Post Flight Report

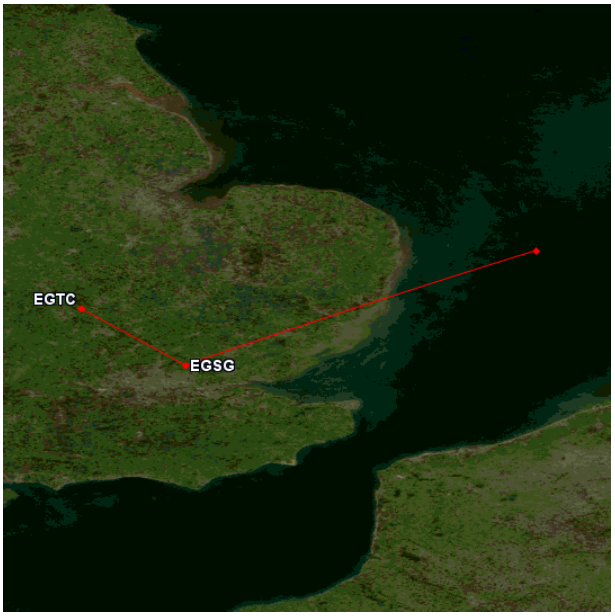
Prepared by Guy Gratton

General Details

| | | | |
|---|---|---|---|
| **Type:** | Dornier 228 ARSF | **Purpose of Sortie:** | Characterisation of the ash cloud from the Eyjafjallajokull volcano |
| **Reg:** | D-CALM | **P1:** | Joseph |
| **Date:** | 16 April 2010 | **P2:** | Davies |
| **Airfield(s):** | Cranfield / Cranfield | **Other crew:** | MS: Guy Gratton<br>CPC/PCASP: Phil Rosenberg<br>Instruments: Phil Goy<br>Instruments: +1 |
| **Wx:** | See appendix A | **Other Details** | This was a joint FAAM/ARSF flight using the ARSF aircraft and a mixture of ARSF and FAAM instruments and crew |
| Start : 1430<br>B/Off: 1444<br>T/Off: 1448 | Land : 1734<br>B/On: 1743<br>Shutdown: 1744 | | |

Report

Routing planned was initially as shown below, on the assumption of a relatively vertical plume edge, with the intention of subsequently flying a north-south “zig-zag” pattern to explore the shape of the edge of the plume once it had been detected. FL100 was achieved and maintained by and from the LAM VOR.



However, on the track shown above (approximately a 60° outbound track from LAM VOR) the plume was not detected before reaching the Amsterdam FIR border, which could not be crossed due to closure of Netherlands airspace. So, it was decided to turn onto heading 030 to track the VOR boundary. When after a period nothing was seen, it was decided to commence a descent at 500ft/min. At 8,600ft sHp the aircraft descended through two thin layers of elevated CPC indications (note: not seen on PCASP so believed to be below 100nanometre in size). At one brief peak a CPC reading of about 700 was seen (compared to a 100 background count at LAM) at about 8,000ft.

