Aircraft: DC-8 - AFRC (See full schedule)
Flight Number: 130613
Payload Configuration: SEAC4RS2013
Nav Data Collected: Yes
Total Flight Time: 8.7 hours
Submitted by: Frank Cutler on 08/29/13

Flight Segments:
From: KGEG
To: KEFD
Start: 08/27/13 18:03 Z
Finish: 08/28/13 02:45 Z
Flight Time: 8.7 hours
Log Number: 138301
PI: Kent Shiffer
Funding Source: Hal Maring - NASA - SMD - ESD Radiation Science Program
Purpose of Flight: Science

Comments:
Purpose of Flight: Science flight (wild fire smoke from California & Idaho to over Canada) Aircraft Status: Airworthy. Sensor Status: SEAC4RS instrument payload; all instruments operated. CIT CIM incurred system failure during flight Significant Issues: None Accomplishments: Suit case flight out of Spokane, WA to Ellington Airport, TX. Initial climb to 15,000ft MSL headed east towards Missoula, MT. Climb to FL230 arriving at 1912Z. Start east/west data wall west of Crazy mountain, MT at 1925Z. Data wall flown at FL230, 13,000ft MSL, 7000ft MSL. Complete data wall at 1947Z. Climb north to 14,000ft MSL headed on course to west of Great Falls, MT. Climb to FL230 an fly north/south data wall west of Great Falls, MT starting at 2004Z. Fly data wall at FL230, with ramp down to 1200ft AGL, and 1200ft AGL, 14,800ft MSL (cloud base), 15,800ft MSL (in cloud), 16,000ft MSL (cloud top). Complete data wall at 2113Z. Head northeast toward Winnipeg, Canada. Fly at altitudes 13,000ft MSL, 11,000ft MSL, 17,000ft MSL. Cross Winnipeg at 11,000ft MSL at 2253Z. Turn south and initially descend to 3000ft MSL at 2301Z then climb to fly at various altitudes in route. FL340, FL360, FL380, FL400, FL350, FL370, FL390, FL400. Land at Ellington Airport, TX. Takeoff time: 239 18 03 24 Landing time: 240 02 45 22

Flight Hour Summary:

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<th>Flt #</th>
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<th>Duration</th>
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### Flight Reports began being entered into this system as of 2012 flights. If there were flights flown under an earlier log number the flight reports are not available online.

**Related Science Report:**

**SEAC4RS - DC-8 08/27/13 - 08/28/13 Science Report**

**Mission:**
SEAC4RS

**Mission Summary:**

We departed Houston on 26 August with a plan to sample fresh smoke on 27 August from one or more ID fires in coordination with the BBOP G-1 and then fly NE and E along the massive plume from the Rim fire to document changes as it aged over several days of transport before heading to Houston slicing across the anticyclone at high altitude. However, the extent of the Rim fire plume and the difficulty we experienced trying to get into smoke from Little Queens fire on 26 Aug, plus instrument problems on the G-1 caused a change of focus. An outline of revised plan was developed in the evening of 26 Aug, this plan was refined morning of 27 Aug and relayed to us in Spokane ~ 2 hours before take off. The new plan had 5 elements: 1) head from Spokane to Missoula and shoot a missed approach through thick part of Rim plume, 2) proceed to Bozeman and fly a wall pattern in and above the smoke, 3) then to Great Falls and fly a second wall in a region where the smoke was capped with small Cu with aim to sample smoke in and between the clouds, 4) fly to Winnipeg in the smoke as much as possible, and 5) slice through the transition between tropical and extra-tropical air masses in the high altitude anticyclone over central US enroute to Houston.

Objectives 1 and 2 went exactly as planned. Enroute to Missoula at 15 kft DIAL HSRL reported smoke below us shortly after they started transmitting. Shortly later we intersected the top of the plume and began what turned out to be ~ 4.5 hours of nearly continuous in-situ sampling of the smoke plume. During the descent into Missoula the density of the smoke was quite variable, probably indicating that plumes from smaller local fires were embedded in the main Rim fire plume As we approached the first wall we flew over Bozeman and a little E of SE end of the wall and noted that we were out of smoke plume, apparently having crossed S of southern edge. We ascended to 23 kft for the HSRL leg of wall and passed over the edge of smoke plume before starting the first SE to NW leg. The return leg at 13 kft and the final leg near 7 kft were both in the smoke. During this leg the planning team in Houston moved the location of the next target area a little to optimize the cloud field. We climbed to 14 kft and headed toward Great Falls in the smoke. We then climbed enroute to 23 kft for the top of the next wall above clouds and smoke. Return leg was a ramp down to 5 kft for leg below much of the smoke,
followed by 2 passes that were in the clouds. First cloud leg tried to be just above cloud base, followed by one just below cloud tops, however the cloud bases and heights varied a lot so both legs flew just below some clouds and penetrated many small clouds at different levels (relative to the individual cloud base and top), and the second leg also flew over some clouds along the track. These 2 legs appeared to yield very rich data set, but it will take some effort to reconstruct the 3-D aspects of the region.

After the second wall we headed for Winnipeg, starting at 13 kft, in smoke but not in the thickest part. With advice from DIAL, we descended to 11 kft to find the heart of the plume and stayed at that level for ~ 45 minutes. We ascended to 17 kft briefly to get out of the smoke and encountered a layer with enhanced O$_3$ and depleted CO that seemed characteristic of the layer just above the smoke much of this flight. We dropped back down to 11 kft and flew in smoke to Winnipeg where we turned south. As soon as ATC allowed, we dropped into the BL for 5 minute leg before beginning a climb to max altitude to sample the UT around the anticyclone. All of the ascents/descents through the smoke after the missed approach showed more vertical structure than we had observed during the flight to Spokane on 26 Aug. Specifically, the thickest smoke was centered near 11 kft, decreasing above and below. This layering was also observed by DIAL HSRL. On our BL run south of Winnipeg concentrations of fire tracers approached background levels.

On the return to Houston we profiled from 34 to 40 kft, ascending first into a tropical air mass wrapped around the anticyclone. Near the SD-NB border we entered an extratropical air mass with enhanced O$_3$ at 38 kft. We climbed to 40 kft and flew a 30 min leg to give 4 STAR time to conduct a Langley calibration just before sunset, during this run O$_3$ increased to > 150 ppb and then slowly declined. We ramped down to 35 kft and stepped back up to 40 kft before final descent to land at EFD. In this final profile we penetrated cirrus and noted BL tracers in and around these clouds. We also passed back into a tropical air mass before starting the landing descent.

Total flight duration was 8.7 hours. CIT CIMS reported that the triple quad instrument went down about an hour after take off, though the TOF functioned well through out the flight. All other instruments stated that they were in good shape for the next flight.

Images:

MODIS TERRA view of Rim fire 27 Aug