

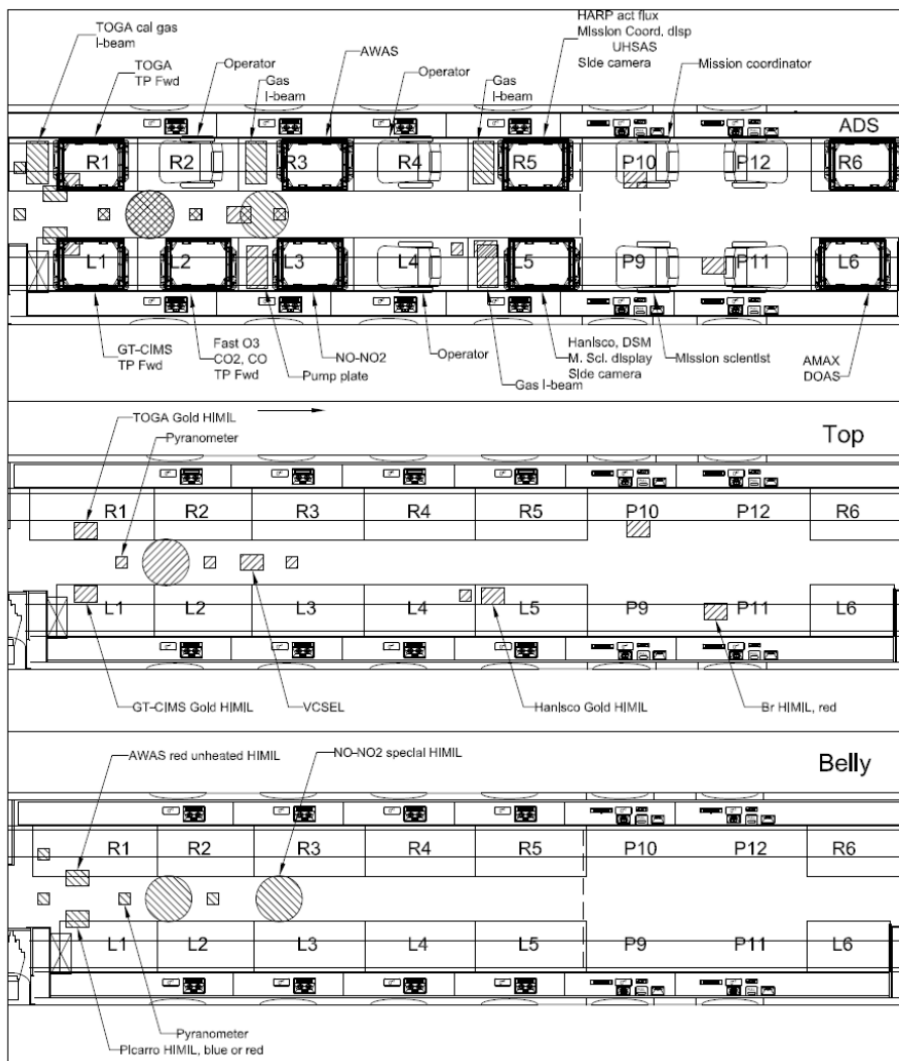
Update: May 24, 2023, with High Rate (25 sps) Data Notes

CONTRAST Project Manager Report Aircraft payload

CONTRAST GV payload

11/22/2013

- VCSEL
- Fast O3
- NO-NO2
- VUV CO
- Picarro CO2,
- CH4
- CH2O
- GT-CIMS
- AMAX-DOAS
- Br (BRIGHT)
- AWAS
- TOGA
- UHSAS
- 2D-C
- CDP
- HARP
- Mission coord.
- Mission sci.
- Gas cylinder rack
- Gas I-beam, x4



General Data notes

During CONTRAST chilled mirror hygrometers exhibited sensor limitations in many flight regimes. After descents they frequently oscillate trying to stabilize the mirror temperature in presence of excessive condensation. At high altitudes, the dew point is lower than the sensors' cooling capability and the instruments reach their limit at -65 to -70C. On all flights multiple periods of DPL and DPR are considered bad data and are removed from the final data set. On several flights DPL did not report any useful data (listed in flight notes below).

The Omnistar DGPS real time augmentation service experienced satellite feed dropout on several occasions. On RF17 the aircraft left the Omnistar satellite coverage area and the receiver did not re-acquire a new satellite, resulting in the complete loss of DGPS augmentation for RF17.

DSM303, which controls Novatel GPS data acquisition, experienced serial connection dropouts during the first half of the project. The issue was addressed several times by replacing and re-seating the serial card. The data loss is noted in individual flight notes below. Avionics GPS data were available during all Novatel GPS data gaps.

The nadir looking pyranometer was flooded by subfloor condensation / rain water before RF05. The issue was resolved by sealing the replacement pyranometer to the GV floor and the measurement was re-established for RF09 and all subsequent flights.

PLWCC may on occasion demonstrate baseline features that are due to the airflow changes around the hot wire probe and not due to the presence of liquid water. The PLWCC uncertainty is on the order of 0.02 g/m^3 for normal level flight.

WIC – needs revision. WIC is affected by altitude and angle of attack.

