Introduction

- Corvus-BC 6U overview
- Subsystems to be open sourced
- Current development status
- Open sourced items
- Future Rollout
Our Background

- 17-person team in Silicon Valley
- Core engineering team worked at Canopus Systems
- 100% of current team completed Perseus-M mission
- Broad range of experience in the space industry
- Now focused on generating 22m and 2.5m multi-spectral Earth imagery

SRI –RAX 1

LightSail

SSL-ABS2

Perseus-M

AMSAT – OSCAR Series
Current Projects

• **Perseus-M**
  - Launched in June 2014
  - 2x 6U Automatic Identification System (AIS) CubeSat
  - Characterizing AIS payload performance
  - On-orbit test bed for future missions

• **Corvus-BC**
  - Launch Q1 2016
  - 4x 6U Earth observation CubeSat
  - Multispectral: Red, Green, NIR
  - 22 m ground resolution (GSD)

• **Corvus-HD**
  - Launch Q3 2016
  - 4x 16U Earth observation CubeSat
  - Multispectral: Red, Green, Blue, NIR, Red Edge
  - 2.5 m ground resolution (GSD)
Corvus-BC Overview

- 6U Form-factor
- 11 kg
- Imaging solution: 22 m GSD at 600 km, Red, Green, NIR spectral bands
- Flight computer: ARM A8 running Linux
- Power system: scalable 48Wh Li-Ion
- Communication: UHF transceiver running at 19.2 kbps for TT&C. Payload data is downlinked through Ka-band at 40 Mbps
- Solar panels: ARM M0+ processor, temperature, magnetometers sun sensors and magnetorquer coils
- Control: 3-axis with three reaction wheels, star tracker, GPS, gyro, magnetometers, and sun sensors
- Storage: 1 TB
Corvus-BC Overview

Smart Solar Panels

Multi-spectral Imager

Batteries

Ka-Band Radio

Flight Computer, EPS, Radios (“The Rack”)

ACS Module
Corvus-BC Overview

Data & Power Module (“The Rack”)
- Flight Computer
- UHF Radio
- GPS Radio
- EPS boards
- Batteries (48 Wh)

Open volume for future use (Propulsion!)

ACS Module

Multi-spectral Imager

Ka-Band Radio

8/9/2015
Corvus-BC Overview

- EPS Boards (Aquila Space)
- TT&C radio (AstroDev Lithium)
- Flight Computer (Aquila Space)
- GPS (Novatel OEM615)
- Batteries (Aquila Space)
- Reaction Wheels
  Sinclair 30mN-sec
- Star Tracker
  Sinclair ST-16

8/9/2015
Corvus-BC Overview

- Custom Ka-band transmitter
- 1U, 1 kg
- Currently 40 Mbps
- Planned upgrades to >200 Mbps
- Simple interface
- Ethernet UDP/IP packets in
  - UDP/IP over DVB-S2 packets out
- On-orbit testing in progress
- See Jan’s presentation on Thursday afternoon for more!

Open Technology for Space

Corvus-BC Overview
Data & Power Module ("the rack")
- Full EPS
- Full Flight Computer
- GPS and UHF Structure, Interfaces, System Software

Solar Panels

Star-tracker & Reaction Wheels
(Structure, Interfaces, System Software)
Development Status

- Corvus-BC hardware design work is completed
  - Flight assembly underway
- Launch is scheduled for Q1 2016
- Already preparing design improvements (backup radio, propulsion, etc.)
Software Development

- Core Flight Computer functions ready
- EPS control using MicroPython in final development stages
- Solar panel, UHF, GPS, Star Tracker, and Reaction Wheel drivers completed
- ACS development in process on-orbit
- Plenty of potential improvements remain!
- Aquila performs on-orbit updates regularly, so it’s never too late for an upgrade

8/9/2015
Platform Upgrades: Corvus-HD

- Upgraded bus to be used for Corvus-HD, launching Q3 2016
- 16U, 20 kg platform
- Improved ACS accuracy and availability
- >200 Mbps data transfer with adaptive MODCOD
- Miniaturized Ka Transmitter assembly
- S-Band, UHF, and backup TT&C radios included
- Doubled battery capacity (96 Wh)
Technology included

The following technologies will be open sourced:

• Source Code
• Schematics (Altium)
• PCB Layout files (Altium)
• Bill of materials
• Drawings (Solidworks)
• Part files (Solidworks) – online now!
• Testing procedures
• Assembly procedures
• Harness diagrams

GPL License (add assembly procedure)
Example: Assembly Procedures

- Unambiguous assembly procedures
- Can be used without modification, or just as a reference for design methodology
- Language barrier-proof format
Example: CAD Models and Drawings

- ICDs provided for full spacecraft, as well as subsystems
- Even “closed source” units like Ka-band have models
  - This allows for easier interfaces with user-specific designs
- Ka-band ICD and model are now available at aquilaspace.com
Look for early adopters

• We are actively looking for early adopters
  • Universities
  • Companies
  • Individuals

• Future directions (let’s brainstorm!)
  • New ADCS algorithms
  • Propulsion
  • Firecode/backdoor spacecraft reset receiver
  • S-band receiver
  • Ground segment (software & hardware)
  • What else?...

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