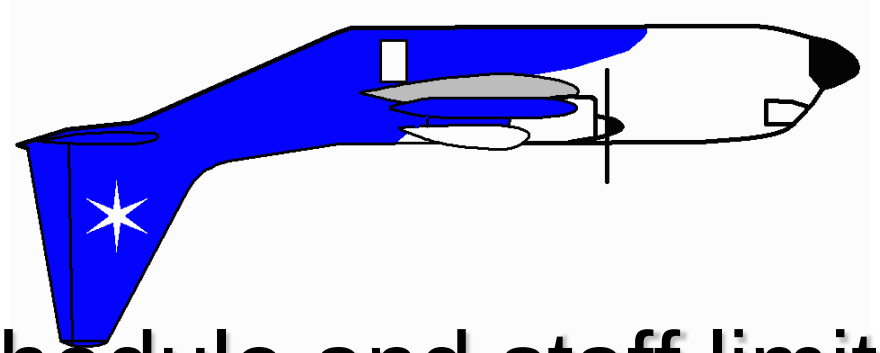
C-130 and instrumentation for RICO



Flight schedule and staff limitations
Hardpoint allocation and cabin layout
Time synchronization
Flight issues – expectation around convection

Sensor groups and expected performance

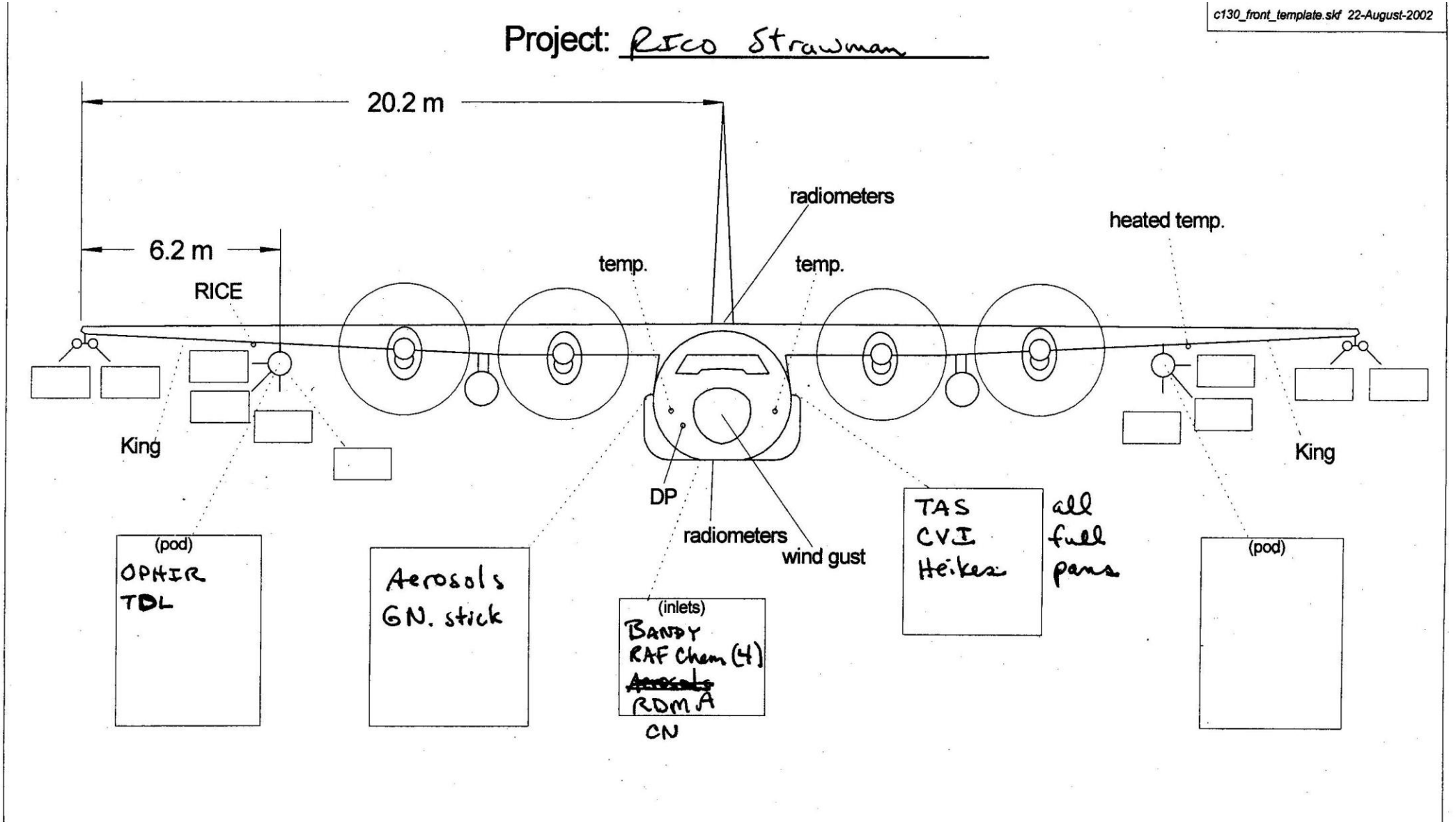
Flight schedule and staff limitations

161 mission flight hours
5 week deployment
32 hours per week = 4 flights of 8 hours
(Aircrew limits are 35 flight hours per week)