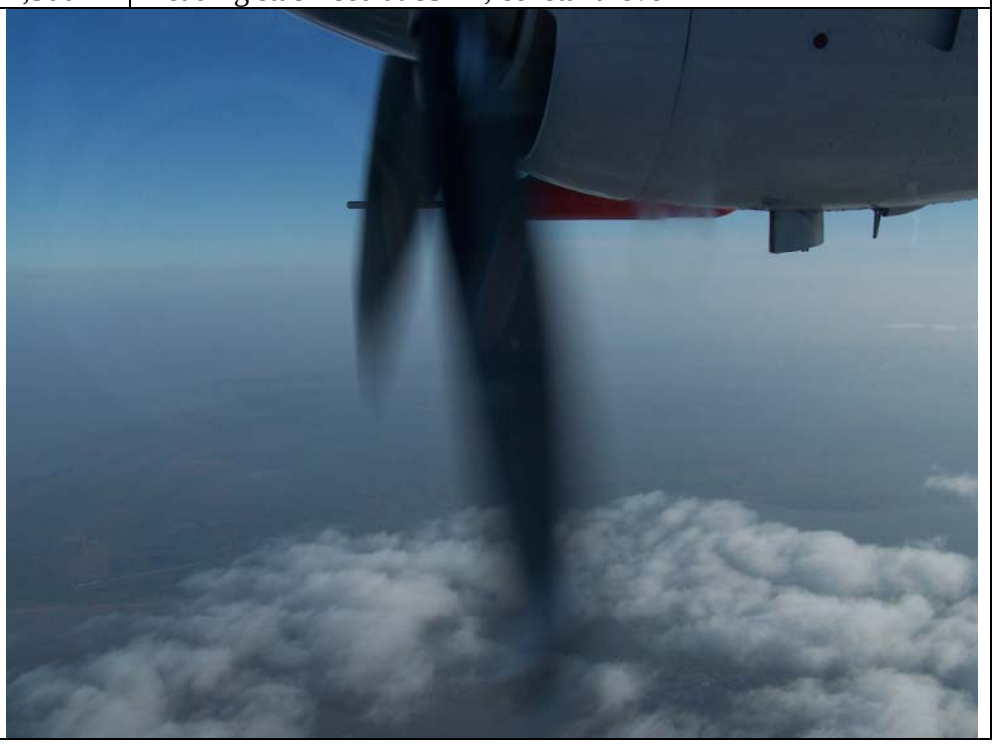
At 52.49N 002.48E the aircraft was turned left onto an approximately north-westerly heading whilst maintaining FL70. CPC reading was an elevated 160 so descent was recommended. CPC readings however then increased, so the aeroplane was turned at 5,000ft left onto a south-westerly heading at approximately 52.75N 002.38E; this caused the CPC count to drop initially to 140 then a high peak of 2000 was seen.

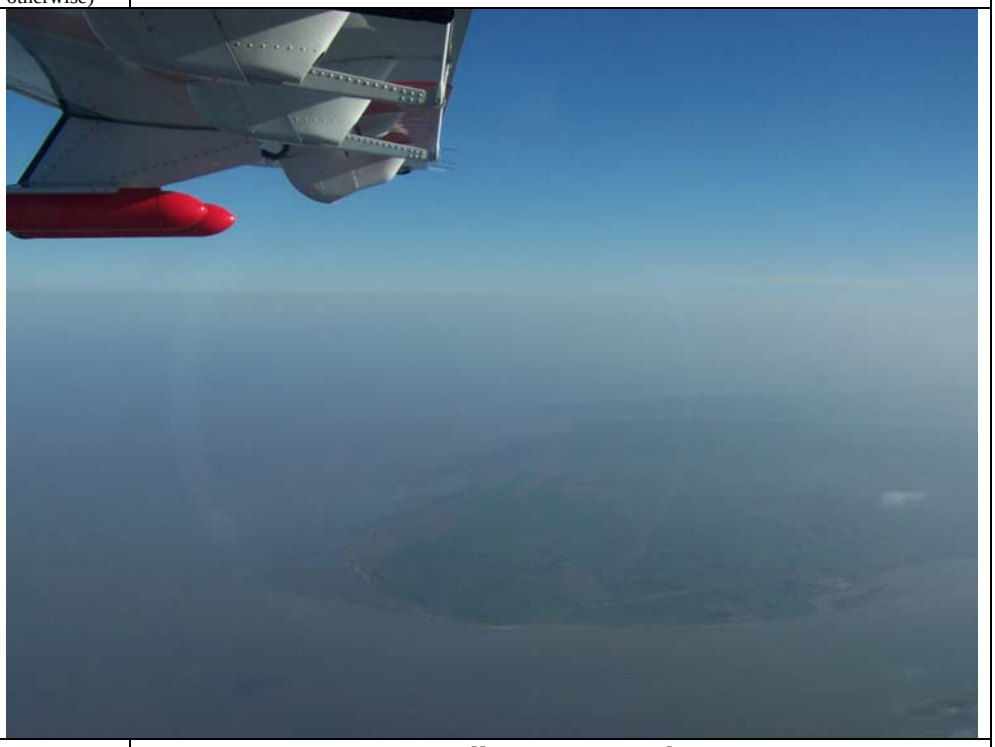
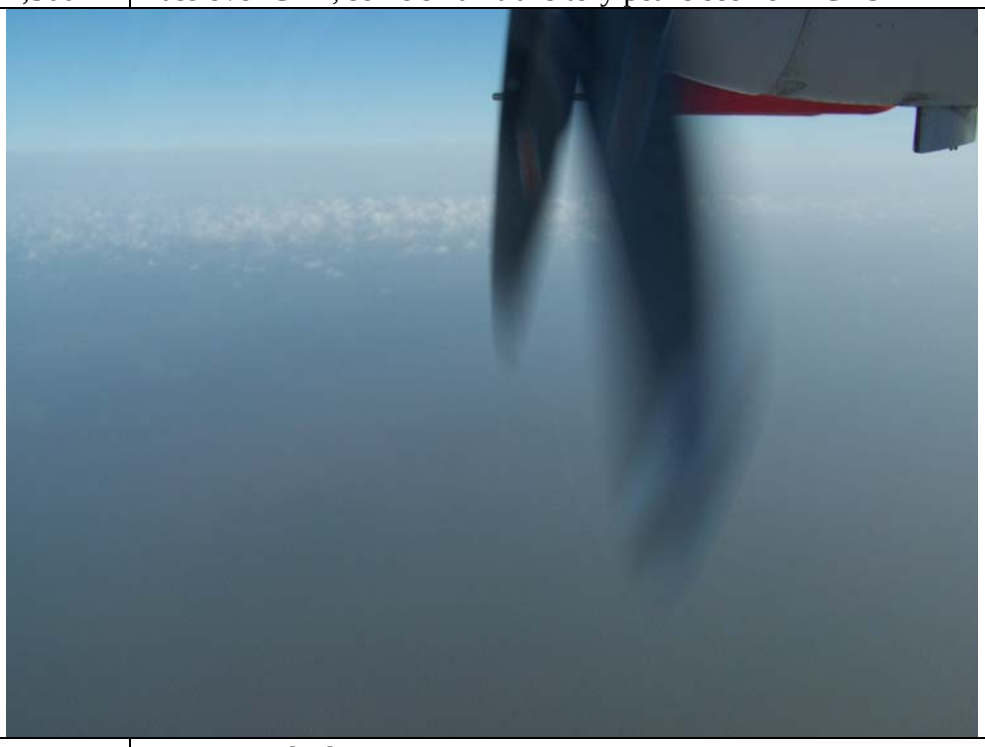
This was considered unacceptable for safety reasons so a rapid descent was initiated to 2,000ft where conditions appeared to suggest still substantial dust trapped in the boundary layer.

