



International Civil Aviation Organization

Eight Meeting of the Communications/Navigation/Surveillance and Meteorology Sub-Group (CNS/MET SG/8) of APANPIRG

Bangkok, Thailand, 12-16 July 2004

Agenda Item 8: Implementation of ISCS and SADIS

TESTING OF WORKSTATION SOFTWARE

(Presented by the United Kingdom)

SUMMARY

SADISOPSG Conclusion 8/10, WAFSOPSG Conclusion 1/22, WAFSOPSG Decision 1/23 and WAFSOPSG Conclusion 1/24 refer. The SADIS provider has completed a further assessment of the SADIS visualization software packages.

1. INTRODUCTION

1.1 During SADISOPSG/8 there was discussion about the ability of the end user systems to produce SIGWX charts from BUFR that are fully compliant with the SADISOPSG software criteria. These criteria were subsequently refined by the group (SADISOPSG Conclusion 8/10 part (a) refers). See Annex A for a copy of these criteria.

1.2 SADISOPSG/8 requested the SADIS provider to carry out a further review of the software packages (SADISOPSG Conclusion 8/10 part b refers), and asked the WAFS Operations Group to consider developing criteria related to the depiction of meteorological and other features on forecast charts in T4 format derived from the BUFR and GRIB data (SADISOPSG Conclusion 8/10 part (c) refers).

1.3 In addition the WAFS Operations Group (WAFSOPSG) at its first meeting formulated a number of decisions and conclusions that have a direct bearing on the issue of software testing. These are summarised below.

WAFSOPSG Conclusion 1/22 – Depiction of meteorological and other features on WAFS forecast charts

That,

- a) the WAFS Provider States complete, as a matter of urgency, the development of guidelines, in coordination with the WAFSOPSG member from WMO, related to the depiction of meteorological and other features on WAFS forecast charts derived from the BUFR and GRIB data, making sure that no modifications be allowed to the *meteorological* content of forecasts labelled as WAFS products;
- b) the Secretariat

- 1) circulate the guidelines for information and comment to the WAFSOPSG members ; and
- 2) develop the proposal stating that no modifications be allowed to the meteorological content of forecasts labelled as WAFS products, for inclusion in draft Amendment 74 to Annex 3, for consideration by the WAFSOPSG/2 Meeting.

WAFSOPSG Decision 1/23 – Elimination of “edge effects”

That, in order to eliminate the “edge effects”, the visualisation software be permitted to interpolate the flight level at the start and end of the jet, and at any points in between as required, by assuming that the flight level is the same as it is at the nearest available point that contains the flight level data.

WAFSOPSG Conclusion 1/24

That,

- a) the WAFSOPSG Provider States be invited to develop, as a matter of urgency, a list of software vendors who meet the high-level criteria concerning the depiction of meteorological and other features on WAFS forecast charts, as developed by the SADISOPSG/8 Meeting; and
- b) on completion of this list, ICAO inform Contracting States accordingly and place the list on the open WAFSOPSG web site.

2. DISCUSSION

2.1 The WAFSOPSG was presented with information from the SADIS provider that captured the main non-compliance issues which affected the different visualisation packages during October 2003. These issues affected the packages to a greater or lesser extent. For completeness this information is attached as Annex B to this paper. Many of these issues still affect a number of the packages at the time of writing of this paper (June 2004).

2.2 The WAFSOPSG Decision 1/23 provided the WAFSOPSG Provider States with firm guidance as to how “edge effects” could be resolved. See Annex B for an explanation of the “edge effects”. This information has been included in a BUFR guidelines document which has been substantially revised by both WAFSOPSGs and now reflects a common WAFSOPSG standard. The document provides developers of BUFR visualisation software with guidelines as to how their software could be constructed to maximise compliance to the SADISOPSG software criteria. A copy of this document was circulated to all of the software vendors in early January 2004 and is attached to this paper in Annex C. This document will be updated later in 2004 to include guidelines relating to the depiction of medium level SIGWX (SWM) information.

2.3 During February and March 2004 (4 to 10 weeks after the revised BUFR document was circulated), the BUFR visualisation capability of the different software packages was re-assessed. This assessment was implemented by sending the vendors a set of operational BUFR files and comparing the depiction of this data over some agreed chart areas against the equivalent T.4 product, if one was produced for the same area. Images of the assessed areas are included in Annex D. These areas include ICAO standard regions B, E, K and (approx.) L, plus zoomed in regions from the area D and H charts. The zoomed in areas were chosen carefully to verify whether the software could resolve the “edge effects”.

2.4 The software review did not extend to the visualisation of other data, e.g. OPMET and GRIB. The software evaluations carried out during 2002 (results available at <http://www.metoffice.com/sadis/software/index.html>) covered these functions adequately, and the vast

majority of the current packages display these mature data products to the required standard. The review thus concentrated on the depiction of the BUFR encoded SIGWX which is the issue of greatest concern to both the SADISOPSG and the WAFSOPSG.

