

Squawk List for flight 1856 and 1857,  
flown on Thursday, 1-2 February 2001 (UTC dates)

Project IMPROVE flights 10 and 11

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

OVERALL ASSESSMENT OF MEAUREMENTS

- Generally a good measurement day with the exception of a preponderance of poor images from the CPI.
- The 35 GHz radar continues to work very well and data are being recorded.
- Electrical noise continues to impact some key instruments.
- Project mid-point tests of some key probes was accomplished prior to the flight.

1. GPS /WINDS/TURBULENCE/AIRSPEED

**GPS tans-vector:** No change; data OK; apparently a characteristic of this system is to only find a new lat-long every 3-15 seconds. Thus for intervals of the same time period, winds cannot be updated, nor do we show a location change. Winds and ground speed are thus necessarily constant, and are derived from the last last lat-long position, which may have been as much as 10 or more seconds earlier. This also appears true for the Shadin static temperature measurement.

**Rosemount TAS:** No change. LOTS of noise due to dropouts. Appears accurate otherwise; in essence, the trace looks like a bar diagram whose peaks are at the correct true airspeed.

**BAT:** Not working yet.

2. STATE PARAMETERS

**Rosemount temperature sensor:** Huge increase in noise after the middle of the flight otherwise no change. The Rosemount-derived static temperature continues 5-12° C higher than both the reverse flow temperature (tstatr) and the Shadin Air Computer static temperature. However, the Shadin temperature also has a long reset time and so

often lags the real temperature by a deg or more. Hence, we really only have a single reliable temperature measurement in real time.

It has also been noticed that the temperature difference between the accurate reverse flow temperature and the Rosemount probe changes while flying straight legs at constant elevation, as at 2304 UTC during the last flight when the temperature difference between the reverse flow temperature and the Rosemount began to decrease. It is now being hypothesized that these may be related to pressurization/cabin temperature changes. I believe this is the time that the chief pilot upon hearing that it was too hot in the back, adjusted the airflow. (I made a voice note of this.) More documentation of these changes will be made on the coming flights to test this hypothesis. I am somewhat more confident now that this problem with the Rosemount temperature sensor may be related to pressurization/cabin temperature issues (about 30%).

More effort should be put into fixing our venerable Rosemount temperature probe, perhaps bringing in outside help (perhaps from Rosemount) considering the huge workload that already burdens our engineering crew.

**Reverse flow temperature:** Occasional noise spikes, but fewer than ten for the whole flight.

**Cambridge and Ophir Dewpoint Systems:** Both are routinely are higher in moist conditions than the static temperature by several degrees. They should be cleaned at least.

### 3. CLOUD PHYSICS

**FSSP-100:** Calibration showed that the FSSP-100 continues to operate reliably and accurately.

**PVM-100:** Noise spikes in the LWC, effective radius and surface area channels were more numerous than on previous flights for some reason. The probe was tested with the HG disk and the results have been recorded. Operation appears normal with the exception of the ever present noise which we do not seem to be able to correct.

**DMT hot wire:** No change. Still impacted by too much drift type noise rather than spikes of the kind that impact the other LWC probes. LWCs are pretty close to that of other probes when the noise is absent and the LWC appreciable.

**J-W:** Generally worked well with the exception of noise spikes. Grant believes that he has determined the source of the noise and is working to eliminate it though it has not yet been eliminated.

**2-D cloud probe:** Working very reliably. Need concentration calculations in real time. Water spray tests showed nominal operation, i.e., a Gaussian distribution of particle sizes (one of the tests recommended by PMS). Sizing tests not available.

**1-D cloud probe:** Otherwise appears to be working well. Bead tests and water spray tests showed that the probe is operating within norms.

**HVPS:** Occasional noise problems/data dropouts, but in general worked. Some dropouts are associated with steep descents and likely condensation because the probe remains colder than the warming moist air that the plane is descending into. However, it has also been noticed that the probe seems to drop out in some climbs as well.

**Radar:** Worked well, and data is being recorded. Some lost data due to hard drive filling up again.

**CPI:** As with the last flight, camera images had a very mottled appearance (worse than the previous flight because the granulation was larger) when the probe was turned on at the beginning of the flight. No data appeared to be recorded in the light to moderate rain. However, the images gradually improved as the flight progressed and as we ascended into lower temperature regions. This may suggest a temperature/heater/dessicant problem inside the probe that may allow the lenses to become too cold/moist.

It should be noted that the probe was cleaned prior to this flight by Don, however, and that it worked well on the ground.