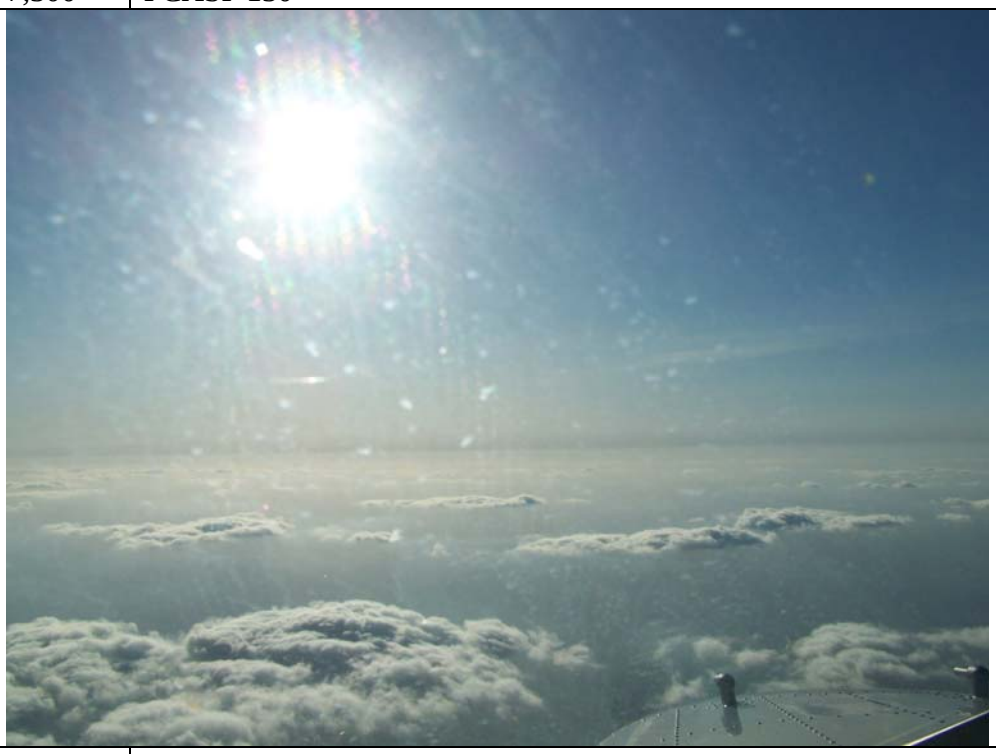
Maintaining a heading of 230° the aircraft was then established in a best rate climb to further attempt to escape these conditions. CPC reading was 3,000 at 2,500ft, 4,600 at 5,000ft then it dropped off rapidly to 140 at 5,400ft, 200 at 6,000ft [time 15:58:30Z] but then increased again to 1000 at 7,600ft [52.39°N 002.06°E]

