



## Senior Design Project in Electrical & Computer Engineering



# Testing Methodology of VHF-DF

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Sponsor: U.S. Coast Guard Headquarters (G-AND)

### Project Background

The objective of this project is to modernize and upgrade the National Distress and Response System. The team known as Rescue 21 has taken on this modernization project. The ultimate goals of the system are:

1. Update hardware of the current system.
2. Provide automation in areas where there was previously none.
3. Fill coverage gaps across the United States.
4. Link or Network systems on the coasts. (No localized direction finding.)

The Coast Guard awarded General Dynamics the contract to build a system to meet these needs. Their system is built and ready for testing. The above goals will lead to a distress and response system that is faster and more accurate. Due to the more accurate system, search and rescue teams will be able to search smaller areas, locate missing boaters faster and distinguish between legitimate and false distress calls.

### Project Plan

Over the next year, I will procure the mobile radios from Key Radio Systems in the UK, build the test system and do field testing. Field testing will be broken into three parts:

1. Stationary testing to verify the device can accurately direction find.
2. Mobile testing on different modes of transportation
3. Testing in different weather conditions for each situation above.

The second and third part cannot be completed unless the first part has proven accurate. Once all the testing complete, the device will be released to General Dynamics to test the final system.

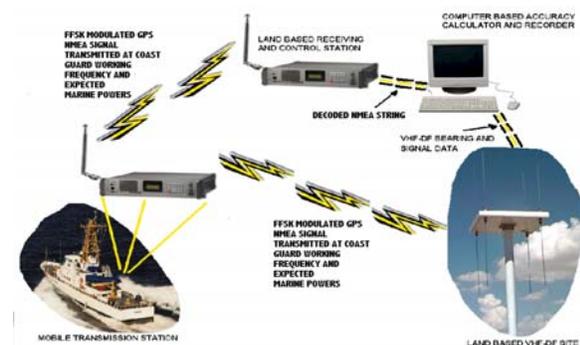
### Project Deliverables

The project deliverables are:

1. Radio modems with programming and operation manuals.
2. Software and hardware interface for interaction between the computer and the radio modems.
3. Specific site methodology test plan.
4. Finalized testing system after field testing.

### Project Work

The project requires the development of a testing device to verify the accuracy of the General Dynamics system. The proposed testing device for the system is shown below:



The Rescue 21 team has set the following requirements for the actual system that General Dynamics is building:

1. Accuracy within plus or minus two degrees
2. At a minimum, provide one line of bearing (LOB) to a voice transmission.
3. Maximum search area encompasses within the search pattern not to exceed 25 square nautical miles.

These requirements needed further clarification in order to define tests that would meet these specifications. During 2002-2003, the following additional specifications for the testing device were developed by USCGA. The additional requirements are:

1. Electric Field of 1 micro volt per meter
2. Frequency within 150.000-165.000 MHz
3. Signal to Noise Ratio (SNR) of no greater than 15 dB
4. The power ratings should be 1, 5, and 25 watts

These specifications are in order to simulate expected marine transmissions. The ultimate goal of the system is to verify that the system General Dynamics built for the Coast Guard actually finds accurate position information within the specifications given by the Rescue 21 team.