



*International Civil Aviation Organization*

**EIGHTEENTH MEETING OF THE METEOROLOGY  
SUB-GROUP (MET SG/18) OF APANPIRG**

ICAO Regional Sub-Office, Beijing, China  
18 – 21 August 2014

**Agenda Item 7: Research, development and implementation issues in the MET field**

**7.1 WAFS**

**SURVEY ON OPERATIONAL USE OF SERVICES AND PRODUCTS FROM SERVICE  
PROVIDERS OF WORLD AREA FORECAST SYSTEM (WAFS) IN ASIA/PACIFIC REGION  
AND WAFS TRAINING NEEDS OF ASIA/PACIFIC STATES**

(Presented by Chairman, WAFS Task Force)

**SUMMARY**

This paper presents the results of a survey in the Asia/Pacific Region conducted from mid-January to March 2014 on the operational use of services and products from service providers of the World Area Forecast System (WAFS) in Asia/Pacific Region and the WAFS training needs of Asia/Pacific States.

**1. Introduction**

1.1 The Asia/Pacific World Area Forecast System Task Force (WAFS TF) of the Meteorological Sub-group (MET SG) of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) conducted a survey from mid-January to March 2014. This was the fourth annual survey to solicit information on:

- (a) the operational use of services and products from service providers of the World Area Forecast System (WAFS) in the Asia/Pacific Region; and
- (b) the training needs of Contracting States/Territories in the Asia / Pacific Region on WAFS.

**2. The questionnaire**

2.1 The questionnaire for the survey (Appendix A) covers the following areas:

- (a) Access to WAFS services;
- (b) Operational use of WAFS gridded global forecasts;

- (c) Utilization of gridded forecast of icing, turbulence and CB; and
- (d) Training needs.

### 3. Discussion

3.1 The questionnaire was sent to 24 Contracting States/Territories in the Asia/Pacific Region by email on 14 January 2014. A total of 20 (83%) returns were received: Australia; Bangladesh, Brunei Darussalam; China; Hong Kong, China; Macao, China; India; Japan; Republic of Korea; Malaysia; Republic of Maldives; Mongolia, Nepal, New Caledonia; New Zealand; Pakistan; the Philippines; Singapore; Thailand; and Vietnam.

3.2 Key results include:

- (a) Of the 20 responding States/Territories, 11 use UK WAFS as the primary or only source while 9 use US WAFS as the primary or only source (para. **Error! Reference source not found.**4);
- (b) 14 out of 15 responding States/Territories who gain access to UK WAFS products use Secure SADIS FTP Service (para. 3.55);
- (c) 17 out of 20 responding States/Territories said they have implemented GRIB2 WAFS data as part of flight documentation for operators (para. 3.6);
- (d) 8 out of 20 States/Territories were using PNG formatted SIGWX charts as a product and another 7 were using them as backup to locally generated SIGWX charts. Remaining 5 did not use PNG formatted SIGWX charts yet (para. 3.8); and
- (e) Operational use of gridded forecast of icing, turbulence and CB was on the low side (details in para. 3.10).

3.3 A summary of results are given in the following paragraphs. More detailed analysis can be found in Appendix B.

3.4 Among the 20 responding States/Territories, 11 use UK WAFS as the primary source or only source of WAFS products, while 9 use US WAFS as the primary source or only source of WAFS products. As compared with the last survey, two more States/Territories have accessed to WAFS products.

3.5 Of the 15 States/Territories having access to UK WAFS products (whether as primary source or not), 14 States/Territories indicated the channel(s) they use to receive UK WAFS products. Among them, 9 States/Territories use SADIS 2G while all 14 States/Territories use Secure SADIS FTP Service.

3.6 One State/Territory planned to receive UK WAFS products via SADIS 2G satellite beyond year 2015.

3.7 6 States/Territories currently not having access to UK WAFS products via Secured SADIS FTP Service indicated no intention to make use of this Service for the following reasons: (a) already receiving US WAFS products; (b) high implementation cost and (c) high operating cost.

3.8 17 out of 20 responding States/Territories said they have implemented GRIB2 WAFS data as part of flight documentation for operators while the other 3 haven't. Among the latter, 2 have planned to implement GRIB2 data as part of flight documentation for operators beyond year 2015. The remaining 1 has no such plan because their existing WAFS reception system broke down.

3.9 In response to the question on utilization of PNG formatted SIGWX charts from WAFCs, 8 out of 20 responding States/Territories were using them as a product, 7 using them as a backup to locally generated SIGWX charts while 5 others do not use PNG formatted SIGWX charts.

3.10 In respect of utilization of gridded forecast of icing, turbulence and CB:

- (a) 5 States/Territories (25%) are not receiving or retrieving any parameter yet;
- (b) 4 States/Territories (20%) are providing gridded forecasts of icing, turbulence and CB in GRIB2 format to airline(s) who request support for ingestion into their flight planning system(s);
- (c) No State/Territory (0%) indicated their operators who are supported by Flight Planning Vendors are using the gridded forecasts of icing, turbulence and CB in GRIB2 format to support flight planning operation;
- (d) 5 States/Territories (25%) are receiving and retrieving icing, turbulence or CB parameters; and using them to assist in forecast operations (e.g. as additional guidance for forecasters);
- (e) The remaining 6 States/Territories (30%) had not yet reached the stage of using the retrieved parameters for operation.

3.11 The most-need topic for training remains 'Interpretation of WAFS products' followed by 'Generation of products for flight documentation', same as the last survey.