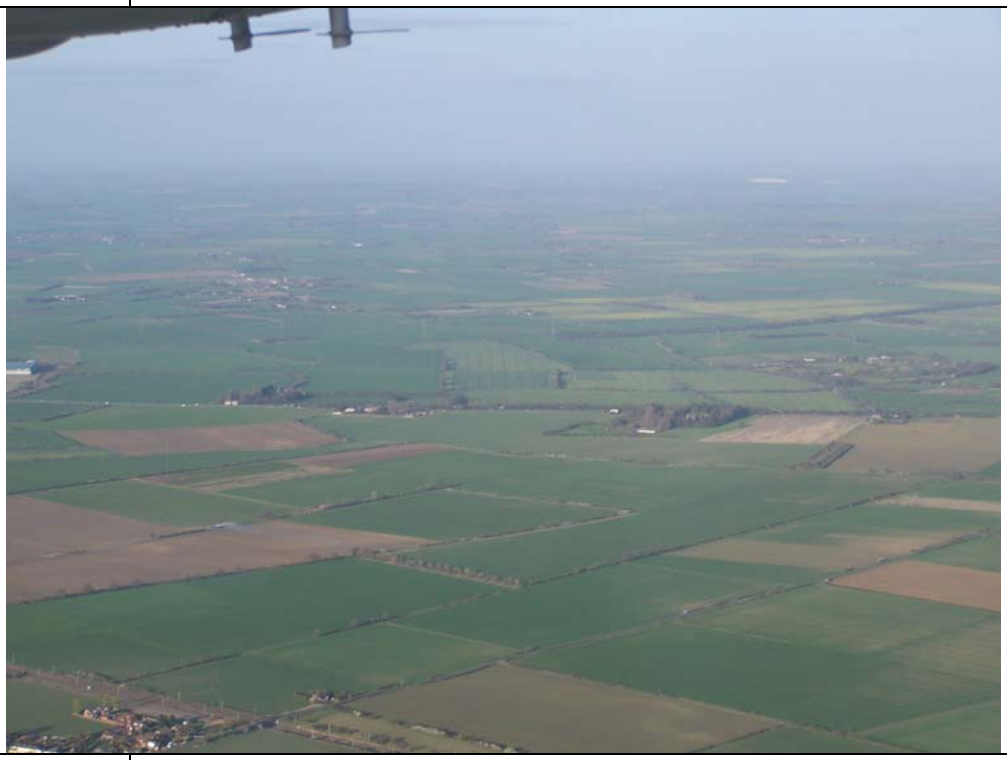
Following this excitement, events settled down as it was decided to fly carefully monitored profiles as indicated below