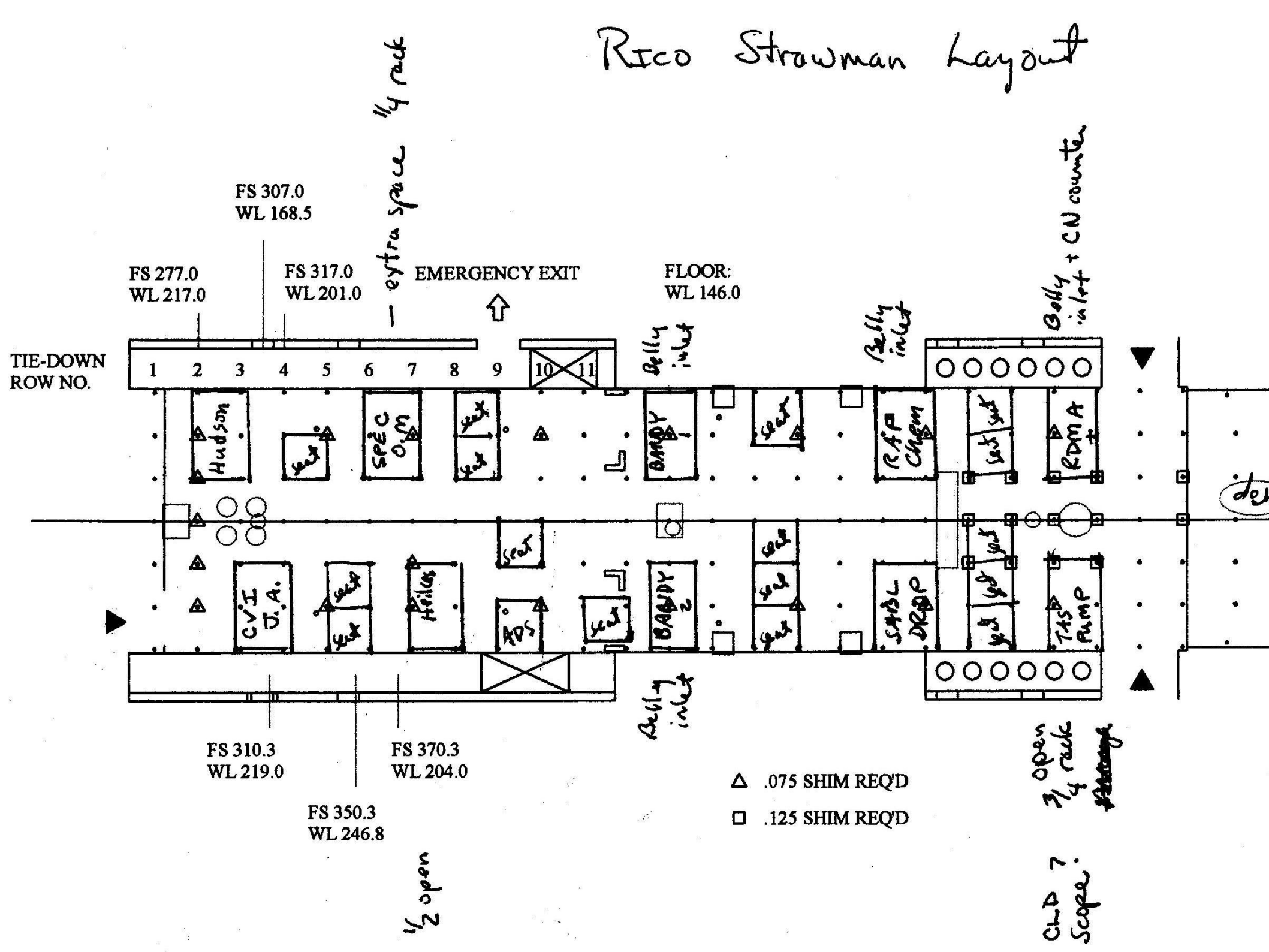
=> Not much time for instrument maintenance
PI's should consider extra maintenance staff

1 hard down day per week.
3 technicians + 3 mechanics allocated to RICO

Hardpoint allocation and cabin layout



Rico Strowman Layout



— extra space 1/4 rack

Belly inlet + CN counter

1/2 open

open 3/4 rack

CLD 7 Scope.

Time synchronization

Strong need for synchronization between many instruments and the C-130 data logger.

C-130 can provide time as:

- IRIG-B
- NTP (Network Time Protocol)
- 1 Hz serial ASCII string

Please, please ensure that high time accuracy is built
into your systems – trace gas, microphysics probes, etc.

Flight issues – expectation around convection

Multi-aircraft flights

- IFR
- Radio communication essential
- Flight tracking systems: TCAS
  ION

Low level flight to 100 ft over the ocean

Passes in heavy precipitation to 500 ft agl or higher

SABL lidar has 1000 m eye-safe distance (un-aided)

Sensor groups and expected performance

1. Pressure and winds:

Mean winds

Turbulence spectra - questions about 4/3 ratio of
longitudinal vs. lateral and vertical spectra

Potential for water ingestion
Consider circles before multiple cloud penetrations?