Rosemount anti-iced temperature sensor was producing higher readings throughout the project. Harco element #1 was used for the temperature reference (ATX) for the entire project.

UHSAS exhibited excessive noise in the smaller size bins. First 12 bins were removed, and a few periods have also been blanked, to correct this problem.

High Rate (25 sps) Data Notes

VCSEL data periodically shows noise in the -20 to -30 dewpoint range, the bottom end of the high-humidity mode. This noise level is far more than would be expected from simple noise averaging, sometimes as much as $\pm 5 \text{ C}$. Periodically a 1-Hz spike is seen, from the 1-Hz update rate to pressure and temperature from aircraft data feed, which affects the high-rate spectrum.

UHSAS and CDP probe size distribution data variables have been removed at the high frequency.

Flight Specific Data notes

RF01

1/11/2014

There was a landing on this flight and the data from 17:46:56 to 18:49:56 and from 18:55:23 to 18:56:38 should not be used.

Data gap from 00:22:53 to 00:27:01 in DSM303, resulting in the loss of Novatel GPS data (GG*). Position data from the aircraft avionics is good during this period (GALT_A, GLAT_A, GLON_A) and are recommended for use, however during other periods the Novatel data have higher accuracy and are preferred.

UHSAS: Generally operating normally. There are a few episodes of noise counts in the smallest diameter size bins, approximately 60-70 nm. These are apparent when UHSAS total concentration CONCU shows large spikes while the concentration of 100 nm particles and larger, CONCU100, has no corresponding increase. This typically occurs in the first 10-15 minutes after startup, but may occur at any time. There were no scatter signal saturation events or any other indications of laser instability.

RICE: Malfunction (going to zero volts) during high-altitude flight at 19:35 to 20:05, 00:19-00:21, and 01:39-01:45. Also, small step function in probe output; this is related to UHSAS heater circuit, and the small error will be present as long as UHSAS is flown on the same pod.

HARP: All 4 actinic flux channels reporting reasonable values; no failures. IRIG sync at startup August 6, 2014

fails -- employing manual work-around. jNO2 values running ~0-0.02/s. A typical value for low SZA, above 10 km altitude, is 0.015/s (Brasseur, Orlando, & Tyndall, Atmospheric Chemistry and Global Change, 1999.)

Omnistar data dropout from 01:27 to 01:49. Regular GPS is still available during this period. Picarro CH4 and H2O appear normal. CO2 is running high, 450 to as high as 800 ppmv, indicating cabin air is leaking into the sample line. CO values look reasonable. The Picarro continues to suffer variable delay in its serial output to ADS, approaching an hour. Picarro is aware of the problem but has not offered a solution. Data recorded internally by the Picarro are correctly time-stamped.

RF02

1/13-1/14/2014

Omnistar data was not available during portions of the flight. Periods of reduced GPS accuracy are from the start of flight until 21:05, from 22:01 to 22:24 and from 22:38 to 23:34.

Data dropout at 02:48 to 03:07. Required several restarts to recover normal operation. This is likely a software bug which occurs when it changes from direct mode to strong mode and back to direct within about 10 seconds.

UHSAS: As in RF01, UHSAS had some noise counts in small bins but otherwise operated well.

RICE: Malfunction (going to zero volts) during high-altitude flight at 21:49 to 21:54, 23:01-23:13, 02:45-04:00, 04:30-04:35 and 04:44-04:59. Also, small step function in probe output; this is related to UHSAS heater circuit, and the small error will be present as long as UHSAS is flown on the same pod.

Picarro's time delay and a sample line leak persist. For this flight a conversion of CO raw detector counts to mixing ratio was introduced. However, the offset was intended to be used in the form $Y=m(X-b)$, but was applied instead as $Y=mX+b$, leading to erroneous values in the ADS data stream. Affected data for this flight are easily corrected, and the conversion has been corrected for subsequent flights.

DSM303 serial dropouts.

RF03

1/17/2014

Data gap from 05:31:38 to 05:42:27 in DSM303, resulting in the loss of Novatel GPS data (GG*). Position data from the aircraft avionics is good during this period (GALT_A, GLAT_A, GLON_A) and are recommended for use, however during other periods the Novatel data have higher accuracy and are preferred.

DPL was inoperable for the entire flight. DPR worked periodically.

VCSEL - Laser power down about 25% from pre-RF01.

UHSAS: Beginning at 05:51:07, sample and sheath flows appear to approximately double, and this behavior continues off and on for the rest of the flight. It is not known whether this is a real flow change or an electronic problem in the probe, but the fact that the high flow values are constant, with none of the expected small variation from point to point, suggests the problem is electronic and not an actual change in flows. Data gap from ~0532 - 0543 due to serial card lockup & DSM reboot. Very little noise counts in the small-diameter bins this flight. Size distributions look good, although they suffer from poor statistics at high altitude.

ISAF Too cold, laser shut down on 2nd descent.

TOGA – pump head needs service, affects calibrations only.

CO2 experienced cabin air contamination.

AWAS: ribbon cable problem, some cans won't sample.

LWO analog card is not working. Replacing on the next maintenance day.

Picarro delay, high CO2 problems continue. Appears that Picarro H2O and CO2 channels were swapped in ADS/Aeros today.