#### **4. Action by the meeting**

4.1 The meeting is invited to note the results of the survey and discussion in this paper.

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## Appendix A The Questionnaire

**Questionnaire on  
Operational Use of Services and Products from Service Providers of  
World Area Forecast System (WAFS) in Asia / Pacific Region and  
WAFS Training Needs of Asia / Pacific States**

### INTRODUCTORY NOTE

This questionnaire is developed by the WAFS Task Force (WAFS TF) of the Meteorology Sub-group (MET SG) of the Asia / Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG). It is distributed to Contracting States / Territories in the Asia / Pacific Region to solicit information on:

- (a) Operational use of services and products from the service providers of the World Area Forecast System (WAFS) in the Asia / Pacific Region; and
- (b) training needs of Contracting States / Territories in the Asia / Pacific Region on WAFS.

The results will be presented to the MET SG and will be reported to the World Area Forecast System Operations Group (WAFSOPSG) as necessary.

The questionnaire is divided into 6 sections covering the following subjects:

Section 1	General
Section 2	Access to WAFS services
Section 3	Operational use of WAFS gridded global forecasts
Section 4	Utilization of gridded forecasts of icing, turbulence and CB
Section 5	Training needs
Section 6	Additional information

All questions should be answered if applicable. It is particularly important that you provide your answers as detail as possible. You can provide such details and any other comments in Section 6.

Please return the completed questionnaire by email to [cmcheng@hko.gov.hk](mailto:cmcheng@hko.gov.hk) on or before 15 February 2014. Your valuable inputs are very important to help promoting the use of WAFS services and utilization of WAFS products in the Asia / Pacific Region.

## **Abbreviation**

APANPIRG	Asia Pacific Air Navigation Planning and Implementation Regional Group
CB	Cumulonimbus
MET SG	Meteorology Sub-Group
FTP	File Transfer Protocol
GRIB	GRIdded Binary
GRIB1	GRIB Edition 1
GRIB2	GRIB Edition 2
SADIS	Satellite Distribution System for information relating to air navigation
WAFS	World Area Forecast System
WAFS TF	WAFS Task Force
WIFS	WAFS Internet File Service

## SECTION 1 – GENERAL

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1. Name of State/Territory:
2. Name of Your Organization<sup>1</sup>:
3. Details of Focal Point for **SADIS**, if applicable:
  - (a) Name: (title) Click and select ...  
(given name)  
(SURNAME)
  - (b) Title/Post:
  - (c) Tel. No.: ( )-
  - (d) Fax.No.: ( )-
  - (e) Email:
4. Details of Focal Point for **WIFS**, if applicable:
  - (a) Name: (title) Click and select ...  
(given name)  
(SURNAME)
  - (b) Title/Post:
  - (c) Tel. No.: ( )-
  - (d) Fax.No.: ( )-
  - (e) Email:

*Note: If you are receiving from both SADIS and WIFS, please fill in details of focal point for both SADIS and WIFS.*

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<sup>1</sup> The word “Organization” is used in the questionnaire to mean the entity in your State / Territory, who responds to this questionnaire. If there are more than one entity in your State / Territory that receive WAFS products, please consolidate the inputs from these entities into one single reply for your State / Territory.

**SECTION 2 – ACCESS TO WAFS SERVICES**

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5. Does your State/Territory currently have access to WAFS products?

- (a) Yes (*go to Q. **Error! Reference source not found.***)                      (b) No (*go to Q.6*)

**Answer:** Click and select ...

6. Does your State/Territory have any plan to access WAFS products from either WIFS or SADIS or both?

- (a) Yes    (b) No

**Answer:** Click and select ...

If **'yes'**, then when:

- (i) 2014
- (ii) 2015
- (iii) beyond 2015

**Answer:** Click and select ...

and via which channel(s) (*can select more than one item. Click on checkbox to select. Same for the remaining questions*):

- SADIS 2G satellite communications
- Secure SADIS FTP Service
- WAFS Internet File Service (WIFS)
- Others (please specify below):

If **'no'**, then why:

- Have no technical expertise on implementation
- High implementation cost
- High operating cost
- Have no expertise in using WAFS products
- Current AFS provides information to meet operational requirements
- Other reason(s) (please specify below):

7. Which is the source of WAFS products in your State/Territory?

- (a) Both US and UK WAFS, with US WAFS as primary source
- (b) Both US and UK WAFS, with UK WAFS as primary source
- (c) Only UK WAFS
- (d) Only US WAFS

[Answer:](#) Click and select ...

8. If your State/Territory is having access to UK WAFS products (either as primary or backup source), what is/are the channel(s) through which your State/Territory gains access to UK WAFS products?

- SADIS 2G satellite communications
- Secure SADIS FTP Service
- Others (please specify below):

9. If your State/Territory is under the footprint of SADIS 2G satellite and your State/Territory has NO access to UK WAFS products via SADIS 2G satellite, does your State/Territory have any plan to receive UK WAFS products via SADIS 2G satellite?

- (a) Yes
- (b) No

[Answer:](#) Click and select ...

If **'yes'**, then when to start reception:

- (i) 2014
- (ii) 2015
- (iii) beyond 2015

[Answer:](#) Click and select ...

If **'no'**, then why:

- Already receiving US WAFS products
- Already receiving UK WAFS products via Secure SADIS FTP Service
- Already receiving UK WAFS products via other channel(s) (please specify below):
  
- Have no technical expertise in implementation
- High implementation cost



- High operating cost
- Other reason(s) (please specify below):

10. If your State/Territory has not yet gained access to UK WAFS products via Secure SADIS FTP Service, does your State/Territory have any plan to do so?