Sensor groups and expected performance

2. Temperature:

Rosemount

Cooling due to wetting likely in excess of 2 degC

Ophir

Rebuilt by Stuart Beaton in 2003

Effective path for 200 drops per cc of 12 micron radius: approx. 10 m (1 e-fold length)

Wet-bulb temperature sensor? (Under investigation, not promised)

Sensor groups and expected performance

3. Humidity:

Cooled mirror

Lyman-alpha

- Referenced to cooled mirror sensors
- Potential for temperature determination assuming saturation?

TDL (Under development, not promised)

Wet-bulb temperature sensor? (Under investigation, not promised)

Sensor groups and expected performance

4. D-value:

Radar altitude – pressure altitude

Useful for determining surface pressure, convective initiation, etc.

Fluctuations probably valid to +/- 2 m or better.
Expect natural variability of 5 m (0.6 mb) or larger.

Sensor groups and expected performance

5. RAF particle sensors:

CN counter: TSI-3010	0.01 µm	< d	
RDMA	0.008 µm	< d <	0.13 µm
PCASP	0.1 µm	< d <	3.0 µm
SPP FSSP-100	0.5 µm	< d <	47 µm
260X	40 µm	< d <	620 µm
2D-C	50 µm	< d <	800 µm
2DP	200 µm	< d <	6400 µm
(HVPS	200 µm	< d <	25600 µm)

Sensor groups and expected performance

6. RAF radiation

UV/Vis/IR up/down fluxes (Eppley)
Remote sky and surface temperature (Heimann)

SABL

Crew issues (19 total):

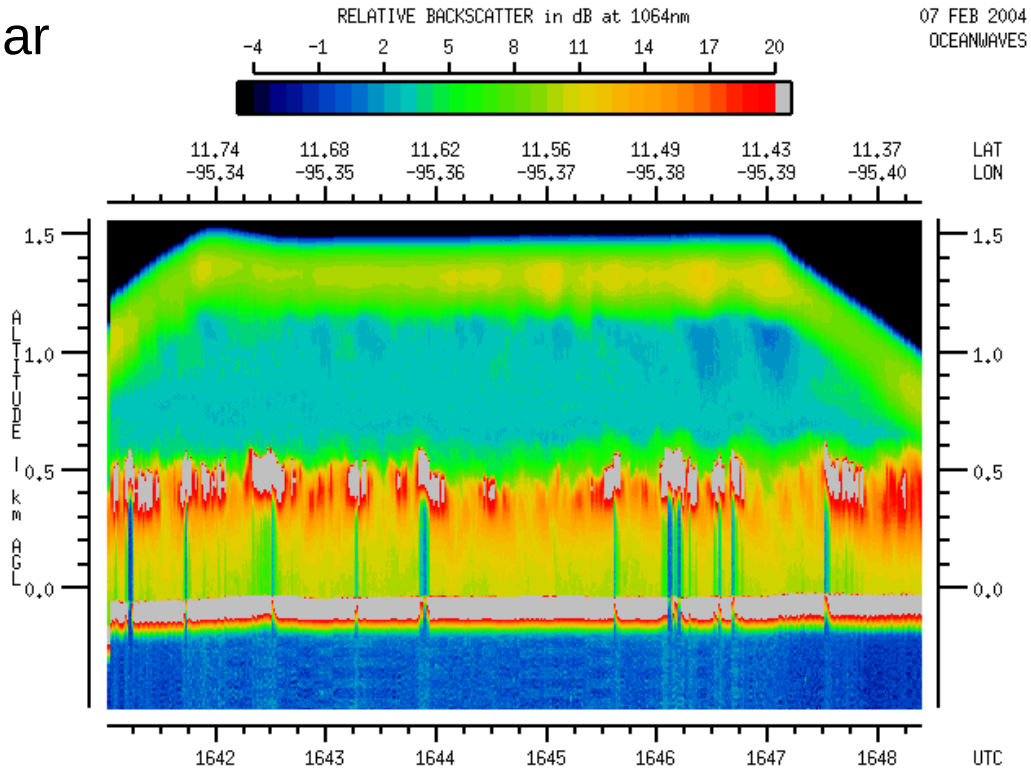
2 pilots + 1 flight engineer
CVI
Peroxides
RAF tech
DMS
Ozone, CO
Fast FSSP, X-probe
doppler
TAS

