Broadband Communication Payload for Search and Rescue Operations

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Background

- Several ships have been severely damaged, and they can't return to shore
- These ships and yachts must be located so that search and rescue (SAR) operations can be deployed
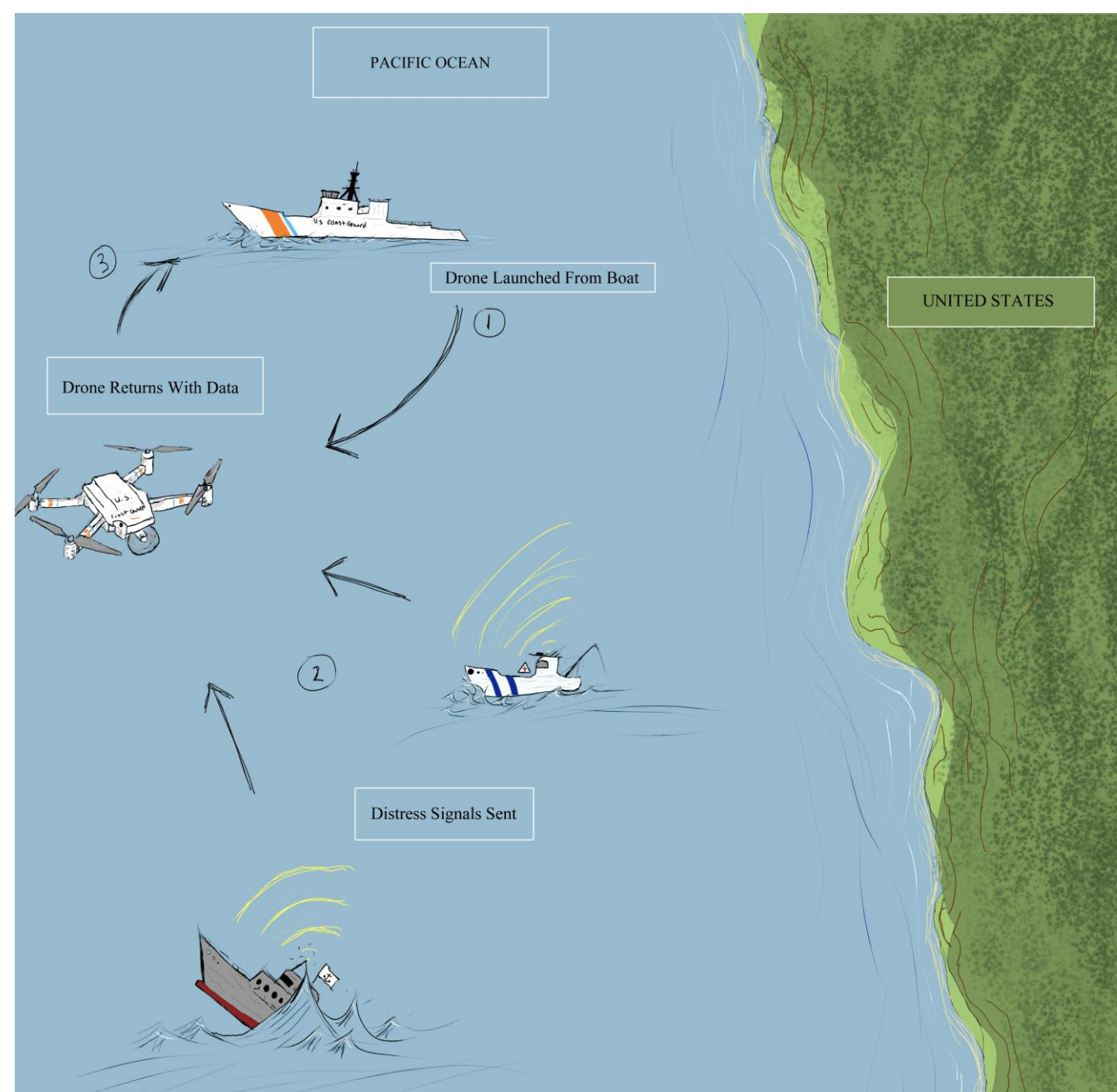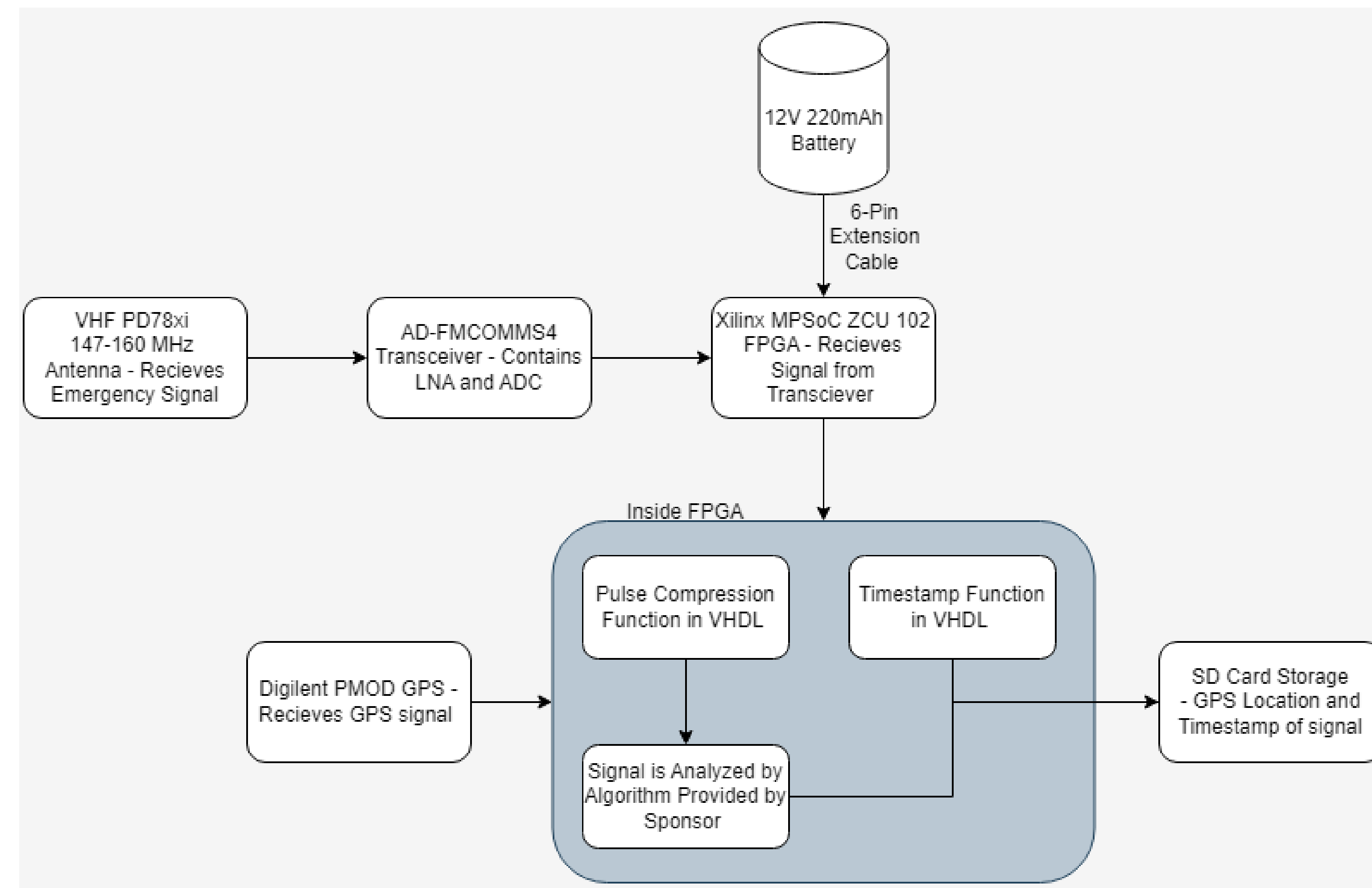- The team is to design a communication payload device to attach to a deployable drone
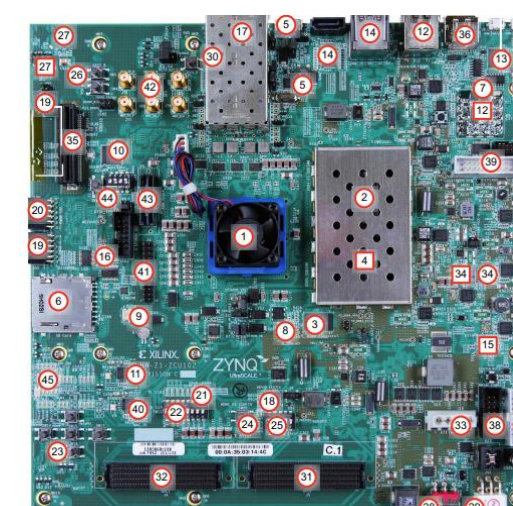
Figure 1 – OV-1 Diagram