(a) Yes (b) No

[Answer:](#) Click and select ...

If **'yes'**, then when to access Secure SADIS FTP Service:

- (i) 2014
- (ii) 2015
- (iii) beyond 2015

[Answer:](#) Click and select ...

If **'no'**, then why:

- Already receiving US WAFS products
- Already receiving UK WAFS products via SADIS 2G satellite
- Already receiving UK WAFS products via other channel(s) (please specify below):
  
- Have no technical expertise to gain access to the service
- High implementation cost
- High operating cost
- Other reason(s) (please specify below):

### **SECTION 3 – OPERATIONAL USE OF WAFS GRIDDED GLOBAL FORECASTS**

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*Both WAFC London and WAFC Washington have ceased providing WAFS GRIB1 data on 14 November 2013. They are now providing WAFS Aviation GRIB2 data, in compliance with the standards and recommended practices in ICAO Annex 3 (up to Amendment 76).*

11. Has your State/Territory implemented GRIB2 data as part of the flight planning documentation for operators?

(a) Yes

(b) No

[Answer:](#) Click and select ...

12. If your answer to Q.11 is '**no**', does your State/Territory have any plan to implement GRIB2 data as part of the flight planning documentation for operators?

(a) Yes

(b) No

[Answer:](#) Click and select ...

If '**yes**', then when:

(i) 2014

(ii) 2015

(iii) beyond 2015

[Answer:](#) Click and select ...

If '**no**', then why:

Not yet able to decode WAFS Aviation GRIB2 data

Not yet using WAFS Aviation GRIB2 data operational but currently evaluating the data

Limited computing facilities and processing software to process WAFS Aviation GRIB2 data to generate products for flight documentation

Other reason(s) (please specify below):

13. Which of the following products does your State/Territory generate from WAFS data?

- High-level SIGWX charts
- Medium-level SIGWX charts
- Wind and Temperature charts
- Text-based Wind and Temperature charts
- Other(s) (please provide details below):

14. Does your State/Territory utilize PNG formatted SIGWX charts from WAFCs?

- (a) Yes, as a product
- (b) Yes, as a backup to locally generated SIGWX charts
- (c) No

[Answer:](#) Click and select ...

**SECTION 4 – UTILIZATION OF GRIDDED FORECASTS OF ICING, TURBULENCE AND CB**

*WAFS forecasts for icing and turbulence and CB, in grid point format, became operational for flight planning on 14 November 2013 as per Amendment 76 to ICAO Annex 3.*

15. What is the status of your State/Territory in retrieving icing, turbulence and/or CB parameters from the WAFS forecasts in GRIB2 format? (*can select more than one*)

- Not receiving or retrieving any parameter yet
- Providing gridded forecasts of icing, turbulence and CB in GRIB2 format to airline(s) who request support for ingestion into their flight planning system(s)
- Operators who are supported by Flight Planning Vendors are using the gridded forecasts of icing, turbulence and CB in GRIB2 format to support flight planning operation (Answer only if you can verify this statement)
- Receiving and retrieving icing, turbulence or CB parameters; and using them to assist in forecast operations (e.g. as additional guidance for forecasters)
- Other(s) (please specify below):

16. If your State/Territory is retrieving icing, turbulence and/or CB parameters from the WAFS forecasts in GRIB2 format (whether or not used to assist in forecast operation), which parameter(s) is/are being retrieved (*can select more than one*) and what is/are the source(s) of GRIB2 data?

- icing            from    Click and select ...
- turbulence    from    Click and select ...
- CB              from    Click and select ...

17. For the parameter(s) being retrieved in Q.16, which parameter(s) is/are being tested before being used to assist in forecast operation (can select more than one)?

- icing from Click and select ...
- turbulence from Click and select ...
- CB from Click and select ...

18. For the parameter(s) being retrieved in Q.16, which parameter(s) is/are being used in operation (can select more than one)?

- icing from Click and select ...
- turbulence from Click and select ...
- CB from Click and select ...

19. For the parameter(s) being retrieved in Q.16, what product(s) is/are being generated out of the parameter(s)? Please provide details below:

20. If your State/Territory has not yet used gridded forecasts of icing, turbulence or CB to assist in forecast operation, does your State/Territory have any plan to do so?

(a) Yes (b) No

[Answer:](#) Click and select ...

If **'yes'**, then when:

- (i) 2014
- (ii) 2015
- (iii) beyond 2015

[Answer:](#) Click and select ...

and which parameter(s):

- icing
- turbulence
- CB

Please supplement further details of your State/Territory's plan below, if any:

**SECTION 5 – TRAINING NEEDS**

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21. Have your State/Territory gained access to training via the following resources?

- Seminar(s)/Workshop(s) organized by ICAO
- Seminar(s)/Workshop(s) organized by other organization(s) (please specify organization(s)):
  
- On-line training (please specify source(s)):
  
- Self-study of training materials on Internet (please specify source(s), if available):
  
- Others (please specify):

22. What is/are the area(s) of training on WAFS that your State/Territory consider most needed? Please specify the priority of your selected item(s) by inserting '1', '2', '3', etc. to the respective text box in the last column (*Can select more than one area. Please prioritize using '1', '2', '3', etc. **instead of inserting multiple '1's**, etc.*).

