Note Re QCF in Recent C-130 Projects

Al Cooper

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The Data

This note records a comparison of QCF and QCFR to QC_A for these C-130 projects: FRAPPE, NOMADSS, ICE-T, IDEAS-4-C130, and TEST-C130. These were the projects for which QC_A was present in available netCDF files without reprocessing; other projects such as VOCALS or RICO were only available as production files from which QC_A was removed, so they are not included here.

The following table shows the coefficients for a fit of the form QCFC = $c_0 + c_1$*QC_A:

Project	c_0	c_1	**Difference QCFC-QC_A**
FRAPPE	-1.852	1.070	2.45
IDEAS-4-C130	-0.026	1.019	1.05
NOMADSS[1]	-0.195	1.027	1.43
ICE-T	0.528	1.023	1.81
TEST-C130	-2.854	1.143	6.43

All these fits are very good, with $R^2 > 0.99$ in all cases. For each project, the values of QCFC are those obtained by independent application of the standard C-130 PCor function based on the LAMS measurements from the IDEAS-4 project. For older projects like ICE-T the value of QCFC is therefore different from that included in the netCDF file. The column labeled 'Difference' is the mean value of QCFC-QC_A, restricted to measurements where the TASX is > 100 m/s and the absolute value of VSPD is less than 2 m/s, to eliminate regions near takeoff and landing and those with significant climb or descent.

FRAPPE and TEST-C130 seem to be outliers in this table. TEST-C130, not a normal project but one flown for some specific tests, won't be considered further because it is likely that file was never processed properly or had some other problem. The FRAPPE file used had calibration coefficients based on the measured values (not the ones used for the initial ground processing during the

field project), so it's strange that this seems to be so different from NOMADSS or IDEAS-4-C130.

A similar table based on QCFR follows:

Project	c_0	c_1	**Difference QCFRC-QC_A**
FRAPPE	-0.432	1.030	1.39
IDEAS-4-C130	-0.489	1.026	0.99
NOMADSS	1.744	0.986	0.91
ICE-T	0.754	1.011	1.39
TEST-C130	1.845	1.106	8.76

This second table shows that QCFR has a consistent relationship to QC_A in FRAPPE and IDEAS-4, so it appears likely that the LAMS-based PCORs from IDEAS-4 apply to FRAPPE. The ICE-T results are enough different to cause the PCOR function to appear less accurate in that project, although the mean difference is consistent with FRAPPE. For NOMADSS, the mean difference is also consistent with-C130), but the individual fit coefficients are significantly different from those in other projects.

Suggested Conclusions and Actions:

1. The consistency of the comparisons of QCFR to QC_A in FRAPPE and IDEAS-4 suggests that the PCOR function determined using LAMS in IDEAS-4 should apply to FRAPPE. In contrast, the same comparison for QCF suggests that something about QCF is significantly different in these two projects. I think that indicates that QCF should not be used unless a reason for the discrepancy can be found. The calibration has been checked and apparently is valid, so it is not clear where the problem originates. QCF produces acceptable results in wind tests if the prior calibration from NOMADSS is used, but there is no justification for that. Because QCFR matches other projects well, it would be helpful to process wind measurements for FRAPPE using QCXC=QCFRC, with QCFRC calculated from the LAMS-based PCOR but using the coefficients appropriate for PSFRD/QCFR. These wind measurements then will need to be used in the reverse-heading and circle maneuvers to see if the results are acceptable.

2. QCF in IDEAS-4, NOMADSS, and ICE-T when corrected by the LAMS-based PCOR give results reasonably consistent with QC_A. For NOMADSS, however, this result was obtained only after adjusting the calibration coefficient for QCF. This result may provide some support for the adjustment that was made, but other consequences (e.g., on PSFX) are more

worrisome. I think the adjustment made in NOMADSS needs some justification, but I don't have any recommendation re NOMADSS; that would require further study.

3. Measurements QCF and QCFR compare very poorly to QC_A in TEST-C130. None of those dynamic-pressure measurements in TEST-C130 should be trusted without further study.

4. It may be worth tracking the origin of the calibrations used for ICE-T because the first coefficient seems to be different from other projects, for both QCF and QCFR.

5. Another avionics variable, QC_A2, gives results very close to those obtained using QC_A.

—End of this note—