Jeff Stith flew as MC.

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RF04

1/19/2014

DPL was inoperable for the entire flight. DPR worked periodically.

Preflight: DSM303 serial driver messed up, replaced serial card in preflight. With that DSM303 was solid for the entire flight.

CO2 was fixed during flight, the overflow line downstream of the pump was sucking in cabin air. LWO still needs timing card work.

UHSAS: UHSAS generally ran well. A few episodes of small-bin noise counts, especially toward the end of the two dips, occurred. Had several more instances of reported sheath and sample flows jumping to high values. Internally recorded data file shows that these flows are jumping to 1000.000 sccm and 100.000 sccm, respectively, and that reported instrument pressure simultaneously jumps to 121.666 kPa, all transducer limits. Strong indication that this is an electronic problem and not actual flow or pressure change. Size distributions look good, except at highest altitudes where particle counts are low and concentration is < 10/cm³.

CO requires rebooting every hour, freezes at 45 min after hour.

ISAF worked well, two unexplained shutdowns.

Bromine took 9 samples and software stalled, had to go back but software does not allow to do this. HARP IRIG startup problem fixed.

AWAS discovered leak at the pump: potentially all flights so far may have been compromised. Pavel flew as MC, Jeff was not feeling well.

Picarro CH4 and CO2 still showing some problems. Picarro serial delay and high CO2 problems remain. Cal gas was run (intentionally) for some portion of the flight, and some troubleshooting was performed as well, so some of the carbon data will be compromised. CO was restarted once during the flight. CO values carry an offset of about 73 ppbv, as evidenced by the zero level, that will be removed in later processing.

RF05

1/22/2014

Radome icing was experienced from 04:54:17 to 05:00:12, 07:18:19 to 07:32:40.

DPL and DPR were inoperable for the entire flight.

Nadir pyranometer (VISBC) has failed during or before this flight; condensation was discovered after flight in the radiometer dome. The instrument was damaged beyond repair.

UHSAS: Operated well generally. More incidents of high noise counts in the first few size bins, and had bad reported flows (as described for previous flights) for most of the last one third of the flight. The size distributions look ok.

CO, CO2 reported to still have cabin air leak.

Garmin GPS froze for a while; power cycle restored operation.

The carbon instruments and sample line were worked on during the flight. That, combined with the large, variable Picarro serial delay, makes interpretation of the measurements difficult beyond noting they are ballpark values.

ISAF (formaldehyde) inlet flow too low; need to adjust plug again next maintenance day.

RF06

1/24/2014

DPL was inoperable for the entire flight. DPR worked periodically.

VISBC is down, instrument damaged by liquid water.

DPR worked better with high altitude legs.

Omnistar data lock was lost from 02:21 to 04:12. Expect reduced accuracy of the GPS data during this period.

UHSAS: Generally operated well, but had more extensive periods of noise counts in the small-diameter bins than in previous flights. Aside from these noise counts, the size distributions look good. Prior to this flight, RAF techs inspected the cable/connectors between the Flow and Digital August 6, 2014

boards and did not find a problem. An intermittent connection here is suspected in the erroneous flow readings that have been occurring. During this flight, both flows (sample and sheath) and the internal pressure showed good readings throughout.

Picarro CO2 concentration began to fall at about the midpoint of the flight and those data appear to be compromised for the remainder of the flight. It was suspected that the Picarro had detuned from the CO2 line, and so was restarted at 05:03 UTC. The restart process took approximately 20 minutes. CO2 continued to read low, however. Other than the data gap on restart, CH4 and CO do not appear to be similarly affected, although a more careful examination is needed.

Picarro lost line lock on CO2 line, 1/2 flight bad CO2 data.

RF07

DPL was inoperable for the entire flight. DPR worked periodically.

VISBC is down, instrument damaged by liquid water.

PLWC was below the detectable threshold. No PLWCC data available for this flight.

UHSAS operated well for the most part. There were no anomalous flow or pressure readings for the second flight in a row. Noise count problem is gradually worsening, with several episodes during this flight that included oscillatory behavior in the (apparent) total counts and feeding into the concentration. The amplitude of noise may be increasing as well, with some noise reaching ~80 nm. These effects are mostly eliminated with the removal of the first 12 bins, but two additional periods require blanking.

Picarro time delay exceeded 90 minutes at times. Small sensitivity change from 1st to later zeros for both CH4 and CO2. Some zeros were sloped, indicating sluggish response in the system. CO and FO3 showed both correlation and anti-correlation at various times. CO zero and cal values look very good.

RF08

VISBC is down, instrument damaged by liquid water.

AMAX-DOAS inoperable, PC104 in the pod failed in preflight.

UHSAS performance very similar to RF07. Many episodes of high noise counts in small bins, otherwise operated ok.

RF09

Nadir (VISBC) pyranometer reinstalled, spare unit placed in service. Spacer-to-fuselage and spacer-to-housing are sealed with tank sealant.

AMAX-DOAS is repaired.