<b>Area(s) of training need</b>	<b>Priority</b> ( <i>'1' most needed</i> )
(a) Channels for reception of WAFS products (please provide details of topics of interest: )	<input type="text"/>
(b) WAFS processing software (please provide details of topics of interest: )	<input type="text"/>
(c) Decoding of WAFS data (please provide details of topics of interest: )	<input type="text"/>
(d) Generation of products for flight documentation (please provide details of topics of interest: )	<input type="text"/>

- (e) Interpretation of WAFS products   
(please provide details of topics of interest:  
)
- (f) Other (please specify):
- (g) Other (please specify):
- (h) Other (please specify):
- (i) Other (please specify):
- (j) Other (please specify):
- (k) Other (please specify):
- (l) Other (please specify):
- (m) Other (please specify):
- (n) Other (please specify):
- (o) Other (please specify):
- (p) Other (please specify):

**Section 6 – ADDITIONAL INFORMATION**

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Please use this section to describe any further details in your answers in the previous sections and to provide any further comments that you may have. Please specify the section and question numbers when you supplement further details in your previous answers.

===== END OF QUESTIONNAIRE =====

**Thank you very much for your valuable inputs !!!**



**Appendix B**  
**Results of Survey on Operational Use of Services and Products from Service Providers of WAFS in Asia/Pacific Region and WAFS Training Needs of Asia/Pacific States (Jan – March 2014)**

Access to WAFS services

1. *Does your State/Territory currently have access to WAFS products?*

All States/Territories (20; 100%) said that they have access to WAFS products.

2. *Does your State/Territory have any plan to access WAFS products from either WIFS or SADIS or both?*

No State/Territory responded to this question since they all have access to WAFS products already.

3. *Which is the source of WAFS products in your State/Territory?*

10 States/Territories (50%) said they have access to both US and UK WAFS products. Among them, 4 States/Territories use US WAFS as the primary source while the other 6 States/Territories use UK WAFS as the primary source. There are 5 States/Territories having access to UK WAFS only whereas 5 other States/Territories having access to US WAFS only. See Figure 1.

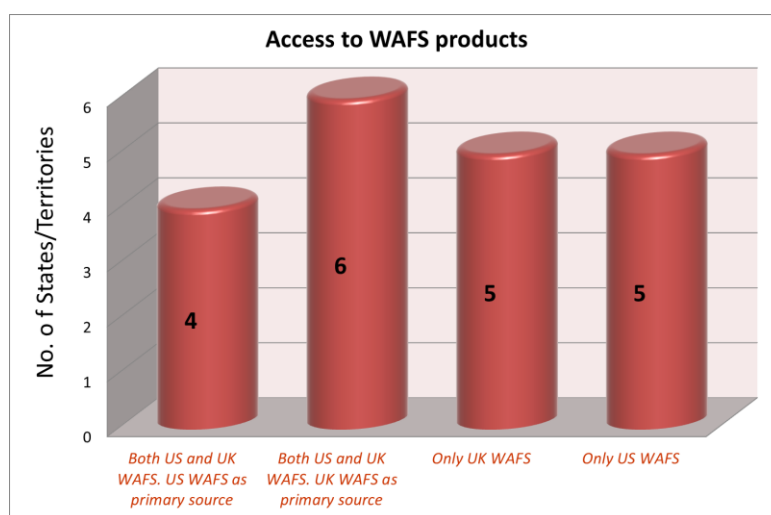


Figure 1

4. *If your State/Territory is having access to UK WAFS products (either as primary or backup source), what is/are the channel(s) through which your State/Territory gains access to UK WAFS products?*

There are 14 States/Territories responding to this question. 9 States/Territories (64%) said they gain access to UK WAFS products via SADIS 2G and all 14 States/Territories (100%) used Secure FTP Service (Figure 2).

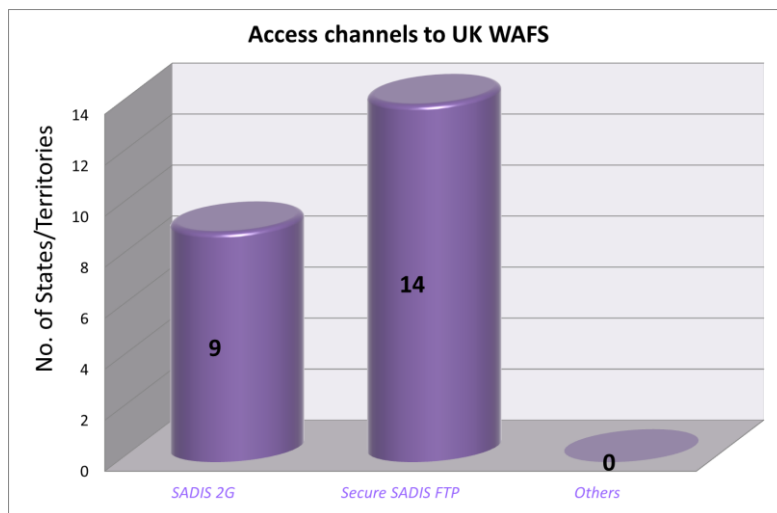


Figure 2

5. *If your State/Territory is under the footprint of SADIS 2G satellite and your State/Territory has NO access to UK WAFS products via SADIS 2G satellite, does your State/Territory have any plan to receive UK WAFS products via SADIS 2G satellite?*

6 States/Territories responded to this question. One State (17%) has a plan to receive UK WAFS products via SADIS 2G satellite beyond year 2015. The other 5 States (83%) said that they have no plan to use SADIS 2G for the following reasons:

- (a) already receiving US WAFS products (4; 80%);
- (b) already receiving UK WAFS products via Secure SADIS FTP Service (1; 20%);
- (c) high implementation cost (2; 40%)
- (d) high operating cost (2; 40%).