PI
CCN
Giant Nuclei

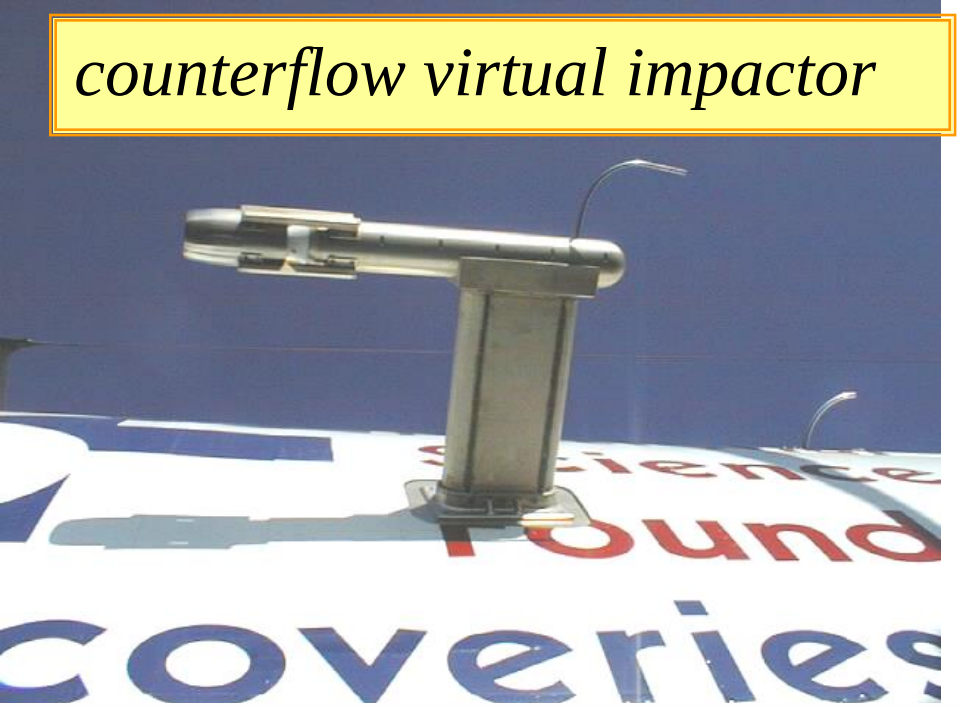
SO2
2D-S
Phased

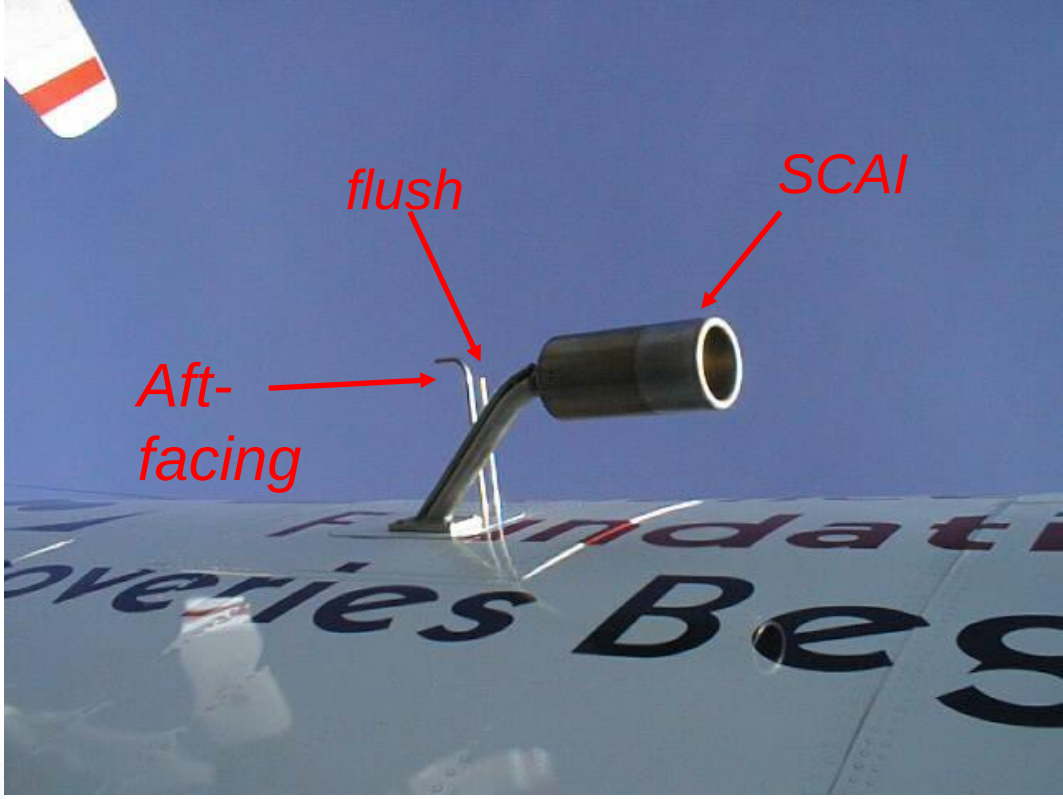
SABL: Scanning Aerosol Backscatter Lidar

Wavelengths	1064 nm and 532 nm
Vertical resolution	3.75 m
Pulse repetition freq.	20 Hz
Along track resolution	5 m (at 100 m/s)
Sample volume size	20 cm x 3 m at 1 km
Eye-safety	Beyond 1 km range
Minimum range	About 400 m
Pointing directions	Up or down