The downward camera (in DOAS) went intermittent shortly after takeoff, between 00:18 and 00:22. Sometimes faint monochrome images (it's a color camera) could be seen through a veiling haze, other times a horizontal white-black gradient existed. Since it's a firewire camera (serial type interface) these symptoms have to be originating in the camera. Restarting the camera acquisition software was no help. Unlike our Fwd, left, right cameras this one has a 6" ribbon cable between the main electronics and the CCD imager which allows flexibility for OEM type setups. Suspicion is falling on the ribbon cable which is disconnected and reconnected when working on DOAS. UHSAS had high noise counts in small bins for much of the flight, otherwise operated ok.

RF10

2/8/2014

Data gap from 05:19:45 to 05:30:19 in DSM303, resulting in the loss of Novatel GPS data (GG*). Position data from the aircraft avionics is good during this period (GALT_A, GLAT_A, GLON_A) and are recommended for use, however during other periods the Novatel data have higher accuracy and are preferred.

AMAX DOAS had no motion stabilization.

ISAF went down (they understand why) but never came back up (they don't know why).

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Down camera seemed to be fine during this flight. The work on the DOAS may have fixed a loose connection. All camera recording stopped 01:00. It resumed ~01:17 after two stop/start operations. UHSAS: High noise counts in small bins for much of the flight.

RF11

2/12/2014

At 03:49-03:54 there is an excursion in ATHR vs ATFH where one heated temperature sensor behaves differently from the other. This occurs in liquid water cloud.

VCSEL data were lost for the period from 04:42:55 to 05:45:06. The laser intensity dropped to zero, possibly due to icing. After restart VCSEL into the wrong mode (the lowest-humidity mode) before the laser intensity came back. In switching mode at 05:01 the again dropped to zero where it remained until the power was cycled at 05:40. Data again at 05:45. No data from

04:43 to 05:45. Operated fine for remainder of flight, laser intensity good, no maintenance required. DPL and DPR were also bad for some part of this period, therefore no humidity correction is applied to the dependent variables.

UHSAS showed high noise counts in small bins for much of the flight, otherwise normal operation.

RF12

2/17/2014

UHSAS: Fewer occurrences of high noise counts in small bins, but the problem persists. No other issues identified for this flight.

RF13

2/19/2014

Data gap from 18:00:05 to 18:13:46 in DSM303, resulting in the loss of Novatel GPS data (GG*). Position data from the aircraft avionics is good during this period (GALT_A, GLAT_A, GLON_A) and are recommended for use, however during other periods the Novatel data have higher accuracy and are preferred.

VCSEL power was cycled at 22:06 by mistake. Short data interruption until 22:08.

UHSAS: Better noise count performance, but the problem persists. Noise seen mainly at low altitude - during ascent, descent, and the dip.

RF14

2/22/2014

Data gap from 09:06:03 to 09:08:23 in all recorded variables. ADS server issue. UHSAS noise problem mostly confined to takeoff and landing.

RF15

2/24/2014

DPL was inoperable for the entire flight. DPR worked periodically.

Omnistar data was not available during a short period in flight. Period of reduced GPS accuracy is from 02:35 to 04:47.

UHSAS noise problem back for much of this flight.

RF16

2/28/2014

DPL was inoperable for the entire flight. DPR worked periodically.

ADIFR ingested water and was inoperable from 01:03:06 to 03:07:33. WIC vertical wind velocity is not available during this period of time.

UHSAS noise problem continues, most prominent during ascent, descent, and the dip.

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RF17

2/28/2014

DPL was inoperable for the entire flight.

Omnistar data was not available throughout most of the flight. UHSAS noise problem continues, occurring for much of the flight.

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Technician notes

RF01 11JAN14

Takeoff: 15:57

Landing in California: 17:43 Takeoff in California: 18:57 Landing: 02:02

All instruments worked as expected. CDP, 2DC, UHSAS, PLWC, and RICE all showed activity at one point or another.

I had to restart cameras after takeoff in California. There seems to be a sequential problem with the wow, landing, and taking off again without stopping and starting cams. No big deal. Just pay attention.

The mouse tweaked out on me about an hour into flight. Completely unresponsive. My suggestion is to stop immediately and unplug the USB and reinsert.

At 00:25 DSM 303 serial card stopped reporting with all serial channels on the status page going red. We saw this during MPEX with multiple DSM's where the card would come back. I did not want to wait, so, I just rebooted and this fixed it.

That's all. Kyle

RF02 1/13/14

Takeoff in Hawaii: 20:07 Landing on Wake Island: 01:16 Takeoff on Wake Island: 02:36

Landing in Guam: 05:58

As expected, dew pointers had an issue with moisture during these first two research flights.

Anything from not coming out of rebalance to service mirror led's flashing. The best solution I have found is to wait until your up to a descent elevation and then cycle power. Probably best to do one at a time. They tend to come around after a moderate amount of time. Anytime we dip from a high altitude or land and takeoff, this happens. I plan on servicing them tomorrow and drying them out as best as possible.

Had to stop and start cameras after takeoff from Hawaii. They were working on the ground. I think this is a software sequential issue with wow and start or stop icons. Again, no big deal just pay attention just after takeoff.

Flight track was a little goofy today but I think this will get better from here on out.

