G 45G (default), 55 G or 65G tower bracket should be included with pricing. Schedule 80 8-inch pipe mounts, trailer mounts, wall mounts and telephone pole mounts available. Custom mount on request.

### Radomes:
- **Material:** NOMEX.
- **Coatings:** Coatings to protect against wind, oil, gas, solvents and abrasion
- **Colors:** White, Sand, Gray (default), Green (extra cost).
- **Sheen:** Gloss or Satin sheen
- **Camera Mounts:** Radome has a threaded hole pattern on top for mounting cameras. Additional mounts available for heavier, long-range cameras.

### Connectors:
Twist-on style connectors that feed power and all signals (including network).

### MTBF:
Designed to be years of operation at 24 hours/day, 7 days a week. MTBF: > 4 years.

### IP Rating
- **IP Rating:** IP66

### Required Maintenance:
- No required maintenance for 4 years. Periodic radome cleaning & inspection as needed.

### Other Standard Items
- GPS for monitoring position on earth and altitude
- BITE/BIT for motors, RF transceiver, communication, and electronics

### External Enclosures
- DCPM provides conditioned DC power to the XRDS and any other camera accepting 24VDC. It also acts as the communication hub. The DCPM includes:
  - AC/DC power supplies
  - 4-port video server, Ethernet switch, conditioned autosensing AC-DC solid-state power supplies are included.
  - Fiber adapter for single mode fiber (MMF also available).
  - Illuminated external power switch bank for DCPM, radar, cameras, and Accessory Boxes
  - Circuit breakers inside DCPM for radar, associated cameras, and other equipment
  - Remote power toggle for radar and cameras (controlled via DMT software)
  - Available in a matching radar color (powder coat) or stainless steel (additional cost).

### Accessory Enclosures
- Accessory Enclosures can be connected to the DCPM or purchased with external power and communications. Accessory enclosures are used for AIS and GPS Tracking receivers. The DCPM has an Accessory port, which supplies power and network communications to the Accessory Enclosure. The Accessory Enclosure can be purchased for other types of hardware that needs 24 VDC, 12 VDC, and Network communications.
3.2 **MOOG Mercury S3-550 Camera**

The MOOG camera includes both day and night vision cameras on a common, rugged pan-tilt unit (PTU). Embedded in the camera is a tracker board with electronics for automatic tracking of drones (and other desired objects). The camera control and video feeds are available within the DMT Remote Client Software. After the DMT radar detects the drone, it points the camera automatically. Once the confidence level of the internal camera tracker is achieved, the camera will then begin to track the drone itself.

### MOOG Camera Specifications

#### Thermal Camera Performance Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Type</td>
<td>Cooled MWIR InSb</td>
</tr>
<tr>
<td>Focal Length/F#</td>
<td>30 mm to 550 mm; f/4.0</td>
</tr>
<tr>
<td>Sensor Size</td>
<td>640 x 512 pixels, 15 μm pitch</td>
</tr>
<tr>
<td>Spectral Band</td>
<td>3 to 5 μm</td>
</tr>
<tr>
<td>Video Format</td>
<td>NTSC or PAL</td>
</tr>
<tr>
<td>Features</td>
<td>Auto Focus, Sharpness, AGC, Level Controls</td>
</tr>
<tr>
<td>Video Output</td>
<td>IP Video. Analog Video Output Optional. Video Format is SD-SDI to Encoder.</td>
</tr>
</tbody>
</table>

#### Visible Camera Performance Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens</td>
<td>15.6-500 mm Day/Night/NIR Corrected Lens with optional Black Glass, Auto Focus, Fog Mitigation, and 32x zoom lens. F3.9-F16</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.009 lux (COLOR, F1.2 AGC: 75dB, Gamma: High, SENS UP: OFF)</td>
</tr>
<tr>
<td>Sensor</td>
<td>1/1.9”, 16x9, 2.38 Mega Pixel CMOS Sensor, NIR Sensitive</td>
</tr>
<tr>
<td>Video Processing</td>
<td>Adaptive Fog Reduction (AFR) allows camera to see through fog, dust &amp; smoke real time.</td>
</tr>
<tr>
<td>Video Output</td>
<td>HD H.264 and Optional Analog SD Video. HD-SDI to Video Encoder (1080p/60Hz)</td>
</tr>
<tr>
<td>Housing</td>
<td>Reinforced Housing with HD Glass</td>
</tr>
</tbody>
</table>

50% Probability DRI; Target 2 degree delta T vs background; Clear Atmosphere/Low Turbulence. Actual range performance may vary based on a number of conditions and the drone type.
## 3.3 Options

There are many options for this system, including the ability to bring the drone down. Although the default for the camera is to supply video tracking, the system may be ordered without it. Audio Detection and RF Monitoring systems are important for identifying the type of drones, and the locations of hand controllers.

