



# MOBILE GROUND TO AIR RADAR JAMMING SYSTEM

## THEORY OF OPERATION FOR U.S. SYSTEM TEST

Prepared for:  
Federal Communication Commission

Prepared by:  
ATK Tactical Systems  
13133 34<sup>th</sup> Street North  
Clearwater, FL 33762

PROPRIETARY DATA

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## TABLE OF CONTENTS

SUBJECT	PAGE
1. Overview of MGARJS .....	3
2. Major Components for U.S. Systems Test .....	4
2.1 ECM Station .....	4
2.2 Command Post .....	4
2.3 Wireless Wide Area Network .....	5
2.4 ESM Station .....	5
3. Test Site Locations for ECM Stations .....	6
3.1 ATK Missile Systems Company .....	6
3.2 Remote Test Range .....	7
3.3 Picnic Island .....	8
3.4 Remote Site at Brandon, Florida .....	8
4. Proposed Frequency and Output Power Requirements .....	9
5. Electronic Warfare Simulator .....	9
6. References for Photographs .....	9



## 1. Overview of MGARJS

The Mobile Ground to Air Radar Jamming System (MGARJS) mission is to detect airborne radar systems operating between 8 GHz to 18 GHz. The radar classifies the signal as friend, foe, or unknown based on a user library. The system will then produce a jamming signal as a countermeasure to the identified threat. The customer for the MGARJS program is the Arab Republic of Egypt. For the U.S. Test of MGARJS, all foreign government representatives will have restricted access only to the ATK Clearwater Facility. All personnel performing tests at remote sites from the company plant will be ATK personnel, who are U.S. citizens. MGARJS will have 1 Command Post, 4 ECM's (Electronic Countermeasures Station), 1 ESM (Electronic Support Measures Station), 1 RDS (Remote Display System), and 1 FMS (Field Maintenance Station). Figure 1 shows the equipment used for MGARJS.