Only other major issue is when we landed in Wake, we descended very fast from 45k to landing. Sat there for an hour and twenty minutes and then took off to high altitudes again. VCSEL went wacky when things got cold. I'm guessing condensation was the issue. Symptoms were laser intensity was good. Dew point just dropped out. It took 3 reboots to straighten things out. After August 6, 2014

that it was fine. My opinion is that VCSEL dew point is an extremely important measurement. Especially when the Buck dew pointers do not like dips from high altitudes.

I did see some activity from all probes this flight. They all seem to be operational. One note is that from monitoring the 2D end diode voltages, I think when we fly through wet clouds and then immediately climb to cold, high altitudes, the mirrors get fogged or ice. Values dropped to very low voltages. They did clear over time.

Very long day. That's it. Kyle

RF03

1/17/2014

Overall instrumentation behaved very well with a few minor exception: I had to restart the cameras twice before take-off.

During our taxi, I noticed that DPR had the rebalance light on. I cycled power on the unit and before takeoff this light was out.

Takeoff was 00:14Z

After seat belt release, I noticed that DPL was not controlling well and was over 30 degrees warmer than DPR.

at 00:28 I noticed that there was no right camera image. I stopped and then restarted (00:41) the cameras to try to get the image back but did not work.

At 00:44, I cycled power on DPL to try to get it to work but it did not control correctly through the whole flight.

00:55- I refreshed the camera page that brought back the right camera.

01:42- at the bottom of our first descent the "service mirror" light came on DPR. At 01:44 I cycled power on DPR but the re-balance never went out.

At the bottom of our second descent 03:29 the mirror light came on again on DPR. This time I waited until we were above 10K feet to cycle power and the re-balance light out shortly.

This happened again on our third descent (05:20) and after I cycled power (05:44), above 10K feet, the unit worked fine.

At 05:35, I observed the all of the serial channels on DSM303 not working. As I looked into it I ascertained that the rest of the DSM was working and it was just that the serial data was nonexistent.

At 05:44 i cycled the power on DSM303 and got the serial channels working again.

During the flight, the mouse started acting crazy 3 times. I fixed it the first time by unplugging it from the PC and plugging it back in again The other two times I fixed it by leaving it alone for a few seconds and then just moving it real slow to recovery.

Touchdown was at 06:53.

Larry

RF04

1/19/14 Takeoff: 00:28 Landing 07:25

During startup, Gordon logged in and, with my permission, changed some interrupts to a couple serial channels on DSM 303 to help solve the serial card dropouts we've been having. After this the card would not respond. Even after he put things back in the original configuration. Multiple reboots with no success. We decided to do emergency serial card swap out during preflight. August 6, 2014

Fortunately this was successful and worked great the whole flight. Only caused a 15 minute delay of takeoff.

Ironically, we thought DPR was going to be an issue but it operated wonderfully the whole flight with our standard recycle of power at around 15k feet after dipping to 500 feet. It tracked very well with DP_VXL. DPL did not operate at all during the flight. I think if Larry works his magic and services it as he did DPR and blowing out the flag, we should be good to go.

We had a solid NOSYNC on LWO DSM. This was expected after swapping a timing card during the last maintenance day which did fix the analog card not responding but introduced this NOSYNC. All data seemed to be coming in good from this DSM. I plan on putting in the old timing card for giggles. If this does not work, then, put back in the NOSYNC one and wait for another spare to show up.

We might have an issue with the LWO 28VDCAI bottom breaker tripping. This supplies heat to the 2DC tips. I plan on opening things up and investigating. I have a divide and conquer idea if the breaker has opened up.

It appears that LSRINT_VXL is getting a little low. I plan on discussing with Stuart and will probably clean next maintenance day.

That is about it. Things were pretty solid this flight and PI's seemed very happy with it.

Tomorrow is a hard down. Go Broncos. Kyle

RF05

1/22/2014

Wed. 1/27/2013

All in all it was a good flight and instrumentation performed well.

I had to restart the cameras before take-off.

DPL still did not work well and DPR dropped out (and didn't recover) about 2/3 of the way into the flight.

The only other anomaly was the Garmin serial channel, on DSM 303, quit reporting about half way through the flight. Since it was only that one serial channel, I removed the fuse from the Garmin box and replaced it and the Garmin data came back.

No other problems were noticed.

Larry

RF06

1/25/14 Takeoff: 23:52 Landing: 07:04

Had to stop and start cameras after takeoff. They worked well the rest of the flight. Adjusted the ISAF Himil heater controllers to 40 degrees C about a half hour into flight.

DPL was not expected to work and it did not. DPR, on the other hand, worked very well. It tracked with DP_VXL as it should.

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This flight was pretty solid. Probably because we only did one dip throughout the flight.

I think Mike Reeves should take a look at UHSAS data. All probes responded at some point during the flight.

That is it. Kyle

RF 07

28Jan2014

Preflight: UHSAS computer does not time sync. No option to force sync or enter time manually.

23:52Z Wheels up

23:53Z Restart Cameras

23:59Z Start Dew pointers

00:06Z Camera display frozen, restart 00:13Z Restart VCSEL

00:15Z Restart DPL

01:18Z Restart DPL

01:47Z Cloud

01:50Z @10 kft, cycle power DPR 03:28Z @10 kft, cycle power DPR 03:30Z @14 kft, cycle power DPL 05:30Z @12 kft, cycle power DPR 05:05Z @16 kft, cycle power DPL Confirmed correct net address with Chris. J. Munnerlyn

RF08

2/1/14

Takeoff: 04:03 Landing: 11:46

No AMAX instrument today. Had issues preflight.