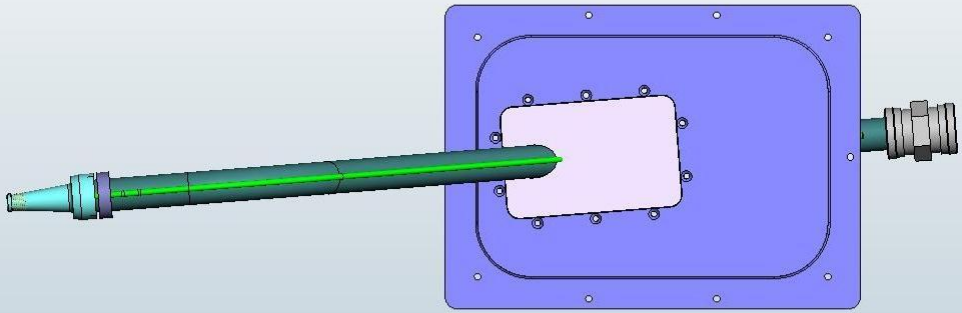


counterflow virtual impactor

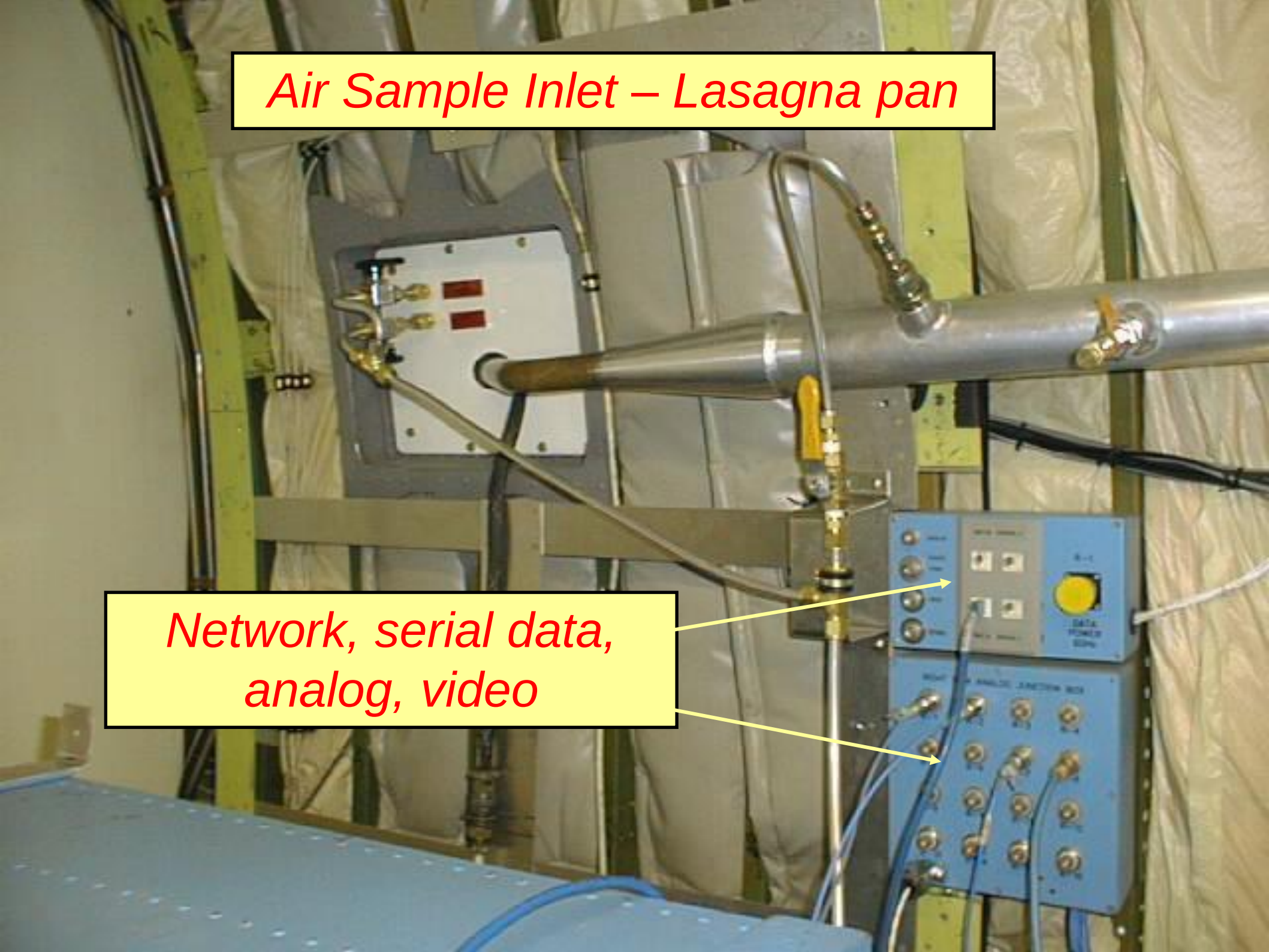




anti-iced diffusing inlet



Air Sample Inlets

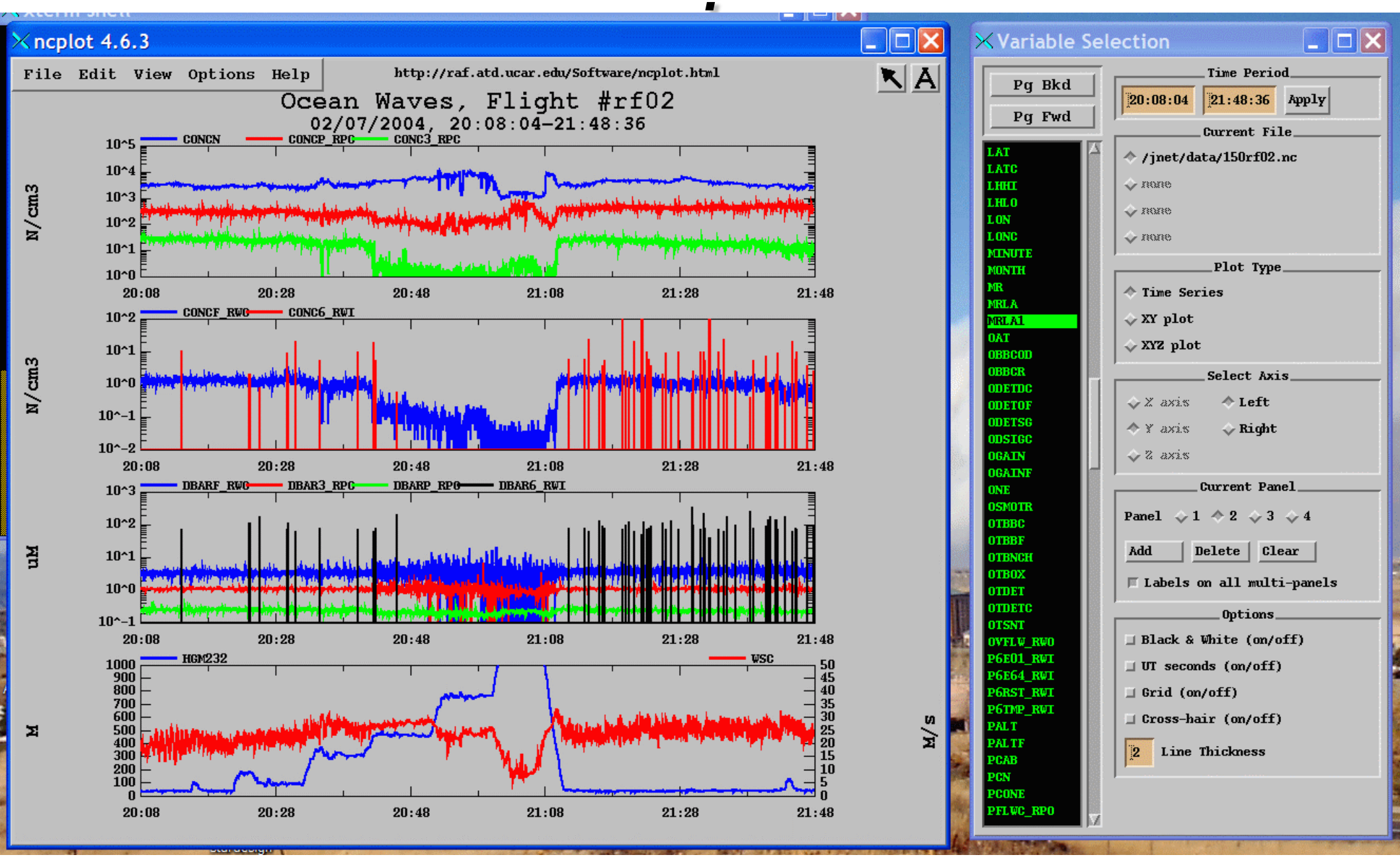

