King Air N2UW flight report for December 10, 2004
Crew: Fagerstrom, Vali, Oolman, Glover

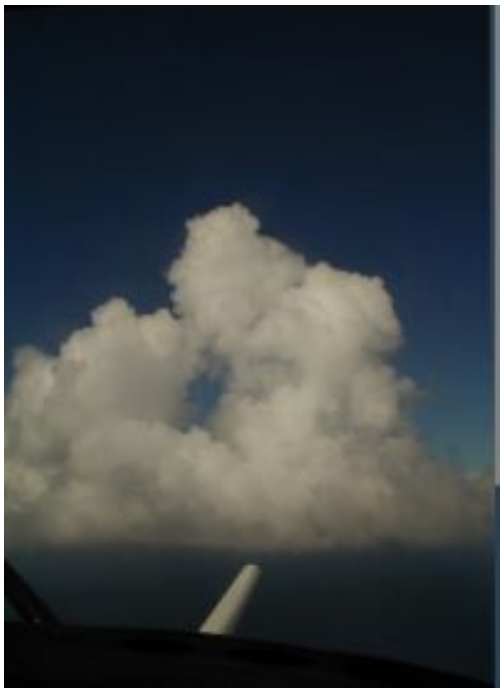
Even though expectation was for deep clouds, rather sparse cloud conditions prevailed.

Objectives were to do and *intercomparison* with the C130, followed by *cloud sampling* on a bowtie pattern in close range to SPOL.

The intercomparison was performed while C130 executed the third circle just below cloud base. This was in the period 1601-1631.

Cloud sampling started at 1718, with the intervening period spent at 18 kft in order to cool the system. That allowed 26 minutes of WCR operation before high temperature limit was reached. Cloud sampling without the WCR continued until 1814. Clouds were so small that the WCR would not have seen much in any event. Larger clouds existed further N, and a very pronounced line was noted behind Barbuda (photos take from 18 kft).

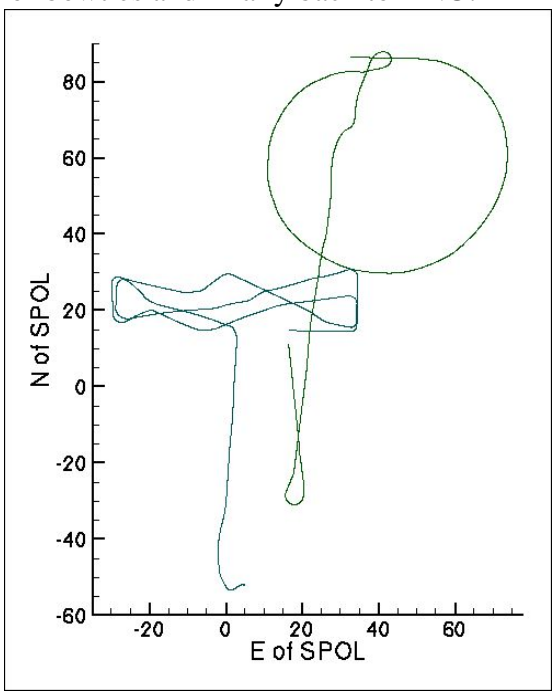
Photos below (at 17:27 on left, 17:31 on right) are "typical" examples:



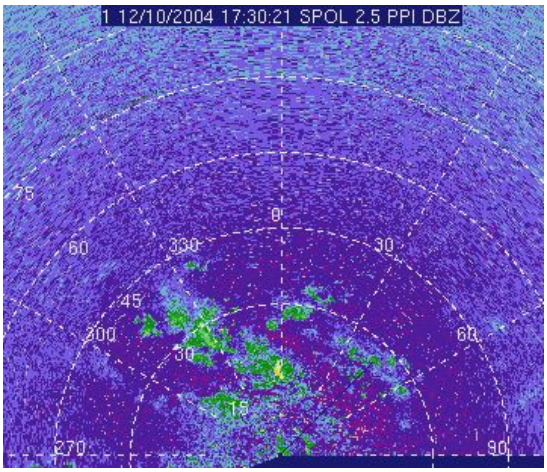
The bowtie pattern was fixed by two points, one E and one W of SPOL. Heading N from each point about 5 NM and then turning to the opposite end of the line formed the bowtie. Deviations to maximize in-cloud time were made, but goal was to sample <u>all</u> clouds,not just most vigorous ones. This policy was fairly subjective and and not the best. With clouds in the area being quite small, plus the temperature problems in the

cabin and the shortness of the flight, led to a so-so data set.

Flight track is shown below, starting with the intercomparison circle and ending, then moving on to the series of bowties and finally back to ANU.