We had a satcom dropout when flying at 500 feet above the water and in a steep turn. We lost both the SBU and SDU green LED lights. After leveling out and people getting impatient, I had pilots cycle power and it came up. Had to stop and restart mpds as well. I think it is always a good idea to stop these processes and start fresh.

At 07:14, we lost DP_VXL. It was a situation between -50 and -60C when we see ACGAIN_VXL go to 0. Stuart warned me about this on a previous flight and it took a power cycle to get it going again. We just have to keep an eye on it.

Had a situation during descent in the dark when the radome iced up and BDIFR started reporting - 32767 and ADIFR's values were not making sense. On the Status Page, serial channels looked good. No reds. After temps warmed up a little, everything came back. We will look for moisture in the lines tomorrow.

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This was a hard day for headsets and push-to-talks. We lost 2 push-to-talks and one headset. We will troubleshoot tomorrow. I suspect broken wires. Might need some spares sent out. I will let you know ASAP.

Overall, the data system worked great. Saw returns from all probes and DSM's were solid throughout.

That's it. Kyle

RF 09

4Feb2014

23:58Z Wheels Up

00:00Z Cycle Power DPR

00:05Z Restart Cameras

00:07Z Cycle Power DPR

00:15Z Cycle Power DPR

00:20Z Cycle Power DPR

00:25Z Cycle Power DPR

00:38Z Restart Cameras

00:39Z cloud

01:31Z cloud, all particle probes fire, ATX & DPXC do not meet, dew pointers track 03:18Z
Cycle Power DPR

03:25Z Cycle Power DPL

04:09Z Cycle Power DPR

04:17Z Cycle Power DPL

04:25Z Cycle Power DPL

04:29Z Cycle Power DPL

04:31Z balance DPL

04:45Z Cycle Power DPL

04:59Z Cycle Power DPL

J. Munnerlyn

RF10

2/8/14

Preflight had issues with DOAS. We removed the front and rear covers so that they could access the inside of the probe. This caused a 15 minute delay in takeoff.

Block Out - 0013 Takeoff - 0019

At about 0100 got a nagios message that camera recording had stopped after a few stop start cycles got the cameras recording and updating again by 0117.

0117 a single nopps on RWO. This is the first and only timing card issue on the flight.

Seeing occasional RICE dropouts. Mainly around 0120 and from 0132 to 0135 or so. RICE goes from a value of about 1V to about 0.05V when it drops out fully. Did not see for the rest of the flight.

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0317 Replaced the PTT cord that we tried to strain relief on the maintenance day. Looks like the wire is breaking near the strain relief of the unit. We should be able to fix it on the maintenance day.

0320 reset 2dc probe it was running away. Reset seemed to have fixed the issue.

At low level there was an aircraft generator issue. We did not see any issues on our side.

0340 both DP s have service mirror lights on.

0341 level shift in PLWC

0355 both DPs are working again.

0414 cycled power on 2dc because of probe run away. It looked like a stuck bit. Power cycle did not help probe still running away.

0456 Stuck bit cleared as we went through some anvil cloud, now working.

0530 noticed that uhas stopped working at 0520. Found that all serial channels were locked up on DSM303. Rebooted the DSM. All channels returned.

0552 a second large spike in CDP concentrations, on the order of $1e+18$, this is not normal. Both were in decents. Not sure what is causing them. Other one was at 0502.

0606 Both DPs had service mirror light on during a dip to 500 feet. Right need another power cycle and finally started to work on decent into Guam.

Power Readings GV

Time - 0222 at 41K for 2 hours Left Side A Bus

400 Hz A Phase 17.9 A 116V 400 Hz B Phase 14.4 A 117V 400 Hz C Phase 10.4 A 115 V

400 Hz AI A Phase 0.0 A 116V 400 Hz AI B Phase 0.0 A 117V 400 Hz AI C Phase 0.0 A 115V

60 Hz 24A 116V

Right Side B Bus

400 Hz A Phase 11.0 A 115V 400 Hz B Phase 16.3 A 113V 400 Hz C Phase 12.0A 115V

400 Hz AI A Phase 0.0 A 115V 400 Hz AI B Phase 6.0 A 113V 400 Hz AI C Phase 0.0 A 115V

60 Hz 15A 115V

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28 VDC 10A 28.6V J. Cowan

RF11

2/12/2014

Take off : 9:57 AM

FWD camera did not show picture on display after take off ,restarted camera 02 times still no luck!

Problem found : The TRU switch on the MPDB was not engage correctly. reset this switch , fwd camera become functional for the entire flight.

Dewpoint Top and Bottom showing "Service -mirror " when we flying 500 feet , however turn both on and off was able clear the problem.

RW DSM worked fine no more " Nocode " message after repaired Timing cable.

About one hours before land VCSEL has low laser counts :600 count, restart computer ,laser count become stronger =2450 counts .

That's it for this flight. Landed :4:23 PM

Ta

RF12

Date 2/17/14

Preflight - When RWO was turned on it had a constant NOCODE. That cleared just after takeoff.