| **Time** (UTC) | **Altitude** (ft SHp unless stated otherwise) | **Event** |
|---|---|---|
| 1604 | 4,900 | 30nm to LOGAN on direct track whilst descending at 500fpm |
| 1605:30 | 4,000 | Encountered top of a plume below the aircraft, initiated climb.<br><br>Note: Indications were that the upper plume (detectible on both CPC and PCASP) contained larger particles than the lower plume (detectible only on CPC) |
| 1607:30 | 5,500 | |
| 1608:40 | 6,300 | Sulphurous smell throughout aircraft, nothing seen on SO2 instrument |
| | 6,500 | CPC 400 |
| | 7,000 | CPC 400 initiated descent |
| | 6,600 | Sulphurous smell encountered again |
| 1610 | 5,000 | Turned on direct track for CLN at constant altitude<br>CPC constant at 200<br>Dust density estimated by CPC scientist as $7x10^{-13}$ g/m$^3$ |

| **Time** (UTC) | **Altitude** (ft SHp unless stated otherwise) | **Event** |
|---|---|---|
| 1620 | | CPC Failure [for which reason a hard deck of 5,000ft was set due to now inability to detect lower fine dust plume] |
| 1623 | 5,000 | Turned west on direct track for Aberporth from CLN [51.848417N 1.147611] (approximately westerly) commenced climb |
| 1629 | 7,400 | PCASP indication constant at 200 |
| | 8,300 | PCASP at 100-150 |
| | 9,000 | PCAS 150 |
| 1634 | 10,000 | PCASP 160 |
| 1635 | 10,000 | 51.90N 0000E/W<br>Initiated descent to 7,600ft and turn onto easterly heading, hoping to locate the westerly edge of the layer at this level. |
| 1646 | 7,500 | Heading stabilised at 85°M, constant level |
| 1646 |  | |

| **Time** (UTC) | **Altitude** (ft SHp unless stated otherwise) | **Event** |
|---|---|---|
| |  | |
| 1650 | 7,500 | Pass over CLN, some small transitory peaks seen on PCASP |
| 1653 |  | |
| 1657 | 7,500 | PCASP peaked to 200 |

| **Time** (UTC) | **Altitude** (ft SHp unless stated otherwise) | **Event** |
|---|---|---|
| 1700 | 7,500 | 51.90N 001.94E<br>PCASP at 120<br>Aircraft turned on direct track for Cranfield intending to profile FL50-FL100 on the way |
| 1702 | 8,000 | PCASP 100<br>Mass concentration decreasing, implying reduction in mean quantity of larger particles |
| 1705:50 | 10,000 | Recommence descent at 500fpm<br>PCASP 100 |
| 1709 | 7,500 | Coast in at 51.95N 001.21E<br>PCASP 100 |
| 1710 | 6,800 | Increase in aerosol mass on PCASP and a strong sulphurous smell in the aircraft. First positive reading on $SO_2$ instrument. |
| | 6,300 | As above, climb initiated to avoid these conditions |
| | 7,300 | PCASP 130 |
| 1713 |  | |
| 1714 | 7,800 | PCASP 100 |
| 1716 | 8,900 | PCASP 80<br>51.98N 0000E/W |
| 1717 | 9,500 | PCASP 150, layer visible around the aircraft |
| 1718 | 10,000 | PCASP 100<br>Descent initiated at 500fpm<br>Layer visible on instruments and out windows on way down. |

| **Time** (UTC) | **Altitude** (ft SHp unless stated otherwise) | **Event** |
|---|---|---|
| 1722 | 6,000 | Brief dusty smell in the cabin<br>PCASP 200 |
| 1723 | 3,800 | PCASP mass substantially elevated, entry to fine layer strongly suspected |
| 1725 | 2,000<br>QNH<br>1026 | PCASP 150 |
| 1725 |  | |
| 1728 | 2,000<br>QNH<br>1026 | PCASP 150 |
| 1729 | 2,000<br>QNH<br>1026 | PCASP spike about 5 miles south abeam Bedford |

Further comment

The aircraft's weather radar and stormscope were monitored throughout the flight. At no point did either show anything

Discussion

Evidence appears to show below 10,000ft three layers of volcanic residue over East Anglia and the southern North Sea. A lower fine level in the order of 1,000ft-4,000ft; a mid level sulphurous chemical layer at around 6,500ft, and a higher level of coarser particles around 8,000ft.

The density and edges of these layers appear hard to predict, whilst levels clearly reach values with potential to be hazardous to aircraft. This is particularly significant in the context of the invisibility of these layers to normal aircraft instrumentation.

Signed:

16 April 2010

Appendix A – Forecast weather at time of flight