

## ***Interactive comment on “Quality assessment of Automatic Dependent Surveillance Contract (ADS-C) wind and temperature observation from commercial aircraft” by S. de Haan et al.***

### **Anonymous Referee #1**

Received and published: 27 August 2012

General Comments: =====

The present manuscript seeks to perform a basic assessment of the quality of a class of meteorological information from commercial aircraft (ADS-C) that is available in principle but is not generally used for numerical weather prediction. Since in contrast to AMDAR, the meteorological information in ADS-C transmissions is are taken as-is from the flight-management system (FMS), the outcome depends much more on non-disclosed proprietary algorithms in the FMS. Hence investigating the quality of ADS-C is a novel and very valuable task within the scope of AMT and is surely worth being

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published.

The outcome is somewhat preliminary, but based on adequate methods and reasoning. The results appear transferable and are properly discussed in the framework of existing literature. The text is fairly organized and I see no major flaws in language and presentation. Several details, however, need clarification or correction. The main points are some excessively repeated and some out-of-place facts, some factual errors (at least to my knowledge) and a missing presentation of temperature profiles. The changes I suggest are all minor, but they are numerous (see list below). Hence, I propose to accept the manuscript after major revisions. A re-review of the revised manuscript, however, appears unnecessary.

Specific Comments (preceded by page/line number): =====

5618/4-6: The sentence "The ADS-C messages..." is either missing something or not very informative. I suggest to remove it.

5618/6: insert: A comparison ...

5618/7: "Mode-S" is not introduced (in the abstract)

5618/8: prefer "16,000" to "16 thousand" (here and in the following)

5618/10: 76 days: consecutive? when (year, month)?

5618/7: "Mode-S" is not introduced (in the text)

5619/1: insert: ... using extra software ...

5619/2: insert: ... by extra hardware ...

5619/2: not quite correct: replace "through ground stations (e.g. located at aerodromes)" by "through the ACARS (aircraft radio addressing and reporting system) network using either ground stations or satellite links (see Fig. 1)"

5619/9-20: this paragraph is quite confusing since it contains a lot of terms not ex-

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plained and some factual errors. It tries to explain that Mode-S data are another new source of data based on "ADS-something" but that are different from the data targeted in this manuscript. I suggest to rewrite the paragraph moving all information unnecessary here to section 2.1 Some issues to take care of: How does the term EHS (used in abstract and chapter 1) to relate to the term TAR (used in chapter 2)? ADS-B transmissions are not done by the aircraft transponder (Both use different frequencies (ADS-B 1090 MHz / transponder 978 MHz) and different protocols; as far as I know, they may just share the same transmitter). As far as I know, every ADS-B message contains the aircraft position. Does the ground base radar system (TAR or EHR) provide better position information (e.g. based on azimuth and time-of-arrival) or why is it needed to combine both ADS-B and some radar? Or is the radar just used as a trigger and receiver? To differentiate between ADS-B and ADS-C it would be helpful to name more clearly, where the "Mode-S data" are assembled from.

5619/21-23: Since the information given is confusing in this place, I suggest to remove everything between "... Surveillance Contract)" and "is a surveillance technique..."

5620/3-4: To my knowledge, its the other way round: "Unlike AMDAR that uses its own algorithms (Painting, 2003), ADS-B and ADS-C wind and temperature observations are based on direct read outs from the FMS."

5620/7: add "aircraft" after "(KLM)"

5620/8: When were the 76 days?

5620/23: "position and flight track": since "flight track" may designate a sequence of positions, too, the wording should be changed, e.g. "ground speed (change of position with time) together with airspeed and heading".

5621/1: was called "Mode-S EHS" before, check consistency of wording

5621/2-5: repeated information, remove.

5621/24-5622/4: This paragraph would be more helpful if moved to the beginning of

## Sect 2.1

5621/27: "since limited by": I suggest "since Mode-S needs a direct line of sight which causes the lower bound for possible altitudes to rise with distance, due to"

5622/1-2: Is the position of ADS-B messages really discarded, although it uses 16bit (approx 500m) resolution?

5622/6: Change "ADS" into "ADS-C".

5622/7: To my knowledge, "ADS-C" messages are only generated by request. The request however may contain the query to report repeatedly at certain intervals.

