Comments from Jeff Stith:

General Comment. This paper is quite publishable and I'm excited to see it get out as I believe it will be an important work. Although the paper is clearly written and most of my specific comments are minor, I think overall the paper could be improved some by more focus on how much improvement in calibration can be achieved by using LAMS. I don't think there has been much in the way of improvements in thirty years over trailing cone technology, in spite of major advances in GPS technology, so this paper should have a significant impact and it is important to show how much improvement to expect by using LAMS.

Specific Comments:

1. Title. How about something like: "Improving the calibration of airborne measurements of airspeed, pressure and temperature using a Doppler laser air-motion sensor". These results might find wide application to non-research aircraft, for example.
2. Abstract: "The calculated excess pressure produced by that airspeed at the inlet of a pitot tube…" This is not clear.
3. Top of page 3. Probably should restate that this has been developed and tested for nsf/ncar aircraft, but that these techniques are generally applicable to any aircraft equipped to carry LAMS.
4. Page 3, item #2, an example would be helpful here.
5. Page 4. "The analysis that follows demonstrates that the LAMS provide another means of calibrating pressure, one that can be available routinely. " Couldn't you say that LAMS provides a ***better*** means of calibrating pressure (or temperature…)? If LAMS is just one way of several that provides calibrations, then it is not nearly so important, but if we can show where LAMS produces significantly better calibrations then that is of major interest.
6. Page 5 top of page. Shouldn't you say here the problems caused by sampling in cloud? In particular the deviations in Total temperature caused by ingestion of ice in the immersion sensors can cause a problem for research, but also could give erroneous input to flight control systems in any aircraft. Wetting of sensors is also a problem (although we have not solved it yet…).
7. Section 2. "…from the Doppler shift in laser light returned from aerosols…" perhaps this should read "…laser light returned from ambient aerosols…"
8. Top of page 6. End of top paragraph that begins with "Spuler et al. (2011). Can these two sentences be updated to include the new sensitivity and an approximate percentage of time that the signal is lost?
9. Section 3.2, first paragraph. A little more information would be helpful here. The Parascientific 100 is connected to static ports (two of them? On two sides of the fuselage?) Is the Mensor Model 6100 connected to the same static ports in the same way? Is the static pressure connections setup to provide an average static pressure reading from two ports? Or is there one connection to a single static port and there are two redundant system (as seem to be the case as discussed in Paragraph 2). A central premise of your analysis is that the total pressure is accurately measured, so it is important to provide details here and to make a strong case for this

premise. The GV system is described in the first paragraph in some detail, but the C130 system is not described in the same detail. These details are probably important here.

10. Section 3.3, bullet ii. "The RAF aircraft", should probably be replaced by "the GV and C130 aircraft".
11. Eq. (6) has R_d, while Eq. (2) has R_a. Is this intentional?
12. Page 12. "Other indications are that the uncertainty in total pressure measurement is also about 0.1 hPa, so using the LAMS correction yields a correction to the ambient pressure that has an uncertainty of around 0.15 hPa". Sorry, I'm confused. If Pt = q + p and the uncertainty in Pt is 0.1 and the uncertainty in q is 0.13, how does the uncertainty in p become 0.15? What other indications are you talking about here?
13. Section 3.5.3. First sentence. So the avionics are certified, but are the sensors more reliable and different technology from those we use in research? If so, why shouldn't we use the better sensors for research? Does the RVSM certification method produce better calibrations than we have for research? How?

14. Page 18 section 3.5.3. Is the drift in D values consistent with the synoptic gradient in air density?

15. Page 24 middle of page. "optim()" ??

16. Page 28 and elsewhere. "the excess pressure produced by that airflow at the inlet of a pitot tube can be calculated." It is not clear here what you mean by excess pressure.