<table>
<thead>
<tr>
<th>Options</th>
<th>Video Tracking:</th>
<th>RF/GPS Disruptor:</th>
<th>Audio Detection System:</th>
<th>RF Monitoring Sensor:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multi-Algorithm Tracking. Located on Positioner (no External Box Required).Selectable Edge, Mass and Intensity Centroid, Vector† and Correlation ModesMulti-Target Detection, Acquisition and TrackRobust Intrusion Detection, Coast and Target RecoveryAdvanced Motion Compensation FilterZoom Lens Scaling and CorrectionUser Text Annotation and Graphics</td>
<td>Effective Range: 1 and 2 km options availableISM Jamming Frequencies: ISM and UHF-HAM bands being used by commercial drones.GPS Jamming Frequencies: GPS frequencies using shaped beam to minimize inadvertent GPS disruption.Applicability: Effective against all commercial class I and II UAS using ISM, UHF-HAM and GPS frequencies for communications. In addition, is effective against a range of customer built and modified class I and II UAS.</td>
<td>• MIL-grade System• Partial geo-referencing capability• Steer/Focus Audio Beams without moving parts• UAS detection/classification• Fielded systems in use with military and other agencies• 500 m performance, depending on environment</td>
<td>• MIL-grade System• Continuously monitor signals, analyze spectrum occupancy, and identify interference between 9 kHz and 8.5 GHz.• Full geo-referencing capability• Fielded systems in use with military and other agencies</td>
</tr>
</tbody>
</table>
4. **DMT Remote Client Software**

The DMT Remote Client Software supplies monitoring and control of the following radar systems:

- **Black Marlin**
- **XRDS**
- **Spearfish**
- **LDSR**
- **MDR**
- **IDAR**
- **Dorado**

Those radar systems listed in red boldface type above are drone detection radars. Although any DMT radar can potentially be a drone detection radar, the one’s listed in red have elevation motor options. Elevation motors result in the best drone detection and camera pointing.

The DMT Remote Client is a map interface, which plots the radar tracks of detected objects on the map. Up to 24 radars can be monitored and control from one instance of the software. 48, 96, and 120-radar versions are also available at an added cost. Any number of cameras may be monitored/controlled from the interface and is usually limited only by the network capacity for video. The cameras that can be controlled by the DMT Remote Client are:

- MOOG (all PTU models, and most camera models);
- FLIR (all models);
- Axis Cameras (all dome camera models);
- General Dynamics EOSS Cameras;
- Pelco Cameras (all dome camera models);
- EMX Cameras (all models);
- IEC Cameras (all models);
- PVP Cameras (all models);
- Any Camera using the Pelco-D control format;
- And many more.

The software can also control and/or monitor:

- Automatic Identification Systems (AIS);
- Blue Force Trackers (BFT);
- Unattended Ground Sensors (UGS);
- Loud Hailers;
- Security Sensors (switch closures, etc.);
- Video Encoders (Axis, Moxa), and video streaming (including VLC);
- And more.
The software has a built-in correlation engine, so it can determine tracks from overlapping radars are, in fact, just one intruder. It also performs data fusion of radar tracks with tracks from AIS and BFT receivers. This is a valuable function for police or military forces that must respond to the threats.

A built-in webservice in the DMT Remote Client has been used by many Situation Awareness Software packages. Examples of software integration include:

- Boeing’s VSOC;
- Mariner CommandBridge
- TACCS Priority 5
- Harris Corporation C4I System
- Proximex
- Greutebruck
- General Dynamics C4I System
- Raytheon C4I System
- Thales C4I System
- Lockheed C4I System
- Cameleon
- Lenel OnGuard
- RaptorX
- COTS (Cursor on Target)
- Milestone, Avigilon, and many other VMS providers.

The DMT Remote Client software includes these features:

- Mission Options (one-button implementation of all DMT radar parameters);
- Search Areas (areas the radar will search for intruders, and is drawing using the mouse);
- Unlimited Warning and Alarm Zones that can be drawn on the map with the mouse;
- Scheduler (event and calendar-based schedule implementation);
- Radar Track Logging, Video recording and snapshot recording;
- Web Service (for 3rd-party communication);
- Correlation of AIS, BFT and between multiple radars;
- And much more.

For drone detection, the DMT Remote Client uses the Doppler signatures and object behaviours to characterize a drone from other types of objects.
Figure 4. This shows the DMT Remote Client Software and Black Marlin radar being tested against a DJI Phantom 4 drone. The protective radome has been removed from the radar and is resting on the ground in these pictures.

Figure 5. DMT Remote Client showing the detection and track of a DJI Phantom 4 out to about 2 km.
Figure 6. Flow chart for radar, cameras, other receivers, and software.

Figure 7. Typical display setup with DMT Remote Client Software.

Sales Information about this product: sales@dmtradar.com, +1-703-291-1524
DMT Corporate Offices in USA: Palmetto, FL; Forest, VA
DMT Support Offices: Palmetto, FL; Lafayette, LA; Riyadh, Saudi Arabia; Milan, Italy; Perth, Australia
5. Export Concerns

The Black Marlin, DMT Remote Client Software, and DCPM are exportable to most countries around the world, with an EAR-99 classification. The export all other equipment described in this document (including cameras) may be subject to either US Commerce or US State Department regulation and may require export licensing.

6. Representations and Trademarks

The information found in this document is copyrighted material, and cannot be copied, duplicated or paraphrased without written consent from DMT. The system is also trademarked in the USA as the Gauntlet. Contact DMT at sales@dmtradar.com for permissions to replicate any portion of this document.

7. Contacting DMT

Contact DMT for more information regarding this product.

In USA and Worldwide Contact: sales@dmtradar.com. 703-291-1524
Middle East: Contact Fahmi Al Ubbad, fahmi@dmtradar.com.