2.5 Annex E to this paper includes the images that were received from the software vendors and submitted for review. A review of these images against the equivalent T.4 charts (Annex D) clearly confirms that some of the packages persist in having major non-compliances. These include the following points (with examples included in brackets), though this list is not exhaustive:-

- Failure to display tropical cyclones and/or volcanoes. (see E1.1, E1.2 and E1.3)
- Jet-streams entirely missing. (See E1.2 and E1.3)
- Cloud areas entirely missing or not labelled. (See E1.3)
- Fronts entirely missing or incorrect units (m/s) used for speed or front nomenclature not in line with WMO standards. (See E1.3 and E3.1)
- Edge-effects persist (including unlabelled jets near the edge of chart boundaries). (See E2.4)
- Over-plotting of features making other features illegible. (See E7.2)
- Incorrect plotting of CAT boundaries. (See E1.1 and E1.4)
- Flight levels (FLs) missing from wind fleches on jet-streams. (See E3.1 and E1.2)
- Incorrect smoothing assigned to features. Some “kinks” in jets. (See E1.6)
- Incorrect cloud heights assigned to CB cloud areas. (See E2.3 and E2.1)
- ICAO standard areas not correctly mapped (ICAO area B, which is a rotated Mercator projection, causes particular problems) (See E5.3)

2.6 It is clear that the construction of compliant WAFS SIGWX charts from BUFR is a complex and challenging software project. The market for visualisation software is extremely competitive with at least seven companies competing for a relatively small number of contracts. Consequently during the software review process some resistance has been encountered by the SADIS provider from a small number of the vendors to invest in making the required improvements. From a business perspective this is perhaps understandable but clearly unacceptable from a safety and regulatory point of view. However the SADIS provider is very appreciative of the generally positive attitude and cooperativeness that has been demonstrated by the vast majority of the vendors throughout this review process.

2.7 A review of the images contained in Annex E clearly demonstrates that the level of non-compliance varies considerably from package to package. However it is clear that many of these non-compliances have safety implications, e.g. tropical cyclones entirely missed from charts. *Even though neither the SADIS provider nor the SADISOPSG has the authority to prevent charts from being produced using non-compliant software it is recommended that a vigorous approach is taken by ICAO to inform States and other SADIS stakeholders of the list of vendors that can provide compliant software, and warn them that many of the packages do continue to have serious limitations that could have an impact on flight safety.* It is recommended that this mechanism is used as a lever to exert influence on the software vendors to improve the degree of compliance. Clearly software vendors that do not appear on the list of compliant software will lose a competitive edge. However for this mechanism to be effective it is crucial that the list of compliant packages is given wide exposure to States and their users. In this regard SADISOPSG/9 formulated Conclusion 9/17 which tasks ICAO with informing States of those packages which are considered largely compliant, and to forewarn them that a number of BUFR visualisation packages continued to exhibit serious shortcomings.

2.8 The SADIS provider would like to inform the CNS/MET SG that the review process is considered to be an effective mechanism for raising the quality of BUFR software constructed by the *commercial SADIS software vendors*. However no such mechanism exists for the more general issue of ensuring compliance of products issued by other organisations including the major flight briefing companies and aviation meteorological service providers.

2.9 By employing the methodology outlined in this paper to review the quality of SIGWX charts constructed from BUFR data, the SADIS provider has ascertained that the following software vendors have produced BUFR visualisation software that can deliver WAFS SIGWX charts to a compliant standard.

- GST/3SI (*METLAB* application)
- MapMaker Group Ltd. (*GIS Meteo* application)

The SADIS provider is of the opinion that the BUFR visualisation software developed by Info-Electronic Systems Inc. (I.E.S.) and Netsys Intl. are both at a very mature stage and compliancy is likely to be achieved shortly following some further minor modifications. The list of vendors producing compliant software can be updated when additional manufacturers finish refining their software in-line with the recommendations.

2.10 The SADIS provider would like to emphasis that the methodology employed and the extent of the review process are limited in scope and therefore *there is no guarantee that these packages will always produce SIGWX charts that are fully compliant with ICAO recommendations*. The SADIS provider would like to emphasise that the review process is a useful tool to guide users towards software that can produce WAFS products in a compliant manner, but it remains the responsibility of the user to ensure that the product which they procure meets their own particular requirements, including compliancy to recommended practices. Furthermore the review process is not a certification process *per se*, but an objective review (with limited scope) of the ability of the software to produce WAFS products in a compliant manner.

3. ACTION TAKEN

The SADIS provider invites the CNS/MET SG to:-

3.1 Note the information contained in this paper with particular reference to the safety implications associated with the short comings affecting many of the software packages.