Air Sample Inlet – Lasagna pan
Network, serial data, analog, video

Investigator instruments

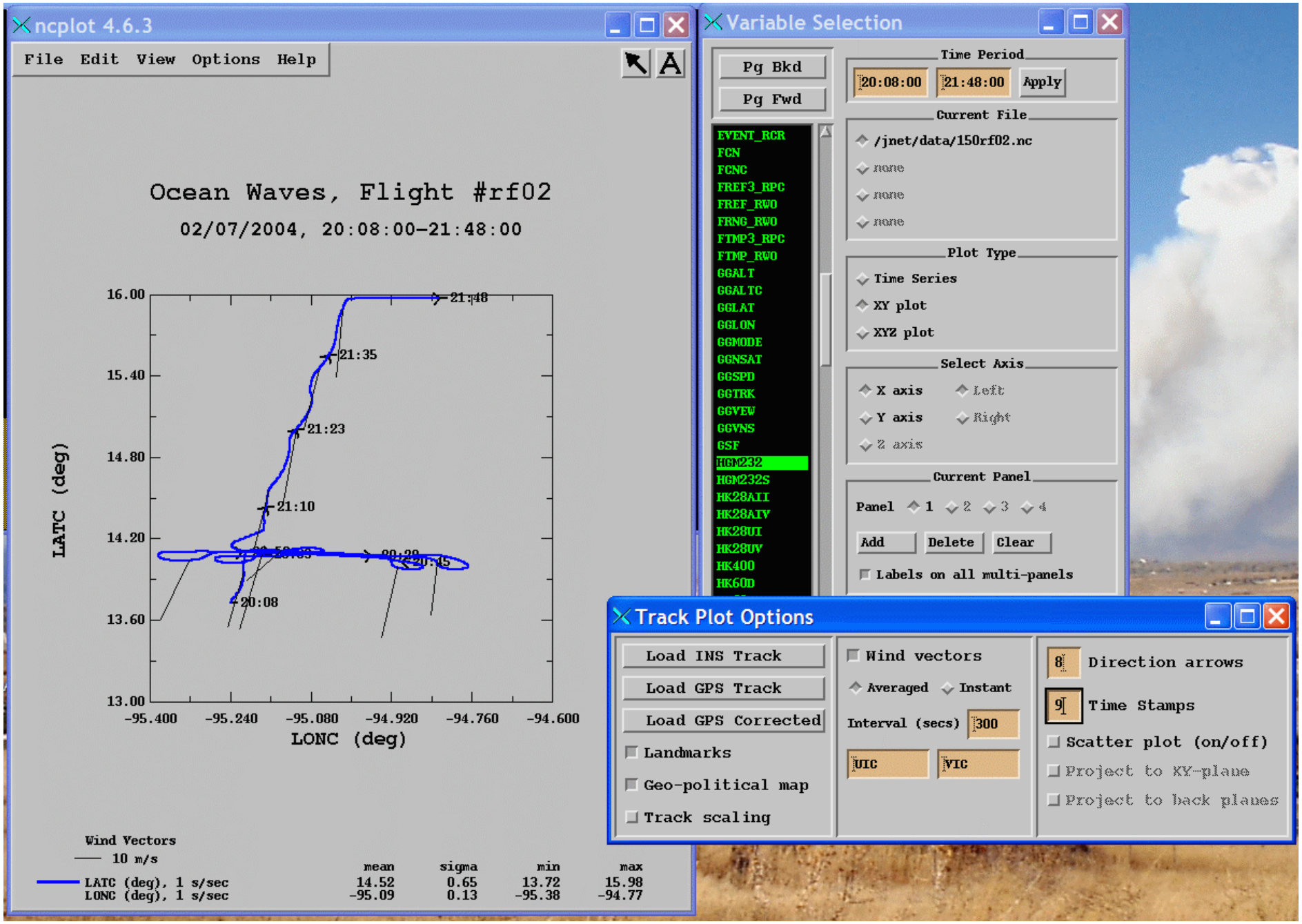
- *mount in RAF racks, PMS cans or pod*
- *requirements for safety and flight worthiness*