6. *If your State/Territory has not yet gained access to UK WAFS products via Secure SADIS FTP Service, does your State/Territory have any plan to do so?*

6 States/Territories responded to this question. All of them said that they have no plan to use Secure SADIS FTP Service. 5 States quoted the following reasons:

- (a) already receiving US WAFS products (4; 80%);
- (b) high implementation cost (2; 40%)
- (c) high operating cost (2; 40%).

Operational use of WAFS gridded global forecasts

7. *Has your State/Territory implemented GRIB2 data as part of the flight planning documentation for operators?*

17 out of 20 responding States/Territories (85%) indicated that they have implemented GRIB2 data as part of flight planning documentation for operators while 3 States/Territories (15%)

said they haven't. See Figure 3.

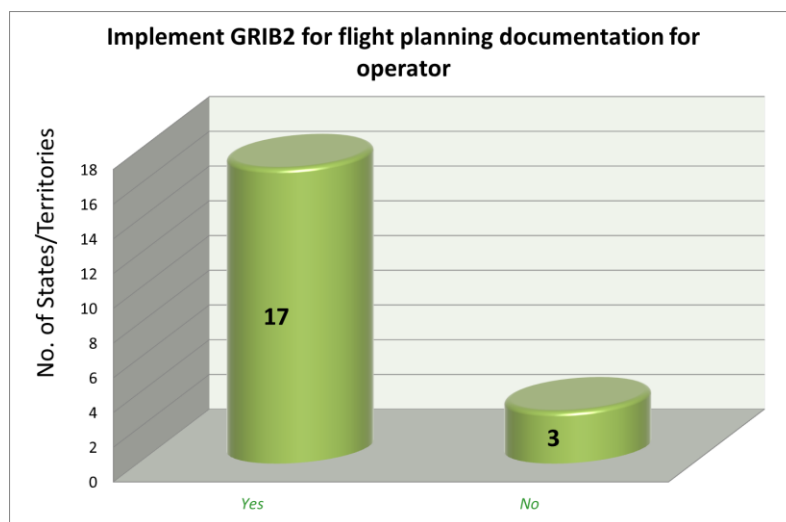


Figure 3

8. *If your answer to Q.11 (Question 7 in this Appendix) is 'no', does your State/Territory have any plan to implement GRIB2 data as part of the flight planning documentation for operators?*

3 States/Territories responded to this question. 2 of them (67%) said that they planned to implement GRIB2 data as part of the flight planning documentation for operators beyond year 2015. The remaining one State (33%) said they have no plan yet to implement GRIB2 data because their existing WAFS reception system broke down. They are seeking approval to upgrade their software to get access to SADIS FTP Service.

9. *Which of the following products does your State/Territory generate from WAFS data?*

19 States/Territories responded to this question. The products that they generate from WAFS data are as follows (Figure 4):

- (a) High-level SIGWX charts (19; 100%)
- (b) Medium-level SIGWX charts (16; 84%)
- (c) Wind and Temperature charts (19; 100%)
- (d) Text-based Wind and Temperature charts (3; 16%)

Three States/Territories (16%) generate other products, including:

- (i) Tropopause, maximum wind, and freezing level;
- (ii) Relative humidity and height charts; vertical cross sections of wind and temperature; and
- (iii) height tropopause, height max wind level, geopotential height, relative humidity, cross section.

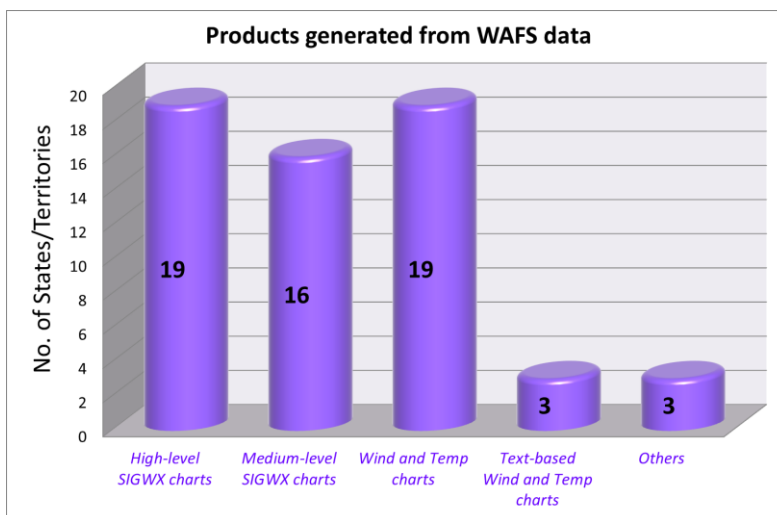


Figure 4

10. *Does your State/Territory utilize PNG formatted SIGWX charts from WAFCs?*

20 States/Territories responded to this question. 8 of them (40%) use PNG formatted SIGWX charts as a product, 7 (35%) use it as a backup to locally generated SIGWX charts while 5 others (25%) do not use PNG formatted SIGWX charts at all. See Figure 5.