Block Out - 2351 Takeoff - 0002

0030 Restarted VCSEL computer. VCSEL dew point was reading NAN. So was EW and CONC. Stuart said that MODE gets stuck at 0 and that is what causes the failure.

0033 Stuck bit again on 2DC. Looks to be about the same bit as last time. Not a lot we can do about it in flight. Stuck bit cleared during the flight.

0023 to 0029 saw 3 instances of NOPPS on LWO DSM. They are short blips not constant.

Another at 0410 also.

0115 the PLWC went from 15W to 6W not sure why? Slowly corrected during the flight back to normal levels.

At 0120 noticed that TCAB started to have periodic jumps of about 1C. It will increase for a few seconds and then drop back down. Look a little like the RICE interference but it is not as regular. Continued for the rest of the flight.

August 6, 2014

0318 DOAS reported that the primary laptop has failed and requested to swap their two laptops. The pilots gave permission and I swapped DOAS laptops. It was just the laptop since the rest of the equipment was the same on the trays. I will have a Mechanic inspect it prior to the next flight.

0517 VCSEL DP went to NAN AT 12000 feet. Cycled power. VCSEL back at 0520.

Land 0533 Block in 0536

Post flight we removed the DOAS laptops so that they could work on them.

Power Readings GV

Time - 0342

Left Side A Bus

400 Hz A Phase 18.2 A 116V 400 Hz B Phase 13.6 A 117V 400 Hz C Phase. 8.7A 115 V 400

Hz AI A Phase 0.0 A 116V 400 Hz AI B Phase 0.0 A 117V 400 Hz AI C Phase 0.0 A 115V

60 Hz 22 A 116V

Right Side B Bus

400 Hz A Phase 12.3 A 115V 400 Hz B Phase 16.3 A 113V 400 Hz C Phase 12.2 A 115V

400 Hz AI A Phase 0.0 A 115V 400 Hz AI B Phase 6.1 A 113V 400 Hz AI C Phase 0.0 A 115V

60 Hz 14 A 114V 28 VDC 11 A 28.5V J. Cowan

RF13

2/19/2014

Take off :3:03 AM

Today I took the night mission flight, all aircraft instruments in working order, with some minor problem.

Here is what's happened on my flight .

-Camera was turn off for a few hrs night flight

-MC has a red flag showed on status instrument page, but it clear after several hours later (I guess Tom did used his magic work to clear this problem.)

Status page was looking for a computer that was not present

-At 4:12 AM DSM 303 had serial card freeze up ,any parameters tied to this card have -32767 values, however after a reset of power to the dsm, problem went away and never repeat for the entire flight.

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-Cameras was turn back on at 5:09 AM with the sun rise ,unfortunately, the images could not be recorded at first due to a software setting. Camera recording started when day light intensity increased.-

-VCSEL was unnecessary reset one time because I got a wrong information from PI. However data was speedy recover after that ! Data lost for ~1 minutes. (That was my bad !)

That's it for my flight, tomorrow will be a day transition back to day time operation. Ta

RF14

2/22/2014

Preflight- during initial start up the ARINC module for DSM303 did not load causeing us to have no ARINC data. Tom found the issue and the DSM now has all data working. Noticed a hard NOCODE again on RWO DSM.

When LWO turned on at 30 min before flight it did not boot correctly, I saw that it was not green on the status page. A power cyclc fixed it. Also had an issue where the ground was not seeing data correctly. It was displaying on the system fine.

Block Out - 0000 Takeoff - 0006

RWO NOCODE cleared after takeoff at about FL010 at time 0012. There were a couple of spikes in the next three minutes then it was solid with no errors.

0022 Started to notice that we had the streaker in the 2DC again.

0038 a single NOPPS on LWO.

0335 2DC stopped in convective cloud and turbulence. Under seat belts so could not reboot right away. Rebooted at 0341. DSM back up at 0342. During this same cloud pass both wings had timing faults show up including NOSYNCS. From time 0335 to 0338. RWO has a hard NOCODE after the incident and since about 0312 before we entered the cell. After the reboot it looks like the streaker went away for the most part.

0355 RWO NOCODE clears.

At 0324 some of the Garmin variables stopped working, mainly GGALT_GMN. At 0408 when we started to climb it recovered and started working on its own. Not sure what the problem was. Problem happened during the cloud pass and cleared when we changed altitude.

0410 RWO starts to show NOCODE again by 0414 it is back to a hard NOCODE. Th remained for the rest of the flight I think.

0514 streaker appeared again on the 2DC during a dip. I wonder if they are related? It seems to stop when we are in level flight.

0658 DPR started a 20 C raise that was not seen in the others, it started to fall back off after the rise.

0716 RWO NOSYNC and at 0722 NOPPS and NOCODE. 0725 LWO NOPPS. 0725 to 0728 moderate turbulence in a convective cloud many DSMs saw timing errors. RWO has hard NOSYNC since 0727. 0732 NOSYNC cleared on RWO DSM.