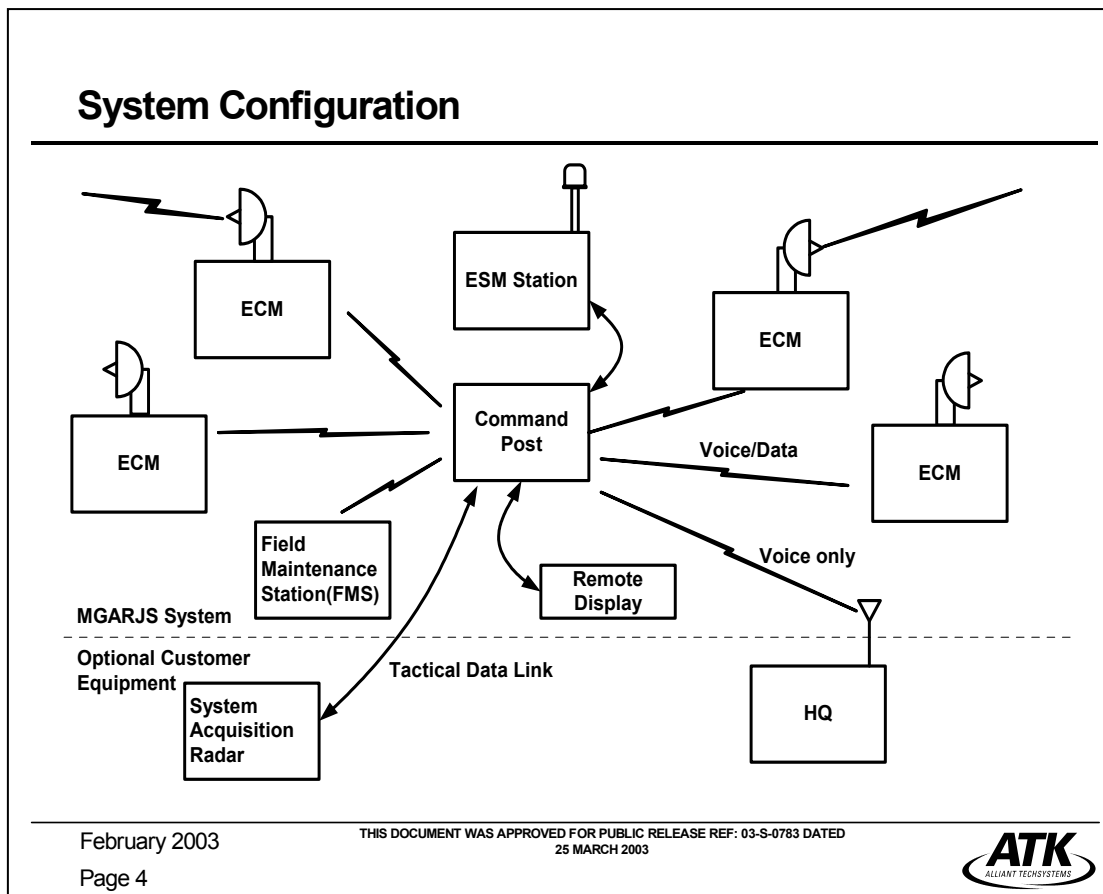


FIGURE 1 – MGARJS System Configuration



## 2. Major Components for U.S. Systems Test

### 2.1 ECM Station

The ECM is the unit that provides the jamming capability. The Electronic Countermeasures station (ECM) has over 19 different programmable noise and deception techniques. The ECM will output 250 kilowatts of effected radiated power towards the identified threat. The frequency range is from 8 GHz to 18 GHz. The ECM's will be at least 100 meters away from any other station, with one ECM being located 25 miles away from the command post. Figure 2 is a picture of the ECM exterior.



FIGURE 2 – ECM Station Exterior

### 2.2 Command Post

The Command Post collects data from both the Electronics Support Measures (ESM) and ECM stations. It also performs triangulation, tracking and correlation functions. The command post will assign threats to ECM stations for tracking and jamming. This station is the heart of the MGARJS program.



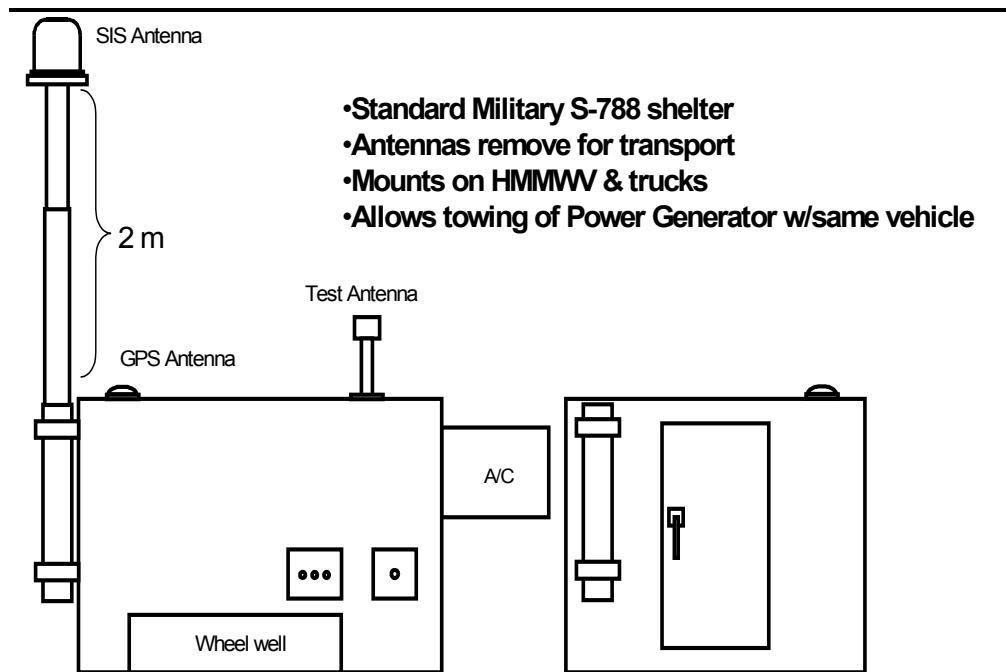
### 2.3 Wireless Wide Area Network

Communication between the command post and other stations will be done using a wireless wide area network (WWAN) with an operating frequency of 890 MHz to 915 MHz or from 1.9 GHz to 2 GHz. For voice communications, a VHF Transceiver will be used that operates from 30 MHz to 89.975 MHz with a maximum power output up to 50 watts.

