Mission Report: BAE146 RICO Flight 8   B079   23-Jan-2005

Aircraft Scientist: Brown

General Cloud characteristics:
Initially very suppressed – highest Cumulus tops were ~3000ft in the Barbuda ‘tail’, which was visible from Antigua just prior to take-off. Some cloud tops were, however, apparently breaking the inversion level to the North and East. Later on in the flight, a mixed cloud field developed with extensive shallow cumulus, some deeper cells to about 8000ft which were weakly-organized into quasi-linear features. There was extensive fringing stratus cloud around the inversion layer, which was relatively weak in the later part of the flight.

C-130 intercomparison
Clouds penetrated during cloud intercomparison

1715 UTC target clouds.  1933 UTC cloud penetration at 5000ft

General Comments
Intercomparison flight with the C-130 in clear air and a brief period in cloud. This should provide a good intercomparison of state parameters at both 8000 and 1300ft altitude, together with turbulent fluxes at the lower altitude. Following this, the 146 conducted cloud and sub-cloud sampling. Initially, zig-zagging across a weak linear organization with cloudbase at around 1700ft but with the usual variability of +/- a
few hundred feet. Following the 300ft L-pattern, further cloud penetrations were made, working parallel to quasi-linear features. Some of these passes were coordinated with the King Air which was at higher altitudes.

**Overview of flight patterns**

Joined up with the C-130 at 8000ft and flew an L-pattern at this altitude, approx. 5min on each leg and oriented approximately along/across the mean wind direction. Both aircraft then descended in formation to 1300ft to fly one of the standard C-130 30-minute circles. The L-pattern was flown in a closer formation than the circle (for the former, separation was estimated visually as ~ 3-500ft laterally, ~100ft longitudinally, and ~30ft vertically). Following the close formation, the 146 broke away to follow at a separation of ~5nm at 3500ft altitude through 2-3 cloud cells. Large cloud drops were detected by the 2D-C during these cloud penetrations but there was only weak precipitation. Following the intercomparison, the 146 performed a profile descent to 50ft followed by legs at 2000, 3000 and 1700ft through convective cells to one side of an apparent line of radar echoes. There was extensive fringing stratus on either side of this line, some of which was generating precipitation. The 1700ft level was at around the cloud base. Following the L-pattern (10 minute legs) at 300ft, there were runs along a line of cells that was being simultaneously worked by the King Air. Clouds were penetrated at 4000, 5000, 6000ft with two final legs also at 5000ft. Further random cloud sampling was conducted at 3500 and 4500ft followed by a final profile ascent from 50 to 15000ft.

**Flight Notes**

1520 takeoff from Antigua

1700ft general cloud base around Antigua, highest cloud tops locally around 3000ft in the Barbuda ‘tail’

start profile descent P1, 15000-7000ft

7500ft altitude – tops getting well above inversion level out to the East.

154028 end profile

155210 start run 1.1 8000ft 193 deg heading, in formation with C-130

maintaining good formation with position fluctuations ~1/2 C-130 fuselage length.

155725 end run

155833 start run 1.2 8000ft 108 deg hdg.

160034 dropped a few metres below following further behind but probably similar relative position fluctuations.

1602 7000ft cloud tops in the area with extensive stratus

160337 end run, turn left for descent to 1300ft

1700ft general cloudbase again.

161348 start orbit 1, following ~3-4 fuselage lengths behind C-130 but quite good level in the vertical.

1625 Precip. from clouds here.

at ~035/47DME, tops to ~5000ft

1626 a bit further back from C-130 here.

164416 end orbit.

20 per second counts on SID-1

165014 start run 2.1 3500ft, trailing C-130 through cloud. C-130 observed just entering target cloud ahead. Poss detection of CO in exhaust plume.

1655 2nd cloud ahead
165537 in cloud. 3rd cell ahead.
165645 end run
1706 inversion v. weak at 5000ft.
171049 start profile P2 6000-50ft
171520 3500ft possible target clouds ahead.
1718 passing under line
171920 end profile 50ft.
   Climb to 2000ft and looking to run along a line – has fringe of stratus with rain falling out.
1722 start run 3.1 2000ft, following radar echoes. Above cloud base.
   end run. Further cells out to East.
1728 start run 3.2 2000ft. No obvious signs of shear.
1731 steered to rain cell which was on South side of cloud line.
1733 clipping some bases but lowest are ~500ft below.
1735 probably zig-zagging along the line
   end run
1740 start run 3.3 1700ft skimming base
   end run
175055 start run 3.4 2800ft may be a different line although appear to be on reverse of previous track.
   end run
180440 start profile descent 5000-300ft
181103 end profile
181254 start run 4.1 300ft 165 deg heading. Strong sense that cloud line may have dissolved.
   surface wind ~120deg?
182256 end run
182357 start run 4.2 300ft 80deg heading, roughly parallel to deeper cells on our right – some precip cells. King Air at 7000ft
1830 crossed at ~45 deg to small precip line, poss cold pool detection? Cloud tops now seem sheared to East.
183415 end run (King Air at 6000ft)
184637 start run 5.1 4000ft into line of Cu
184927 working line with King Air
   end run. Zigged around a bit. Orientation of cloud penetrations at all angles to wind/shear.
185836 start run 5.2 5000ft. Lots of stratus around so difficult to see Cu cells.
1902 turn to pick up new cloud.
190445 King Air just exited this cloud. Turbulence in clear air going into cloud.
190732 end run. Swap heights with KA.
191129 start run 5.3 at 6000ft. Going into cloud top reaching just above flight level.
   end run 5.3
192004 passing just over cloud top, shrinking back beneath us.
192049 end run
   start run 5.4 at 6000ft
   end run 5.4 at 6000ft
192840 end run. These runs tend to be in the along-shear direction from the visible nature of the clouds – may get mixture of both young and mature cells.
193206 start run 5.6
193316 photo. 2nd pass into cloud.
   end run
   start run 5.7 at 3500ft, turning through cloud at the start.
194243 2 good cloud alignments
194422 end run
1948 start run 5.8 4500ft. Early stuff dissipating then some younger cells.
1954 end run. At level of some stratus.
   in patches of stratus during descent to 50ft.
   1700ft, close to cloudbase?
200019 start profile ascent P4, 50-15000ft. Climbout through region of more
   suppressed convection.
   end profile
2019 10000ft in descent. Cu tops to ~6000ft over Antigua.
2036 land

B079 23-JAN-05 15:00:00 - 20:41:57
Profile ascent P4 50ft-15000ft