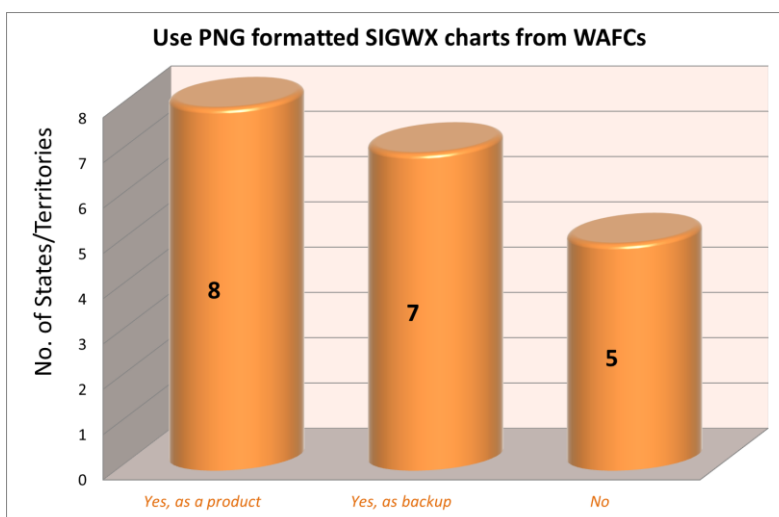


Figure 5

Utilization of gridded forecasts of icing, turbulence and CB

11. *What is the status of your State/Territory in retrieving icing, turbulence and/or CB parameters from the WAFS forecasts in GRIB2 format?*

20 States/Territories responded to this question. Their status in retrieving icing, turbulence and/or CB parameters from GRIB2 data is as follows (Figure 6):

- (a) Not receiving or retrieving any parameter yet: 5 (25%)
- (b) Providing gridded forecasts of icing, turbulence and CB in GRIB2 format to airline(s)

who request support for ingestion into their flight planning system(s) : 4 (20%)

- (c) Operators who are supported by Flight Planning Vendors are using the gridded forecasts of icing, turbulence and CB in GRIB2 format to support flight planning operation : 0 (0%)
- (d) Receiving and retrieving icing, turbulence or CB parameters; and using them to assist in forecast operations (e.g. as additional guidance for forecasters) : 5 (25%)
- (e) Other(s) : 6 (30%). Details of status as follows:
  - (i) Receiving and retrieving icing, turbulence or CB parameters; but not using them to assist in forecast operations yet; research on how to use these data effectively is still under way;
  - (ii) The icing, turbulence and CB parameters are being tested on their performances to assist forecast operation, in particular in the Asian subtropical region;
  - (iii) Production of icing/turb/cb products will be used in 01 May 2014;
  - (iv) Not applicable at present;
  - (v) Receiving and retrieving the gridded forecasts for icing, turbulence;
  - (vi) Receiving but could not process due to not yet upgrade software

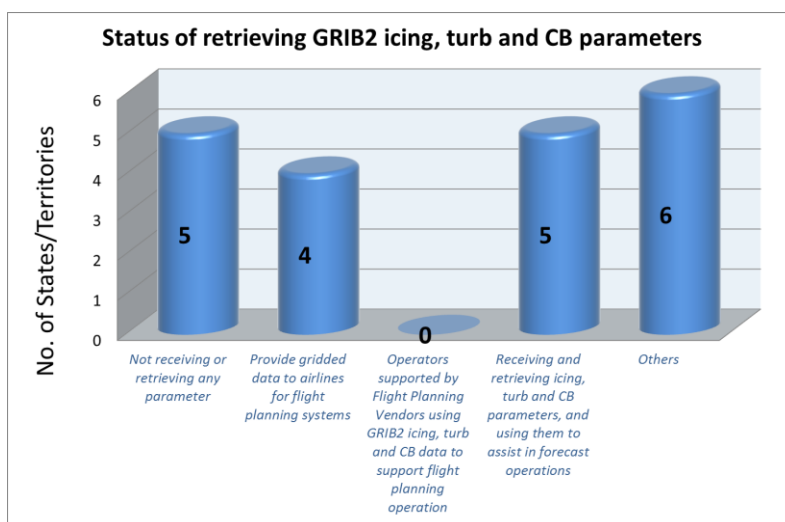


Figure 6

**12.** *If your State/Territory is retrieving icing, turbulence and/or CB parameters from the WAFS forecasts in GRIB2 format (whether or not used to assist in forecast operation), which parameter(s) is/are being retrieved and what is/are the source(s) of GRIB2 data?*

12 States/Territories responded to this question. Figure 7 illustrates the distribution in the source of GRIB2 parameters of icing, turbulence and CB being retrieved by States/Territories. In general, the numbers of States/Territories using UK WAFS source only, US WAFS source only and both sources were more or less the same.

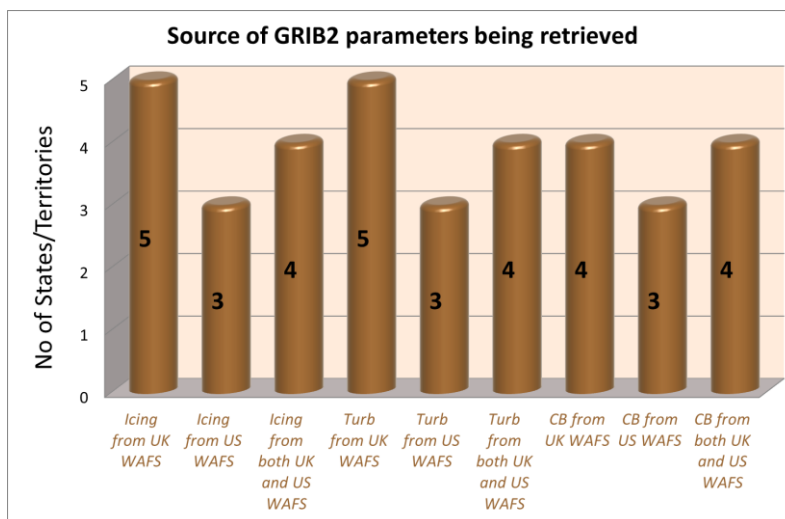


Figure 7

13. For the parameter(s) being retrieved in Q.16 (Question 12 in this Appendix), which parameter(s) is/are being tested before being used to assist in forecast operation?