### 2.4 ESM Station

The ESM responsibility is to receive the radar pulses and attempt to match the specific emitters to an emitter in the user library. The ESM does not transmit any signals for jamming purposes. The ESM operates from 2 GHz to 18 GHz. A test antenna is located on top of the Electronic Support Measures Station. The purpose of the test antenna is to perform a self-test operation of the SIS Antenna used to receive enemy radar signals. The test antenna will also operate from 2 GHz to 18 GHz with a maximum output power of less than 5 Watts.

#### ESM Station – Exterior



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Page 7

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FIGURE 3 – ESM Station Exterior



### 3. Test Site Locations for ECM Stations

Figure 4 shows the two counties, Pinellas and Hillsborough, where MGARJS will be tested in Florida.



FIGURE 4 – U.S. Test Site Locations for MGARJS

#### 3.1 ATK Missile Systems Company

Of the 4 ECM's to be used in the U.S. Test, **only 1 ECM station will be used for jamming purposes.** That ECM unit will be located approximately 400 meters from the ATK facility in Clearwater, Florida at 13133 34<sup>th</sup> Street North. Jamming equipment will not be placed in the remaining 3 ECM's. The Command Post, ESM and RDS will also be positioned at the same location. Figure 5 shows an aerial photograph of where the equipment discussed above will be placed. The other ECM's will be used to test the communication links only for MGARJS. The communication link frequencies are the same frequencies as stated for the WWAN.



FIGURE 5 – ATK Missile Systems Company in Clearwater, FL.

### 3.2 Remote Test Range

The second ECM will be placed at ATK Remote Test Range, which is located at 10901 28<sup>th</sup> Street North, St. Petersburg, Florida. This location is approximately 1.25 miles from the ATK Clearwater facility. Figure 6 shows the location of the Remote Test Range. When this aerial photo was taken, the ATK Remote Test Range had not been built.



FIGURE 6 – Remote Test Range in St. Petersburg, Florida



### 3.3 Picnic Island

The third ECM will be located at 7404 Picnic Island Boulevard, Tampa Florida during the U.S. Test of MGARJS. The unit will be transported to Picnic Island only to test the communications link to the Command Post at the ATK Clearwater Facility. Figure 7 is an aerial photo of Picnic Island.



FIGURE 7 – Picnic Island in Tampa, Florida

### 3.4 Remote Site at Brandon, Florida

The final ECM will be located near the Sears Auto and Tire Center at 686 Brandon Town Center Mall in Brandon, Florida. Figure 8 is an aerial photo of the proposed site.



FIGURE 8 – ECM Test Site in Brandon, Florida





#### 4. Proposed Frequency and Output Power Requirements

The frequencies to be used for the U.S. System Test along with the maximum output powers are listed in Table 1.

<u>Frequency (MHz)</u>	<u>Output Power (Watts)</u>
30 – 108	50 (ERP)
903 - 928	4 (ERP)
9000 - 10000	230 K (ERP)
10000 - 12000	230 K (ERP)
16000 - 17000	230 K (ERP)
2000 - 8000	79 (ERP)

TABLE 1- U.S. System Test Frequency Plan

#### 5. Electronic Warfare Simulator

In order to simulate an enemy radar system, ATK Missile Systems Company will be using a Flight-Line Advanced Multiple Environment Simulator (FLAMES) developed by Northrop Grumman Amherst Systems, Inc. The FLAMES unit can provide various combinations of emitters containing pulse radars, pulse Doppler radars, and continuous wave (CW) radars. The frequency range of the FLAMES is from 2 GHz to 18 GHz with a maximum RF output power of +15 dBm (0.032 Watts). The RF output from the FLAMES unit will go through a 20 Watt Power Amplifier. The Power Amplifier has a frequency range from 8 GHz to 18 GHz. Communication and Power Industries are the manufacturer of the power amplifier. A DRG Series Horn Antenna from Antenna Research Associates is the last stage of the electronic warfare simulator. The antenna has a frequency range from 1 GHz to 18 GHz. The maximum power the antenna can handle at CW power is 400 Watts. All of the above equipment will be located at ATK's main facility at 13133 34<sup>th</sup> Street North, Clearwater, Florida 33762. The contract number for this program is Cairo/F/ER/ATK/2003/3.

#### 6. References for Photographs

All of the photographs for Figures 4 through 8 were obtained from MapCard Version 2.0 software. MapCard includes a Digital Map Warehouse that allows instant access to over 55,000 USGS topographic maps and over 100,000 USGS aerial photos. The company website address is [www.mapcard.com](http://www.mapcard.com).