Targets

- ❖ Detection of distress signals
- ❖ Support of FPGA code
- ❖ Independent battery source
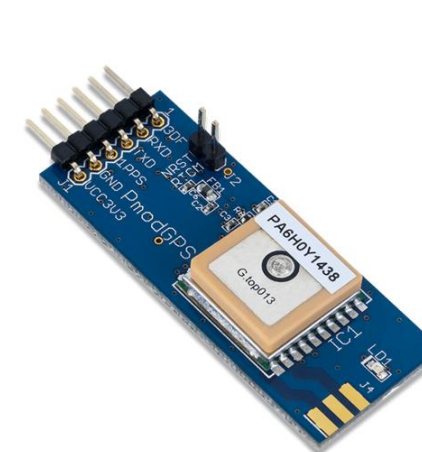- ❖ Internal storage memory Modularity (Should be able to easily mount and dismount)

Finalized Design

12V 220mAh Battery

6-Pin Extension Cable

VHF PD78xi 147-160 MHz Antenna - Recieves Emergency Signal → AD-FMCOMMS4 Transceiver - Contains LNA and ADC → Xilinx MPSoC ZCU 102 FPGA - Recieves Signal from Transciever

Inside FPGA

Pulse Compression Function in VHDL

Timestamp Function in VHDL

Digilent PMOD GPS - Recieves GPS signal →

Signal is Analyzed by Algorithm Provided by Sponsor

SD Card Storage - GPS Location and Timestamp of signal

Major Components

FPGA
Xilinx Zynq ZCU102

PMOD GPS
Digilent PMOD GMS

Transceiver
FMCOMMS4 AD9364

Antenna
All Points Wireless

Battery
12V 2200mAH Battery

Current Results

- ✓ Created a Linux environment to easily initialize transceiver
- ✓ Successfully interfaced between FPGA and transceiver
- ✓ Successful implementation of antenna
- ✓ Can detect and analyze target frequencies

Current Challenges

- − Due to size constraints, 3D printed housing cannot be printed on 3D printers accessible to the team
- + Will have to redesign housing into submodules that can be put together
- − Transceiver data is not easily accessible for real time analysis
- + Redesign of image file for FPGA will be required with custom VHDL designs