8 States/Territories responded to this question. Figure 8 illustrates the distribution in the source of GRIB2 parameters of icing, turbulence and CB being tested by States/Territories. More States/Territories were using UK WAFS than US WAFS as the source of GRIB2 parameters of icing, turbulence and CB for testing. Relatively speaking, more States/Territories were testing with icing parameter than turbulence or CB.

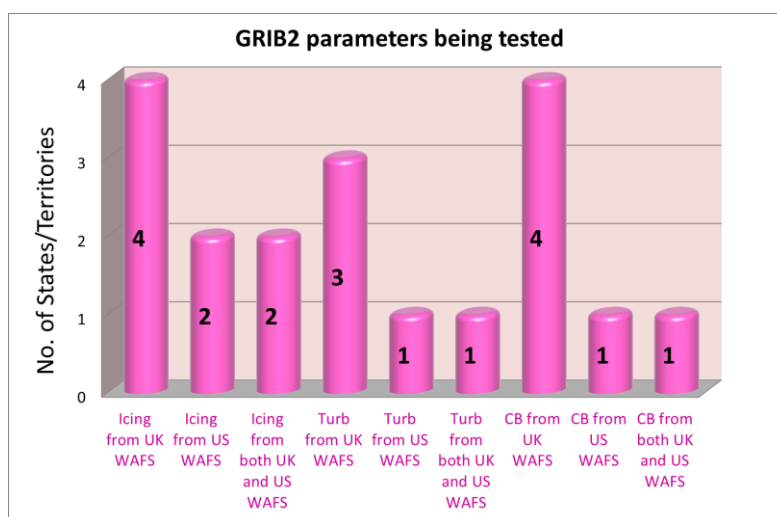


Figure 8

14. For the parameter(s) being retrieved in Q.16 (Question 12 in this Appendix), which parameter(s) is/are being used in operation?

5 States/Territories responded to this question. Figure 9 illustrates the distribution in the source of GRIB2 parameters of icing, turbulence and CB being used in operation by States/Territories. Again, more States/Territories were using UK WAFS than US WAFS as the source of GRIB2 parameters of icing, turbulence and CB for operational use.

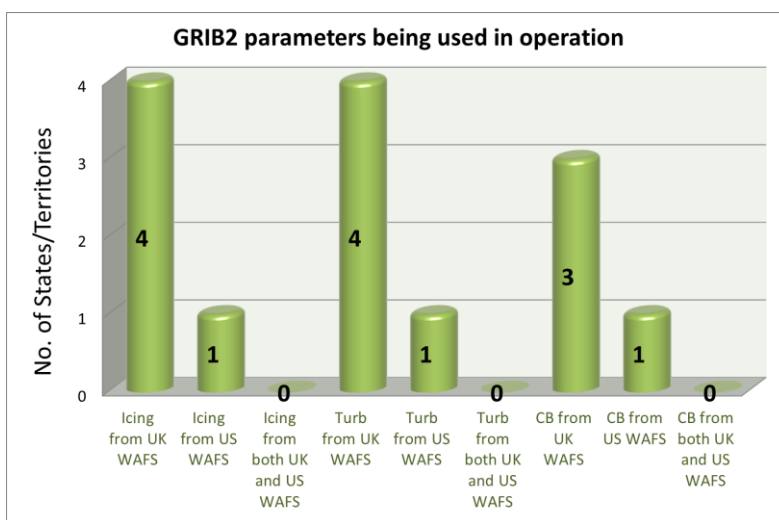


Figure 9

15. For the parameter(s) being retrieved in Q.16 (Question 12 in this Appendix), what product(s) is/are being generated out of the parameter(s)?

7 States/Territories responded to this question. Their quoted product(s) being generated included:

- (a) Pictorial view: 1)CB horizontal extent 2)CB vertical extent; 3)ICAO height at CB base; 4) ICAO height at CB top; 5) Max CAT potential; 6) Max icing potential; 7) Max in-cloud turbulence; 8) Mean CAT potential; 9) Mean icing potential; 10) Mean in-cloud turbulence;
- (b) Trial charts of maximum icing potential, CB horizontal extent, height at CB top, maximum CAT potential and mean in-cloud turbulence potential are being generated;
- (c) CB horizontal extent;
- (d) icing probability, mean CAT potential;
- (e) SIGWX charts;
- (f) Korean meteorological agency project is being implemented at the Aviation meteorological center of Mongolia. In the framework of the project, above mentioned products generated out of the parameters.

16. If your State/Territory has not yet used gridded forecasts of icing, turbulence or CB to assist in forecast operation, does your State/Territory have any plan to do so?

15 States/Territories responded to this question. Among them, 11 States/Territories plan to use gridded forecasts of icing, turbulence or CB to assist in forecast operation while the other 4 States/Territories do not have such a plan yet. Of those who plan to do so, 5 States/Territories plan to do so in 2014, 2 in 2015 and the remaining 4 beyond 2015. All of them plan to use gridded forecasts of icing, turbulence and CB except for one State who plans to use only gridded forecasts of turbulence and CB.