5622/8-18: This part describes ADS-B not ADS-C! Move up and change "ADS" into "ADS-B".

5622/12: ADS-B re-definition unnecessary

5622/12: ADS-B satellite based? It uses only VHF (ADS-B out) and maybe TIS-B (ADS-B in) but no satellite links.

5622/15: add: "... of other properly equipped ..."

5622/17: The met block is called "block 2" not "block e)"

5622/16: This information is very hard to understand: Do you mean: ICAO Annex 3 obliges every signing country to provide aircraft-based upper air measurements. Since many countries do not have an AMDAR program that would fulfill this requirement, Mode-S could provide an easy way to provide such information, at least on a minimal level as defined in ICAO Annex 3 Part 5.3.1 (every 15s for 10min after takeoff, then every 15min) ?

5622/19: Sect. 5.4.1 of ICAO Annex 3 (2010) does not contain such information. Possibly you mean Sect 5.3.1

5623/2-6: contains general information about ADS-C, move up.

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5623/11: "meteor" -> "meteorological information"

5623/12: "called." -> "called, in the following"

5624/(3) and following: I suggest to change the letter alpha (ISO symbol for angle of attack) into (lowercase) phi (ISO symbol for heading) and to change the variable "Mach" into "M" or "v\_M" (i.e. "v" with subscript "M")

5624/10: append ", in the following"

5624/18: Excess "The"

5624/20: Are the data interpolated to the aircraft position or is the nearest grid point used?

5625/1-6: The first two sentences repeat information already given.

5625/6-8: Does this mean that ADS-B and ADS-C transmissions from one single aircraft and taken at the same time are reported as separated in space? If not, please explain.

5626/6-7: The first two sentences repeat information already given.

5626/7-11: Why do you get these numbers. Since every ADS-C transmission is supposed to contain position. I would have expected that it would be possible to get a "derived" wind from almost any transmission, but "direct" wind only from transmissions with a met group. Hence "direct" winds should be more or less a subset of "derived" ones.

5626/18: The different spacial coverage has been well explained, but it cant be seen from the mean winds!

5626/21: bias against which reference?

5626/24 & Figure 3: To me Fig. 3 look as if the stdev is even lower. The data points in the upper left and lower right corner however might increase the calculated value. But

they are not really that far way; it's just due to the cyclic nature of heading. I suggest to subtract 360 deg to ADS-C heading in case of ECWMF-heading  $< 180$  deg and (ADS-C heading - ECWMF-heading)  $> 180$  and to add 360 deg to ADS-C heading in case of ECWMF-heading  $> 180$  deg and (ADS-C heading - ECWMF-heading)  $< -180$  deg and redo the calculation.

5627/5: information repeated again.

5627/14: does the small standard deviation hold for observations of the same aircraft, for all aircraft in a volume or both?

5627/25: If the title promises, temperature profiles should be shown.

5628/8: The statement "... both the Mach number and the aircraft heading match very closely." is not true; something misses here.

5628/10-11: "... could be realistic" which could be judged more easily, if temperature profiles - indicating stability - would be shown.

5628/14: I think that Fig. does not allow to conclude good quality of the data. However, it infers that ADS-C transmissions match well the Mode-S/ADS-B transmissions both in value and reflected vertical structures.

5628/25-5629/2: just "good" is a too general statement. But you could state something like the differences between ADS-C and ECWMF are on the same order as ADS-B (calibrated?).

5630: Several acronyms are lower case

Table 1: ICAO Doc 4444 form 1996 is at least superseded by 15th ed. (2007), available at

<http://www.bazl.admin.ch/dokumentation/grundlagen/02643/02644/index.html?lang=it&download=NHZLpZeg7t.Inp6lONTU>

This document lists (Section 4.11.5) ADS-C contents starting with a) aircraft identification, b) Basic ADS, ...

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Table 2: The choice of fonts appears erratic, please adjust.

Tables 3-5: Mean temperature, wind speed and direction values are not a characteristic value for the comparison, hence I suggest to omit it.

Figure 3: see comment above

Figure 4: way too small (I had to zoom to 250% to be able to read the legend)! I suggest to split into two figures and enlarge both.

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Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5617, 2012.

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