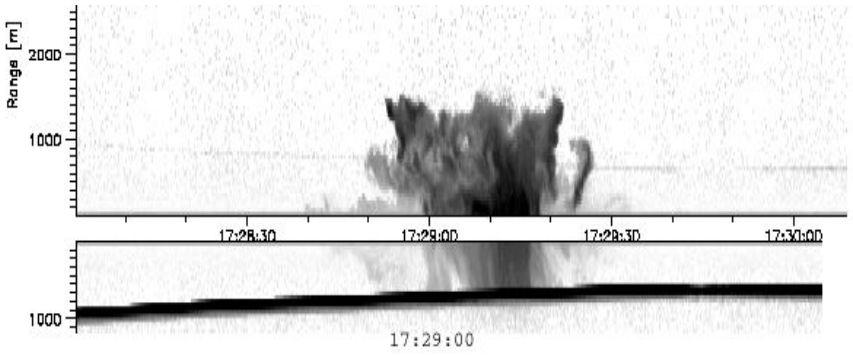


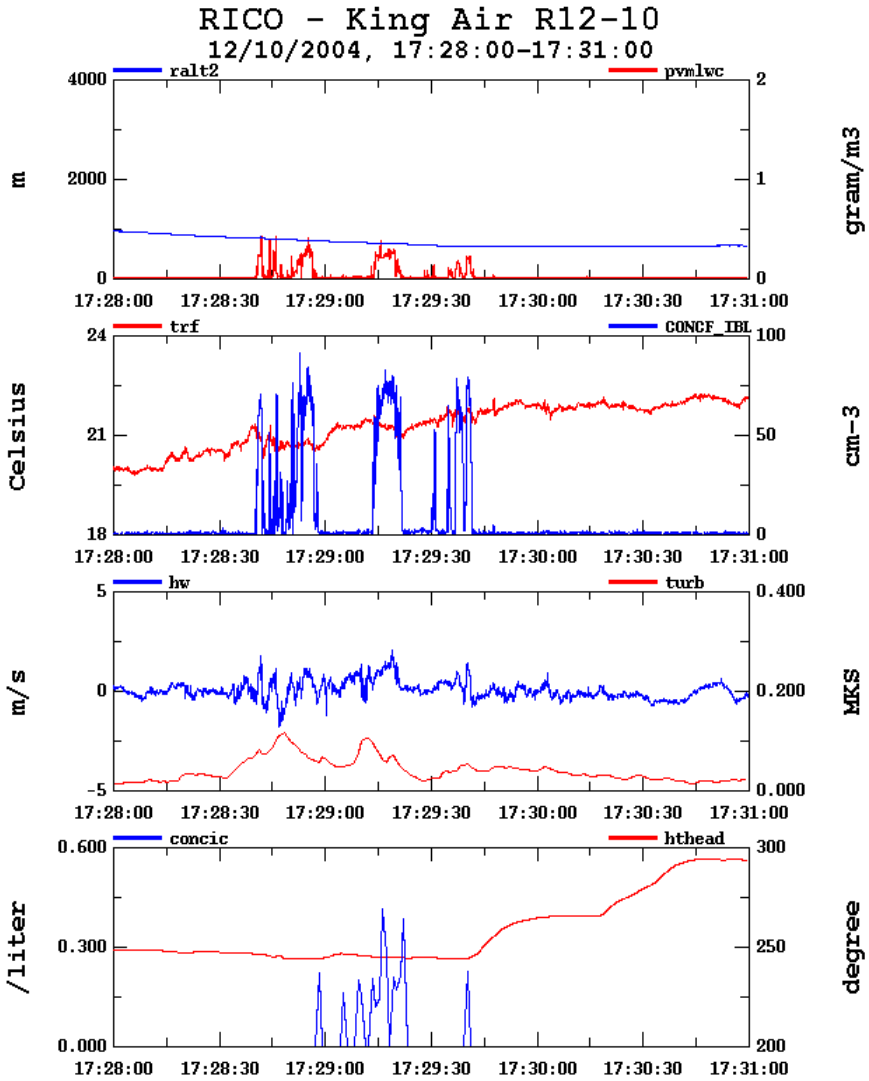
The 2.5° SPol image for 1730 shows the scattered nature of echoes in the bowtie region, and the large difference between the eastern and western halves. This range of cloud sizes may turn out to be an advantage for later analyses. Max. reflectivities are up to about +20 dBZ in a few spots.



