



Preparing DAWN for Future Airborne Campaigns

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DAWN Team



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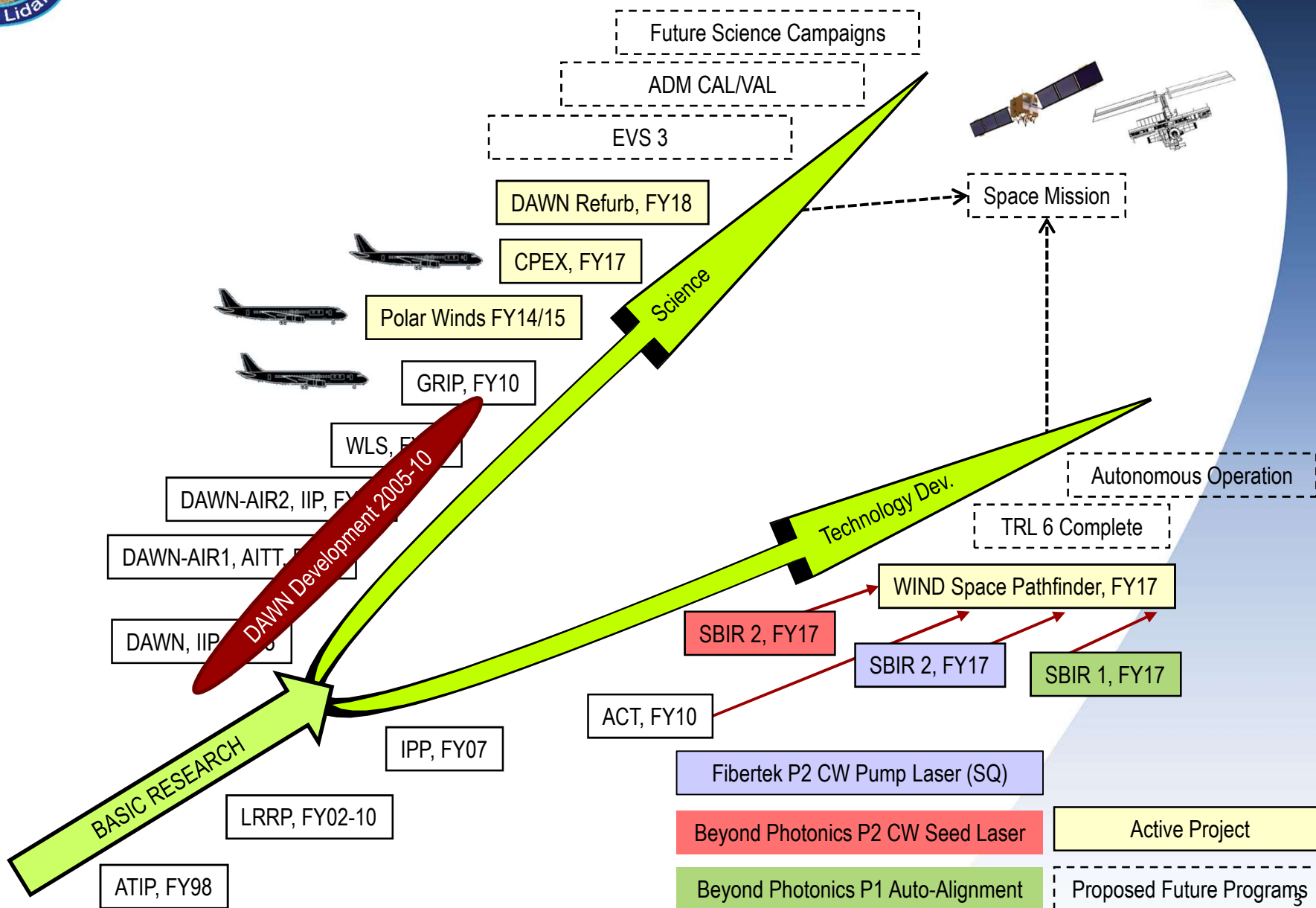
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Beyond Photonics

