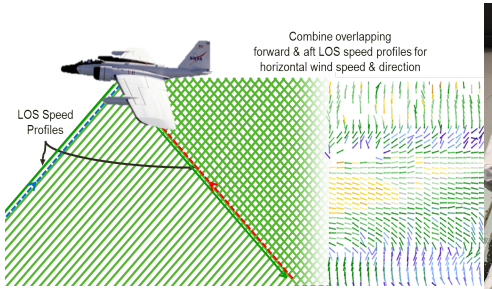
Green Optical Autocovariance Wind Lidar ("GrOAWL") Airborne Demonstrator

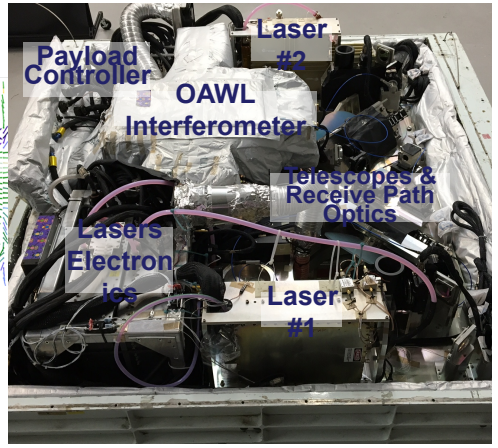
Science PI: R. Michael Hardesty, University of Colorado at Boulder
Instrument PI: Sara C. Tucker, Ball Aerospace

Objective

- Develop the GrOAWL receiver into a rugged airborne 532 nm wavelength aerosol Doppler wind lidar with two look angles from a single platform
- Perform high altitude aircraft test flights measuring line-of-sight (LOS) wind profiles from two looks over a series of atmospheric aerosol conditions
- Validate the airborne system performance using aircraft-based dropsondes.



Two lasers and two telescopes measure winds along two lines of sight for speed and direction profiles



ATHENA-OAWL Airborne Demonstrator installed in the NASA WB-57 pallet

Accomplishments

- Designed and built a two-telescope (30cm), two-laser (capable of >30 mJ/pulse of 532 at 200Hz) configuration of the OAWL instrument to demonstrate airborne LOS wind measurements:
  - Mechanically packaged the two-look system for integration and operation in the NASA WB-57 pallet
  - Demonstrated flight-like electronics and software architecture for remote operation and real-time processed LOS winds measurements
- Integrated the instrument on the NASA WB-57 and conducted 8 test flights (3 with dropsondes) totaling 38 flight hours in racetrack test patterns over the Gulf of Mexico
- Provided simultaneous two-look airborne Doppler wind lidar measurement in the space-based operation geometry and demonstrated continuous vector wind retrievals from two-look airborne system
- Validated airborne GrOAWL LOS wind measurements against concurrent aircraft-dropped radiosondes projected onto each LOS
  - Demonstrated OAWL LOS winds measurement accuracy of better than 2 cm/s and OAWL-sonde R2 values of 0.88+
- Validated the OAWL instrument measurement performance model using aerosol forecast models (airborne) and local HSRL data collected via ground testing demonstrating the OAWL radiometric modeling correctly predicts the OAWL system measurement precision

Co-Is/Partners: Carl Weimer, Ball Aerospace; Floyd Hovis, Fibertek; Sunil Baidar, Univ. of Colorado

TRL_{in}= 3 **TRL_{out}= 5 (space), (7, aircraft)**