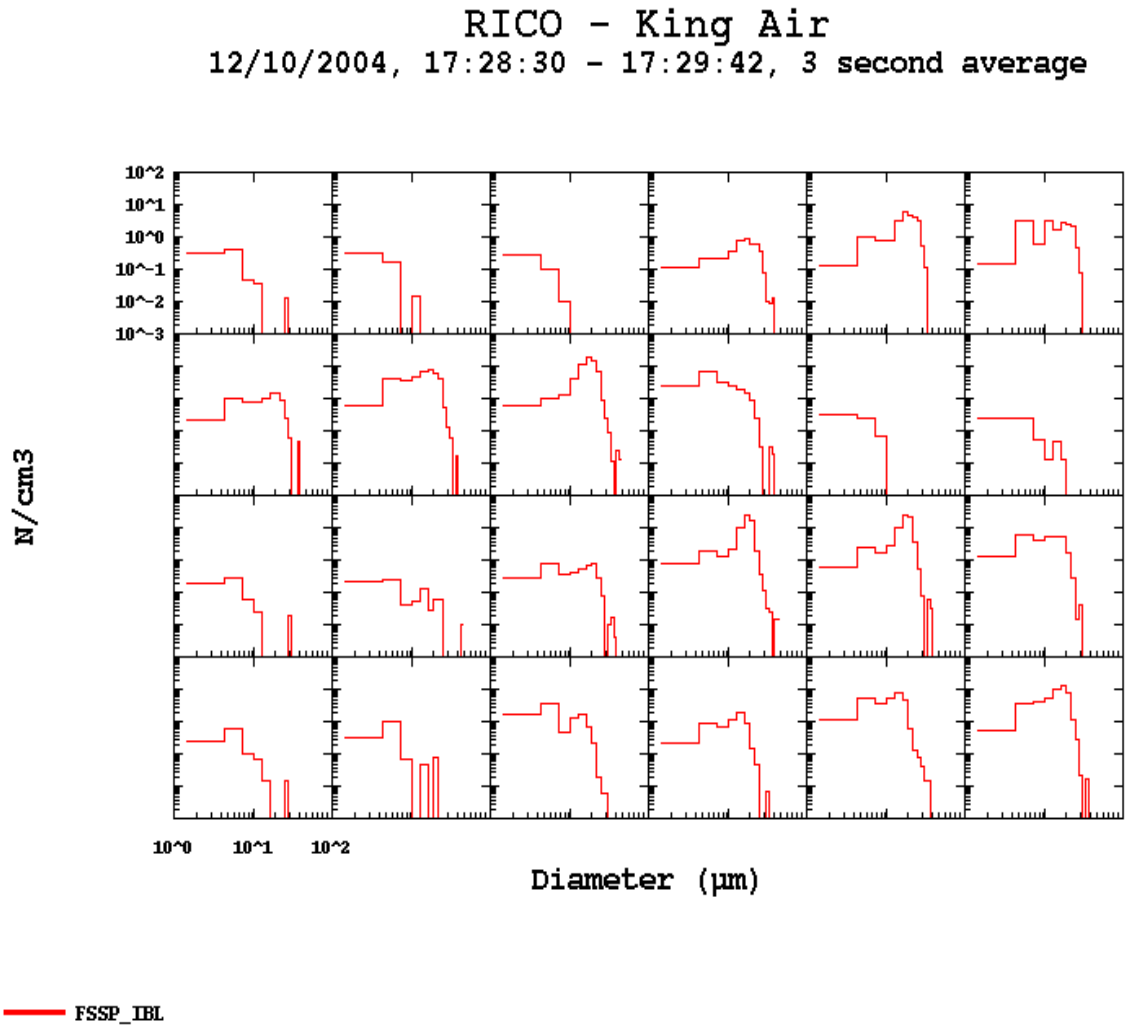
WCR data for the strongest cell sampled by the King Air (left hand photo above) is shown on the next page . This is almost exactly due N of SPol at 17 km; there is a bright spot in the image above at the right location. The W-band reflectivity in the cell is also

close to +20 dBZ in good agreement (at this level of analysis) with SPol. Note the extensive regions of weak reflectivity on both sides of the strong echo.





The plot on the previous page shows in situ data for this pass (450 m altitude, heading to SW): 0.4 g m^{-3}, 70 cm^{-3}, 1.7 m s^{-1}, and raindrops of 0.7 mm maximum diameter. The updraft of 700 m horizontal dimension at 17:29:20 is directly adjacent (on the NE side) to the region of highest reflectivity region and highest, but still low, raindrop concentration, with the WCR indicative of the updraft rising into weak precipitation; too weak to show on the 2D probe



Flight Notes:

1506 Taxi

1523 T/O (typical delay due to traffic). Climb to 4000' dir ferry to 030/80 target.

1540 Crossing C130 path (TCAS) as they are completing second circle.

1546 WCR startup issue resolved after phone conversations with Sam.

1549 Descend to 2000' in preparation for rendezvous.

1552 System off for few minutes. C130 on the right

1601 Start of intercomparison circle.

1631 End of intercomparison. Break off by ascent and crossing C130 path (for photo op). Then, continue to 18000' for cool down period.

1650 Photos of cloud lines behind Barbuda (excellent) and Antigua (less so).

1707 Descent to 6000' . Display stuck, data system stopped.

1718 System back up. Waiting for clearance to lower altitude.

1728 Down to 2000'. Cloud pass: 50 cm^{-3}, 0.2 g m^{-3}. Aimed for center of cloud.

1734 At western end of bowtie (350/38) and turn N.

1738 Following passes are <u>not</u> aimed at centers of clouds but follow straight line.

1743 Got off track toward N

1744 Stopped WCR due to temperature limit (104°F).

1752 Eastern tip of bowtie. Turn to N and will go longer than 5 km planned in order to reach clouds seen there.

1758 Climb to 2500'

1805 Back to western end point.

1814 Turn to ANU. Over Barbados, droplet concentration is ~100 cm^{-3}; twice that of over water.

1827 L/D