

Squawk List for Flight 1847  
Sunday, 7-8 January 2001,  
2300 to 0500 UTC

Project IMPROVE research flight 2

(Instruments not mentioned as having a problem are believed to have worked satisfactorily)

FLIGHT CONDITIONS

Flight over the coastal waters in the airway corridor south of the Warning Area 237 complex mainly between 100-140 nm along a 220 true radial from Westport. A weak leading rainband associated with a larger frontal cloud mass (warm occlusion style front) oriented in a northwest-southeast line off the Washington coast was sampled as it slowly approached the coast. Evidence of warm-frontal boundary conditions were definitive by temperature rises/falls and wind direction shifts in southwest to northeast legs at 7 and 5 kft ASL.

Precipitation, however, was light at all times, and the clouds mainly glaciated above the freezing level with unrimed crystals of little mass or notable size encountered.

Below the freezing level, broken stratocumulus clouds were found, including some that were apart of the warm frontal upglide intercepted between 5 and 7 kft. These latter clouds had low droplet concentrations and significant LWC (up to 0.6 g m<sup>-3</sup>) and a broad droplet spectrum (tail > 30 um).

On the other hand, the scattered to occasionally broken stratocumulus clouds below this level that were also embedded in an easterly and southeasterly offshore flow from the land, were decidedly "continental" with droplet concentrations >400 cm<sup>-3</sup>, and a narrow droplet spectrum (tail <20 um).

OVERALL ASSESSMENT OF MEASUREMENTS

- Generally quite good agreement in all LWCs with the exception when noise spikes impacted readings. Noise increased in the PVM probe after a lull on the last flight.
- Serious imaging probe problems: CPI not installed due to problems; 2-DC also did not image particles, though thousands of blank strips were produced. The HVPS was impacted periodically with noise of a type thought to be due to condensation or other particles on the lenses.

- The 35 GHz radar's signal, while strong, did not appear to detect the substantial precipitation that reached the ground below the aircraft. However, it did very well in depicting the low reflectivity ice cloud above the aircraft.
- Due to these problems, it is difficult to tell what you are flying through (heavy rain/snow vs. light snow, fallstreaks, etc.)
- We were not able to reliably measure either in size or type of ice particle for a significant portion of the precipitation spectrum, mainly those particles below about 0.5-1 mm in maximum dimension that would be well categorized by the 2-DC and CPI probes.
- Our GPS-derived wind direction calculations looked very good and even showed the expected wind direction changes expected when criss-crossing the frontal inversion; the velocity was, in comparison with the UIL sounding, about two times higher than it should have been. Looks like a "meters to knots" conversion problem somewhere. However, this is still a HUGE improvement in our wind calculations over the "flakey" winds we have struggled with for at least the last ten years.
- Noise spikes returned with a vengeance after a quiescent previous flight. (What happened to change things?)

#### HIGHLIGHTS

- Quite good LWC measurements in all probes when noise spikes were not present.

#### PARTICULARS ON INSTRUMENT PROBLEMS

##### 1. GPS /WINDS/TURBULENCE/AIRSPEED GROUP

**GPS tans-vector system.** Data OK; apparently a characteristic of a low resolution part of this system is to report a new lat-long every 3-15 seconds.

**Winds:** A substantial improvement in our wind calculations has occurred under the aegis of Grant. The Shadin and our own winds are in good agreement and looked reliable most of the flight. However, there were a number of unreliable winds that appear to have occurred during turns and climbs, i. e., other than straight leg flying, though this was not ALWAYS the case.

**BAT:** Not working yet.

##### 2. STATE PARAMETERS

**Rosemount temperature sensor:** The Rosemount-derived static temperature continues 5-15° C higher than either the reverse flow temperature (tstatr) and the Shadin Air Computer static temperature (shadin\_stemp). It has been suggested that this is due to a problem with the wiring and/or the Rosemount sensing head.

**Reverse Flow Temperature:** Several bursts of noise spikes.

**Chilled Mirror Dewpoint Temperature:** Several bursts of noise spikes; NOT coincident with tstatr noise spikes.

### 3. CLOUD PHYSICS

**PVM-100:** Noise spikes in the LWC trace were almost continuous at times after a quiescent previous flight. Quite good agreement in LWC with the FSSP-100 derived LWC. The noise spikes do not affect all three PVM “channels” simultaneously.

**Johnson-Williams hot wire:** Dropped out occasionally. Reasonable agreement with the FSSP-100 and other probes when working.

**DMT hot wire:** Still noisy in and out of cloud. LWCs are in quite good agreement with the FSSP-100.

**2-D cloud probe:** Not working properly. No precipitation particle images though imaging activity was triggered by the precipitation particles present suggesting a small step forward in getting this to work right.

**1-D cloud probe:** Not installed. Being worked on “at the bench.”

**CPI:** Not installed. Being worked on (and now, being ferried to the manufacturer in Colorado by Grant).

**35 GHz Radar:** Excellent returns from the upward pointed collector of weakly precipitating ice cloud above aircraft. Only ground return seen when pointed downward and not the precip that was present. Still a problem. Also, no data recorded; still awaiting digitizer card.

Forward Video: Scrolling “bars” degrade picture in the “Play” mode.