Charley Hale
Sammy Henderson



LaRC Roadmap to 3-D Coherent Doppler Lidar Global Wind Measurement

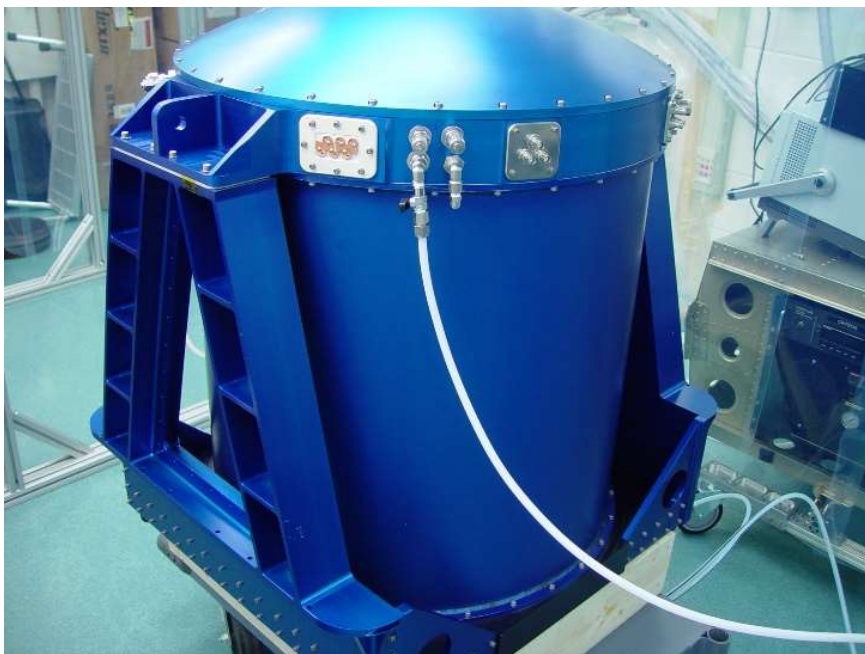




PRE-CPEX IMPROVEMENTS

➤ Mechanical modifications for improved accessibility

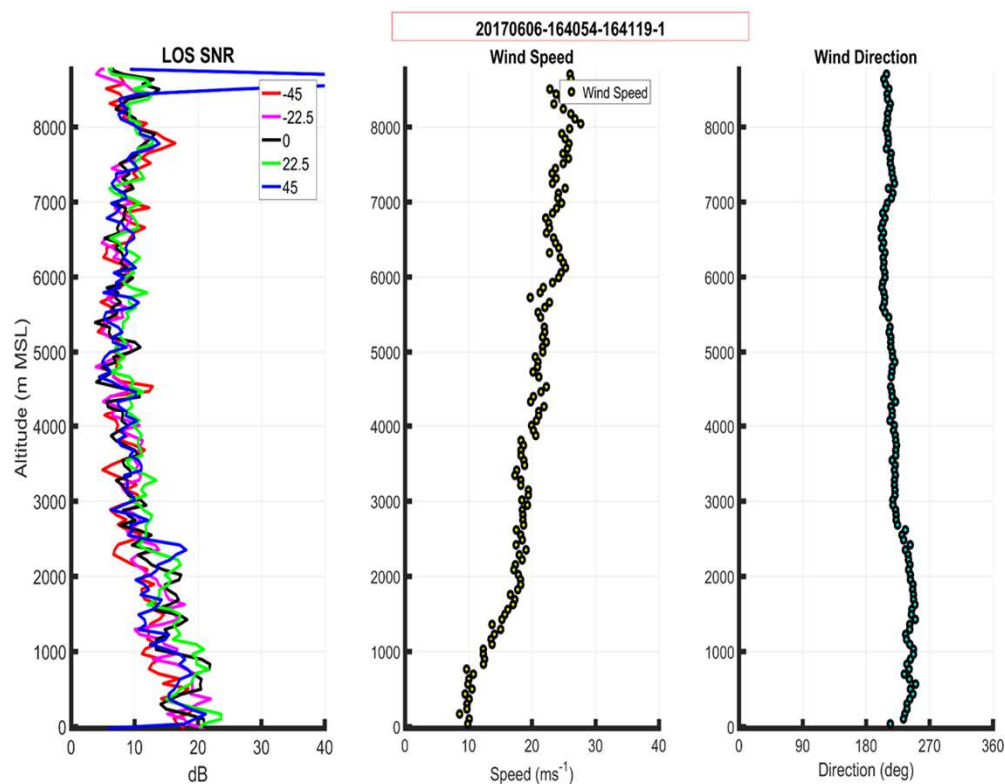
- *Limited access pressure vessel not needed on DC-8*
- Access ports cut into enclosure, covers & alignment jig fabricated
- Internal obstructions removed
- Assembly stresses impacting optical subsystem alignment reduced/eliminated