When asked if they have any details of their plan, one territory responded that:

“Based on initial evaluation of the performance of the gridded forecasts of icing, turbulence and CB, the performance of these gridded forecasts in HKFIR differs from those suggested in the Guidance material, in particular that for turbulence (see WAFSOPSG/8-IP/5). Further

information from the WAFCs on the performance of these gridded forecasts in different regions are required. Meanwhile, Hong Kong, China plans to conduct the followings before the gridded forecasts of icing, turbulence and CB are used to assist in forecast operation:

- (1) validation on the performance of the gridded products, in particular over Asian subtropical region;
- (2) establishment of thresholds more relevant for the Asian subtropical region based on the result of (1); and
- (3) refine the visualization of these parameters based on the findings in (2).

As for the use of these gridded products in the flight planning system, no operator has indicated any interest so far. When such a need arises, Hong Kong China would provide assistance to the operators based on further guidance from WAFCs and our local experience.”

One other territory responded that:

“The Icing and turbulence products generate by the WAFS Grib2 data is only used to assist the forecast operation, it is planned to provide this products in our new aviation weather information system for the flight planning to the flight crew members around the middle of 2014.”

One State responded that:

“Due to inadequate observations/ reports, systematic validation of the icing, turbulence and CB forecasts are not done for Indian Region. However, with the involvement of the pilots/ airline operators, efforts will be started soon for an extensive validation and it is expected to put in operational use by early 2015.

As India has not participated in seminar/ workshops on validation and/or interpretation of WAFS products, we would like to host and organise such a seminar/ workshop for the region with the technical support of ICAO experts

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As India has not participated in seminar/ workshops on validation and/or interpretation of WAFS products, we would like to host and organise such a seminar/ workshop for the region with the technical support of ICAO experts”

One State also indicated their desire:

“To acquire necessary training on the use/retrieval of the WAFS products/parameters.”

### Training needs

#### **17.** *Have your State/Territory gained access to training via the following resources?*

14 States/Territories responded to this question and indicated that they have gained access to training in WAFS via the following sources:

- (a) seminar(s)/Workshop(s) organized by ICAO (8 responses)
- (b) seminar(s)/Workshop(s) organized by other organization(s) (4 responses; all from WMO)
- (c) on-line training (3 responses; 1 from UK Meteorological Office Online; 1 from WMO and 1 from UK WAFc)
- (d) self-study of training materials on Internet (5 responses, from the following sources
  - MetED
  - (i) SADIS User Guide; (ii) Secure SADIS FTP User Guide; (iii) Guidance on the Harmonized WAFS Grids for Cumulonimbus Cloud, Icing and Turbulence Forecasts; (iv) Representing WAFS Significant Weather (SIGWX) Data in BUFR; (v) WAFc London WAFS Upper Air Forecast GRIB2 Dataset Guide; (vi) WAFS



GRIB2 Specification; (vii) WIFS User Guide; (viii) Training module regarding gridded forecasts for CB, icing and turbulence.

- WAFSOPSG website
- <http://www.icao.int/safety/meteorology/WAFSOPSG/pages/GuidanceMaterial.aspx>
- <https://aviationweather.gov/wafs>

(e) Others: (4 responses with details as follows:

- Departmental training
- MeteoFrance
- Training documents supplied by UKMO
- On-site software processing training after installation)

**18.** *What is/are the area(s) of training on WAFS that your State/Territory consider most needed?*

The table below summarizes the priority of areas of training on WAFS as indicated by the States/Territories:

<b>Areas</b>	No. of States/ Territories quoting this area as priority <b>'1'</b>	No. of States/ Territories quoting this area as priority <b>'2'</b>	No. of States/ Territories quoting this area as priority <b>'3'</b>	No. of States/ Territories quoting this area as priority <b>'4'</b>	No. of States/ Territories quoting this area as priority <b>'5' or lower</b>
Interpretation of WAFS products (see Note (1))	8	2	3	2	0
Generation of products for flight documentation (see Note (2))	6	4	3	0	0
Decoding of WAFS data (see Note (3))	3	4	3	1	0
WAFS processing software (see Note (4))	1	2	2	2	0
Channels for reception of WAFS products	0	2	1	2	3

Note :

(1) States/Territories remarked that the topics on 'Interpretation of WAFS products' should cover:

- how to translate CB, icing and turbulence into operationally useful products for the aviation industry
- SIGWX, wind/temperature chart, icing, turbulence, CB
- With regard to the gridded forecasts of CB, icing and turbulence:
  - ◆ (1) establishment of the threshold for specific application given the performance of these gridded products;
  - ◆ (2) visualization of the products; and

- ◆ (3) use of these gridded products in the flight planning system
  - WAFS gridded forecasts of cumulonimbus (CB) cloud, icing and turbulence
- (2) States/Territories remarked that the topic on ‘Generation of products for flight documentation’ should cover:
  - SIGWX, wind/temperature chart, icing, turbulence, CB
  - Medium-level and low-level SIGWX charts
- (3) States/Territories remarked that the topic on ‘Decoding of WAFS data’ should cover:
  - SIGWX, wind/temperature chart, icing, turbulence, CB
  - SIGWX charts
- (4) One State remarked that the topic on ‘WAFS processing software’ should cover:
  - Production of medium/low-level SIGWX charts