

Review of ICARTT file format implementation and operational suitability

NASA's Earth Science Data Systems Standards Process Group (SPG) is considering the International Consortium for Atmospheric Research on Transport and Transformation (ICARTT) file format for adoption as a community standard. The ICARTT file format was developed to fulfill the data management needs for the ICARTT campaign in 2004. This file format is text-based and composed of a header section (metadata) with critical data description information (e.g., data source, uncertainties, contact information, and brief overview of measurement technique), and a data section. Although it was primarily designed for airborne data, the ICARTT format proved to be practical for other mobile and ground-based studies and various data types. The ICARTT file format has since been widely accepted in the airborne field study community and used in recent major airborne studies sponsored by NASA, NSF, NOAA and international partners.

You are invited to review this Requests For Comment (RFC) in the context of your **implementation experience** with this data format specification and its **suitability for operational use**. You only need to answer questions applicable to you. Please send your completed review to:

spg-rfc-019@lists.nasa.gov.

Implementation Experience questions:

1. (*Your background*) Describe in a sentence or two your overall implementation experience related to the proposed specification. Have you directly implemented the ICARTT format specification? Did you use a pre-existing software package, and if so, what did you use?

My experience of the ICARTT format is as a scientific user of aircraft data from NASA, NOAA, DLR, and UK FAAM aircraft groups, during the ICARTT and POLARCAT programmes. I have also used the ICARTT format to store and distribute model output files as time series along research aircraft flight tracks. For this I used ICARTT format file creation software in IDL obtained from Dr. Mathew Evans, Leeds.

2. (*Completeness*) Does the specification provide all the detail you need to implement it in software? (*e.g., to read or write a data file; to implement the specification, a profile or extension; or develop a tool such as a format translator*)
The format is easily read automatically using IDL software, with all necessary information taken by the software from the file header. This works very well, and means the same code can be used to read files from different instruments etc. without any 'hard-wiring' for different files.
3. (*Accuracy*) Do any parts of the specification contain inaccuracies, or internal inconsistencies? If so, please provide details.

I am not aware of any such problems..

4. (*Clarity*) Is any part of the specification ambiguous, or poorly explained? If so, please provide details.

I am not aware of any such problems.

5. (*Usefulness*) How well does this specification meet your information sharing needs? (*e.g., does it work well with the data types and data manipulations in your application? Does it properly represent your datasets? What are the pros and cons of this data format?*)

The format works very well for time-series data, however it is not suitable for use with several dimensions e.g. 3D model output. For this type of data, netcdf format performs best and is also well supported by software packages such as IDL.

6. (*Implementation*) What implementation challenges does the proposed standard present? Please provide details, if any.

The standard is easily implemented using IDL (and I imagine similar packages such as Matlab). For data providers using EXCEL, I imagine the formatting has to be handled manually; although Macros / web-based tools could be supplied (nad may be already?).

Operational Suitability questions:

7. Do you currently use or plan to use the ICARTT format in a production setting? Do you plan to distribute data in this format to science collaborators and other researchers?

If we are to release our model simulation output along flight-tracks for the POLARCAT campaigns, we will use ICARTT format.

8. Why do you choose to use the ICARTT format over other data formats for your applications?

We have IDL software available to read these files automatically, and so it is an attractive format removing the need for purpose-written code for each parameter file.

9. Does the ICARTT file format meet your requirements for storing and accessing data?

Yes, for time-series data such as aircraft data.

10. Have you or your users encountered any difficulty when using some of the data in the ICARTT format? If you have, please provide a brief description of your experience.

None so far.

11. What operational challenges or limitations does ICARTT present? Please provide details.

The purpose-written ICARTT reading software must be available to use the files efficiently. This is available through NASA-affiliated aircraft research groups. However, it is not as widely available as e.g netcdf software.

12. What benefits does the ICARTT file format present? Are there any drawbacks to using this file format? (*e.g., Does it offer the flexibility you want to package the data types in your applications? Does it facilitate interdisciplinary studies?*)

The main benefit is consistency in formatting and use of a single read routine for all data. In addition, the use of a *negative* value for missing data is advantageous, making it less likely that missing data will be averaged or interpolated.

13. How much data do/will you provide or archive in the ICARTT format? (*Number of distinct data sets, total data volume, number of files.*)

Approx. 30 flights of model output will be produced for POLARCAT in separate files for each flight.

14. How many users do you have or expect to have for data in the ICARTT format, and what is your expected user community?

Model output in ICARTT format may be distributed to collaborators in aircraft science groups for the French and German POLARCAT flights (total ~40 users).

15. (*User comments*) Any additional comments, observations or criticisms of the ICARTT format and the RFC can be provided here.