Pre-CPEX Improvements (FY16-17)



- **Optical repairs & improvements (with Beyond Photonics)**
 - Malfunctioning fiber network repaired
 - T/R beam size, curvature, & alignment corrected
- **10 - 15 dB improvement (Polar Winds 2015 → CPEX 2017)**





DAWN CPEX Performance



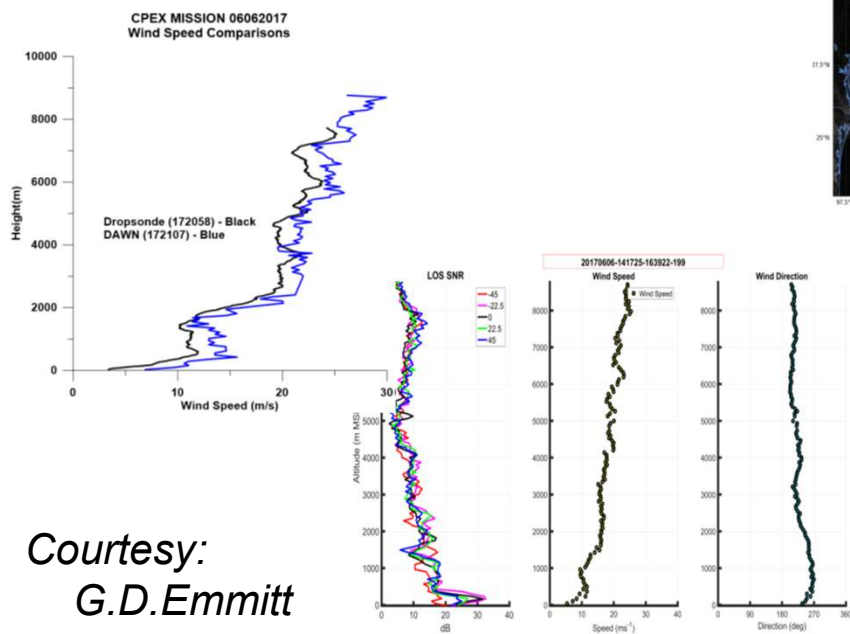
➤ **DAWN operated at ~99% availability during CPEX**

~1% unavailability caused by:

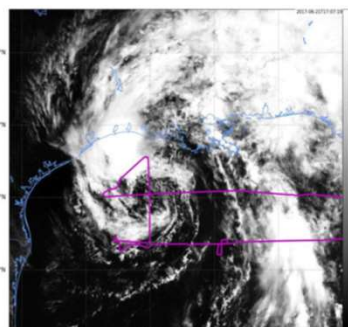
High cargo bay temps at start of flight

Condensation/hydraulic fluid on port window during flight

➤ **Full column profiles when focus adjusted after flight 6 of 16**

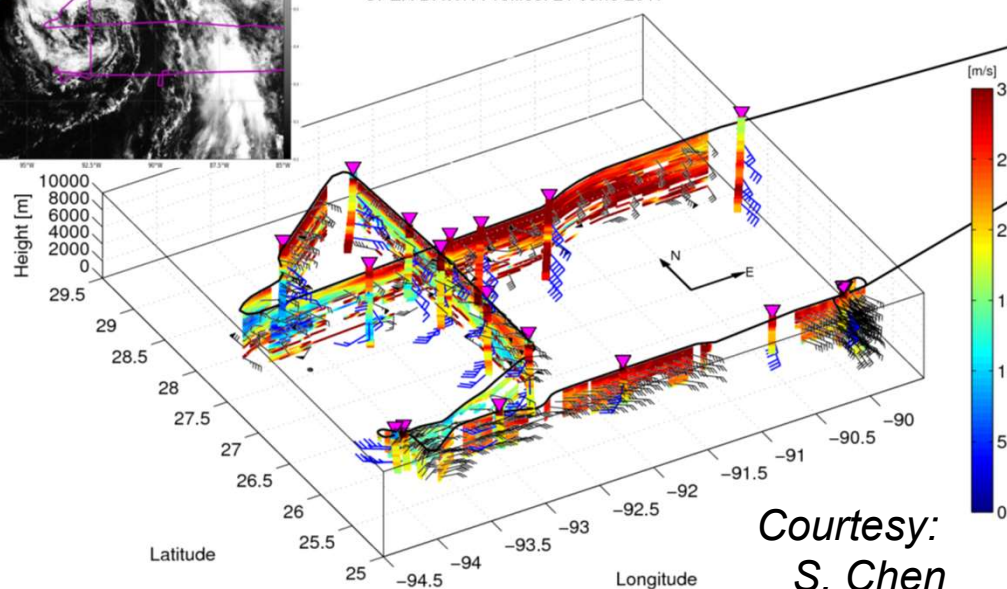


Courtesy:
G.D.Emmitt



CPEX Mission
21 June 2017: TS Cindy

CPEX DAWN Profiles: 21 June 2017



Courtesy:
S. Chen



POST-CPEX IMPROVEMENTS



Simplify Operations & Maintenance



➤ Replacement transceiver bench

- Expanding thermal operating window to ease alignment
- Improving reliability & robustness
- Stiffer bench with improved thermal paths
- Flexure-based bench to structure mounting

➤ Not cannibalizing existing transceiver/laser

- Purchasing new laser components *and* spares wherever possible
- Refurbishing non-replaceable laser components



Electronics Obsolescence Mitigation



➤ Electronics at or beyond end-of-life

- Intermittent problems before CPEX DC-8 upload
- All electronics ca. 2009 or older, with few spares on hand
- COTS electronics no longer manufactured or supported
- Custom circuits
 - Critical components are no longer manufactured
 - Obsolete development tools (FPGA, LabWindows, etc)

➤ Replace or refurbish electronics

- Aim to replace and modernize all system electronics (funding dependent)
- Refurbish components as cost control measure (laser diode drivers)
- Procure sufficient critical spares for >10 year operational lifetime

➤ Obsolete control & acquisition hardware

- Industrial-grade 8U CPCI computers (ca. 2007) running WinXP
 - Intel Core Mobile processor
 - 8-processor SHARC DSP for FFTs
 - Acqiris 10-bit, 1.5 GSPS digitizer (~6.5 ENOB)

➤ Replacement hardware

- Military-grade 2U PCIe computers running CentOS Linux
 - Intel Xeon E3 processor
 - SignaTec 8-bit, 3 GSPS digitizer (7.5 ENOB) w/Xilinx Virtex 5 FPGA





Data Acquisition and Processing System (DAPS) Software



- **DAPS tightly coupled to WinXP & specific hardware**
Update needed

- **DAPS Update Phase A: Move old DAPS to new hardware**
 - Shift FFT code from SHARC DSP to CPU
 - Replace Acqiris digitizer code with SignaTec digitizer code
 - Validating DAPS in virtualized WinXP under Linux

- **DAPS Update Phase B: Complete DAPS rewrite**
 - CentOS 7 with realtime kernel
 - Modular software framework: *Core Flight System (cFS)*
 - Hardware abstraction decouples SW from specific HW
 - Provide improved QuickLook & realtime algorithms & features

Telescope Focus Remote Control



- **Replace manual micrometer with motorized actuator**
Enables focus adjustment to flight conditions





Summary



- **Successful deployment on CPEX 2017**
- **FY18 efforts focusing on:**
 - Simplifying operations & maintenance
 - Improving reliability & robustness
 - Updating hardware and software

DAWN remains ready to fly