ATD can provide design & fabrication support

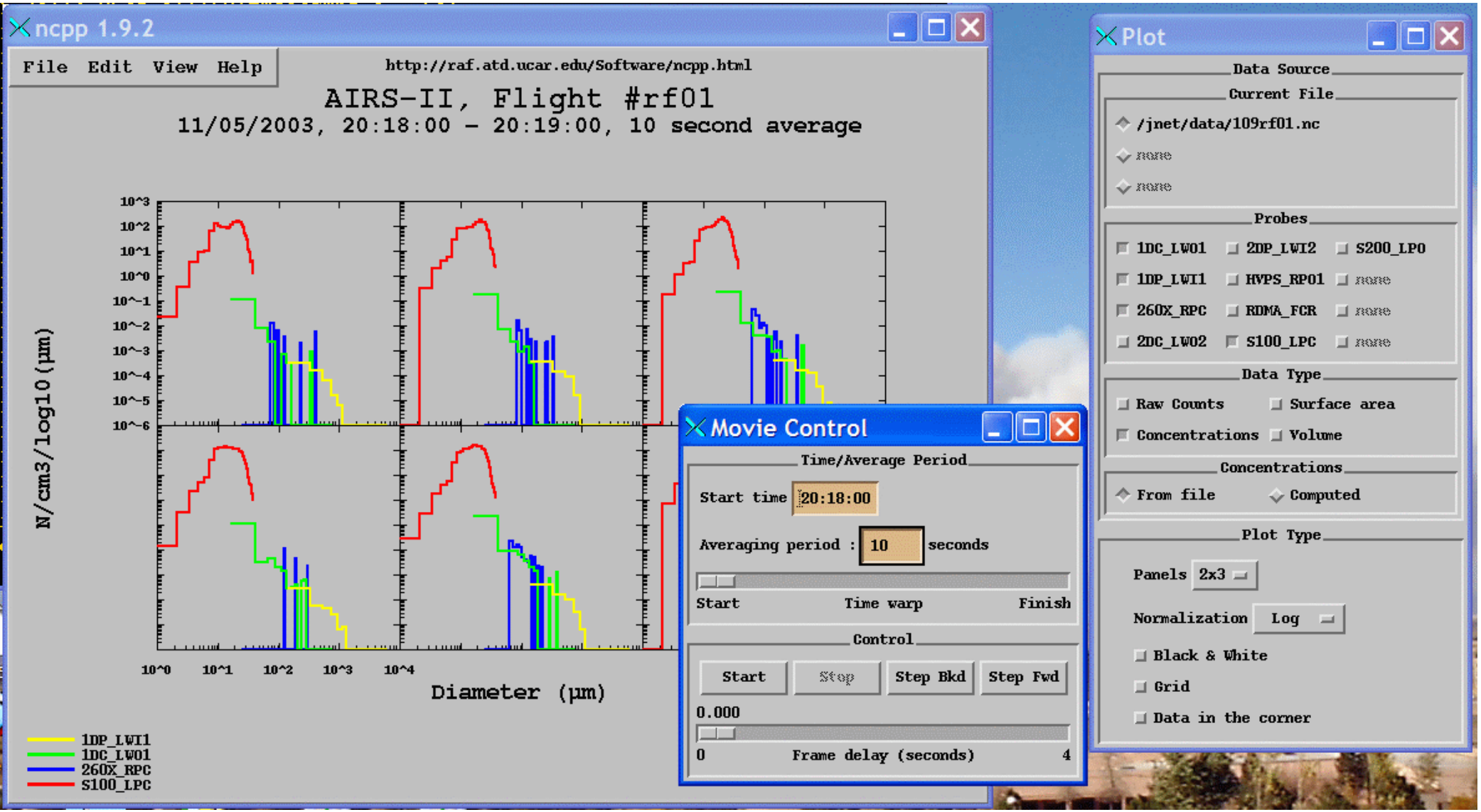
RAF data analysis software – *free !*



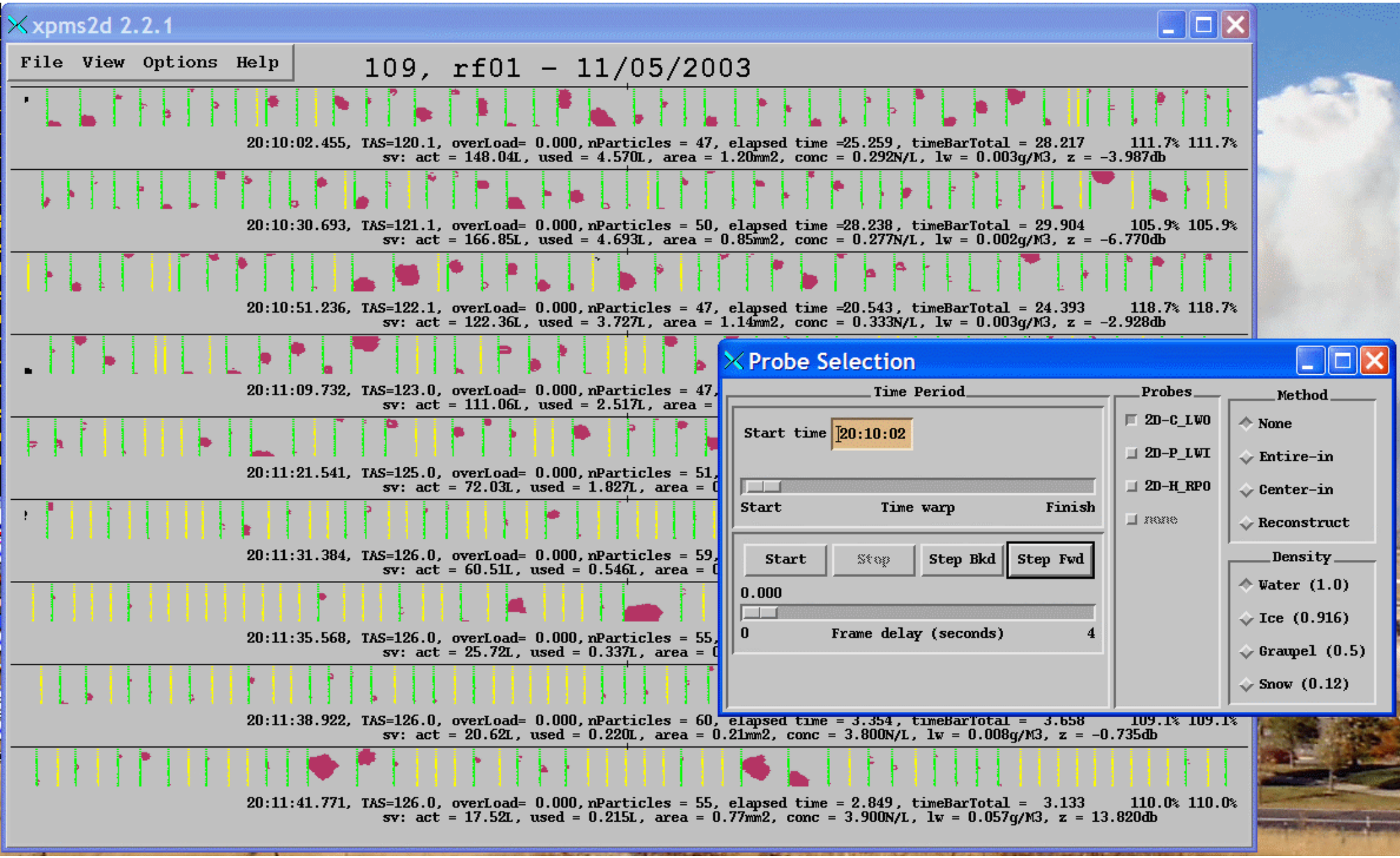
Flight track



Particle size distributions



Particle images



C-130 Data

Data acquisition

- *Network on aircraft*
- *Analog, serial, special*
- *1 Hz – 10 kHz*

Real-time display

- ION (web-based)

Data analysis software - ***free !***

http://raf.atd.ucar.edu/Software/index.html

Data archives

JOSS - *http://www.joss.ucar.edu/*

ATD/RAF - *http://raf.atd.ucar.edu/*