0847 Cameras stopped recording, Night detected.

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0906 Looking at status page saw Nimbus and DSM Server both stopped. Confirmed that we were not seeing data updating in Aeros. The Nimbus window was not scrolling as it should and the DSM server window showing the percent of flight was present. Stopped data acquisition and the restarted by resuming the current flight number. I could not tell if it was working correctly or not. Suspect two minutes of data loss.

0927 2DC end diodes are at 0.27 to 0.21 we are at 3000 feet on approach. The gradually got better. After landing they were around 0.5 or so.

Power Readings GV

Time - 0427

Left Side A Bus

400 Hz A Phase 20.2 A 116V 400 Hz B Phase 13.9 A 117V 400 Hz C Phase 10.6 A 115 V 400 Hz AI A Phase 0.0 A 116V 400 Hz AI B Phase 0.0 A 117V 400 Hz AI C Phase 0.0 A 115V 60 Hz 24 A 115V

Right Side B Bus

400 Hz A Phase 11.2 A 116V 400 Hz B Phase 15.9 A 113V 400 Hz C Phase 13.0 A 116V 400 Hz AI A Phase 0.0 A 115V 400 Hz AI B Phase 6.0 A 113V 400 Hz AI C Phase 0.0 A 115V 60 Hz 17 A 115V

28 VDC 10 A 28.5V

RF15

2/24/2014

Take off : 9:03am

I took the flight #15 for the final project. Today we heading North toward Japan and maintain high altitude between 40 up to 45000 feet all-the time, All aircraft instruments work fine for this flight. Here is some minor issues in this flight:

-During takeoff all camera suddenly turn off for no reason, stop and restart the camera icon button was able bring all camera back to normal and all cameras stay up for entire flight.

--Dew-point Left went to south with calibrate light came on and was not tracking well compared with DPR and VCSEL. , Later on it 's slowly came back but still showed 20 degree different when compare with DPR. Will inspect this for tomorrow .

-2DC probe still have stuck bit problem , we will rotate the probe for ferry flight.

That's it for my flight , no more push to talk cable broken after I suggest user remove their head set before they rotate their seat for take off and landing.

Landed : 5:24 pm

Ta

RF16**2/28/2014**

August 6, 2014

We took off after we had rain on preflight so things were wet.

DPL had a rebalance after takeoff. Repeated power cycles cleared the rebalance light but it did not measure correctly. At altitude it was

-24 while DPR was -50 and VCSEL was -70. DPR had issues during the dip and needed to be cycled. It recovered slowly but did start working.

The stuck bit is still around. I did look at some data comparing Concentrations to Alt, also looking at end diodes and things. I was unable to come up with any link that was consistent.

There are times when you get some stuck bit images that you do not get concentrations so that does not always work. This is going to be a tough one to track down I think. A good time for level flight is at 0426 to 0430. There

were concentrations and stuck bit images but we were not in cloud at

all. I looked at Pitch, Roll, Alt, Vertical and Lateral wind speeds. Nothing seems to correlate.

From 0430 to 0450 no images. I am going to include an image that happened at 0451. you can see the stuck bit at

the top then a bunch of records. We were not in any cloud at the time. It had not produced a record for over 20 minutes before this happened. It was right after a 1000 foot climb we had just leveled off. The next time we did a climb at 0536 to 0538 it took 6 minutes until 0544 for the stuck bit to show up. Then nothing until we started down at 0713. Very strange.

I power cycled the VCSEL once after takeoff as it's dew point did not look correct. I think it was still recovering from being turned on with water on the mirrors.

We are landing at about 0100 and I would guess takeoff tomorrow to be around 1500 all Jeffco time.

That is the highlights please let me know if you have any questions. John Munnerlyn

RF17**2/28/2014**

Block Out - 2259 Takeoff - 2311

Preflight - Time server would not get stratum 1, I had to give it current position and then it locked right up. VCSEL did not start up correctly and needed a power off to get it going. RWO had NOPPS for part of the preflight but it cleared before takeoff.

Just after takeoff noticed that we still had the stuck bit issue with the 2DC.

2317 had to restart the camera recording since it stopped during taxi.

2300 GGQUAL_GNM dropped to 1

2314 GGQUAL dropped to 1

2330 GGQUAL_GNM BACK to 2

0245 night detected byn cameras, solar angle was 96.

0350 Headset broke at L6 position. I suspect it had been damaged for a while. It will need to be sent in for repair.

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0450 look for inverse stuck bit in particles just before this time. It was like it was not on when it should be and then at other times on when it should not be.

Land 2215 local.

Power Readings GV

Time -

Left Side A Bus

400 Hz A Phase 0.0 A 116V 400 Hz B Phase 0.0 A 117V 400 Hz C Phase 0.0 A 115 V 400 Hz
AI A Phase 0.0 A 116V 400 Hz AI B Phase 0.0 A 117V 400 Hz AI C Phase 0.0 A 115V 60 Hz
0.0 A 115V

Right Side B Bus

400 Hz A Phase 0.0 A 116V 400 Hz B Phase 0.0 A 113V 400 Hz C Phase 0.0 A 116V 400 Hz
AI A Phase 0.0 A 116V 400 Hz AI B Phase 0.0 A 113V 400 Hz AI C Phase 0.0 A 115V 60 Hz
0.0A 115V

28 VDC 0.0 A 28.9V