VOLMET/AERIS

Business Rules

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Change summary

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1 Purpose

A recommendation of the Trend Forecast (TTF) services review conducted by the Bureau of Meteorology was that the TTF service should cease and, at relevant locations, aerodrome forecasts (TAF) be issued at three-hour intervals instead of six-hour intervals.

The primary impact of this change on Airservices is the compilation of VOLMET and AERIS broadcasts, since at present the primary product that appears in such broadcasts is TTF messages.

This document defines how VOLMET and AERIS broadcasts are created from a persistent store of observation (METAR/SPECI) and forecast (TAF) messages.

2 Scope

This document presents the rules that dictate the composition of the content of a VOLMET or AERIS broadcast. It does not address how such broadcasts are converted to voice file, or broadcast to pilots.

3 Business Rules

3.1 VOLMET

VOLMET is a periodic broadcast of meteorological information (observation and forecast) over HF for select aerodromes that are the destination of incoming international flights. The provision of a VOLMET service is required by ICAO Annex 3. Airservices broadcasts the latest meteorological information via VOLMET twice per hour; each broadcast is allocated a five minute slot. The frequency is shared with other ATM service providers hence the time slot size is fixed, and the broadcast is terminated after five minutes irrespective of whether it has completed.

The VOLMET rules define the composition of a VOLMET broadcast. How the meteorological products are translated to speech for broadcast is not addressed in these rules.

Traditionally VOLMET broadcasts have contained TTF (trend) messages, that consist of an observation (i.e. METAR/SPECI) and a trend forecast for the next three hours. With implementation of the TAF 3 project, the Bureau will cease issuing TTF, and increase frequency of issue of aerodrome forecasts (TAF) from every six hours to every three hours. Consequently, VOLMET broadcasts will contain METAR/SPECI and TAF in lieu of TTF. Attempting to include full TAF in a VOLMET broadcast is problematic because:

- TAF are typically forecasts for the next thirty hours, whereas TTF are for the next three hours, hence TAF may contain much forecast material that is not of relevance to a pilot listening to VOLMET.
- If TAF do not report significant (e.g. below alternate minima) conditions, there is no value in providing the forecast.
- Full inclusion of TAF would result in VOLMET broadcasts that are too long for the allocated slot.

In consequence:

- The current METAR/SPECI for a VOLMET location is always included if available.

- Elements of a TAF are filtered out if they do not relate to the three hour period of interest to the VOLMET broadcast.
- A TAF is only included if after filtering it forecasts significant conditions.

Additionally, the items in a VOLMET are broadcast such that those with the greater impact are presented earlier (in case the broadcast period is reached before the broadcast is complete). Specifically:

- Those locations that have a METAR/SPECI or filtered TAF observing/forecasting significant conditions are presented first.
- The availability of SIGMET (but not the actual SIGMET) is presented next.
- Then the METAR/SPECI for those locations for which significant weather is neither observed nor forecast are presented.
- Finally, locations for which no products are included are presented (no METAR/SPECI or significant TAF is available).

Within any of these groups, order of locations is dictated by adaptation.

Example

Consider the following meteorological products current at 1905310352:

```
TAF YBBN 302303Z 3100/0106
20012KT CAVOK
FM310400 06010KT CAVOK
FM310800 23006KT CAVOK
FM010400 10010KT 9999 BKN015
RMK T 15 18 18 14 Q 1023 1021 1021 1023

METAR YBBN 310330Z 21005KT 1000 // SCT120 19/M09 Q1020 RMK RF00.0/000.0

TAF AMD YBCS 310330Z 3104/3124
16010KT 9999 -SHRA FEW020 SCT035
FM310900 16010KT 9999 -SHRA FEW015 BKN025
FM312300 16012KT 9999 NSW SCT025
INTER 3105/3110 3000 TSRA BKN018
RMK T 25 23 22 22 Q 1016 1016 1016 1017

METAR YBCS 310330Z AUTO 17007KT 9999 // SCT120 24/20 Q1016 RMK RF00.0/000.0

TAF AMD YMML 302314Z 3100/0106
23013KT 9999 SHRA SCT010 BKN020
FM310300 19014KT 9999 FEW020 BKN025
FM310900 21008KT 9999 SHRA BKN020
BECMG 3113/3115 21008KT 9999 -DZ FEW010 BKN017
BECMG 0100/0102 19012KT 9999 SHRA FEW018 BKN025
TEMPO 3100/3101 3000 DZ BKN007
INTER 3100/3104 5000 DZ BKN015
TEMPO 3115/3124 4000 -DZ BKN009
RMK T 12 13 13 11 Q 1027 1027 1028 1030

SPECI YMML 310330Z 19011KT 9999 VCSH SCT017 BKN019 BKN040 12/11 Q1027 RMK RF00.0/000.4

YMMM SIGMET N04 VALID 310200/310800 YMMC-
YMMM MELBOURNE FIR SEV TURB FCST WI S4150 E11905 - S5000 E11550 -
S5000 E10050 - S3410 E10410 - S3110 E11110 FL140/420 MOV E 20KT NC
RMK: MW=
```

Filtering the TAF for the three hour period commencing 1905310352 results in:

```
TAF YBBN 302303Z 3100/0106
20012KT CAVOK
FM310400 06010KT CAVOK

TAF AMD YBCS 310330Z 3104/3124
16010KT 9999 -SHRA FEW020 SCT035
INTER 3105/3110 3000 TSRA BKN018
```

```
TAF AMD YMML 302314Z 3100/0106
FM310300 19014KT 9999 FEW020 BKN025
INTER 3100/3104 5000 DZ BKN015
```

By the rules of VOLMET composition, this means:

- YBBN has a significant METAR (visibility) but not a significant TAF, so the METAR only is included. Note that the FM010400 group of the non-filtered TAF has significant cloud, but it is outside the period of interest of the VOLMET hence is not considered.
- YBCS TAF forecasts significant conditions (thunderstorms in the INTER group) so both METAR and TAF are included.
- YBBN appears before YBCS.
- There is a current SIGMET for YMMM, which is indicated.
- Neither SPECI nor TAF for YMML reports significant conditions so the SPECI is included after the SIGMET, with a NOSIG indication.
- There are no active products for YPPH so it is indicated as a nil location.

The content of the VOLMET broadcast in order is:

```
METAR YBBN 310330Z 21005KT 1000 // SCT120 19/M09 Q1020 RMK RF00.0/000.0

METAR YBCS 310330Z AUTO 17007KT 9999 // SCT120 24/20 Q1016 RMK RF00.0/000.0

TAF AMD YBCS 310330Z 3104/3124
16010KT 9999 -SHRA FEW020 SCT035
INTER 3105/3110 3000 TSRA BKN018

SIGMET AVAILABLE FOR MELBOURNE FIR

SPECI YMML 310330Z 19011KT 9999 VCSH SCT017 BKN019 BKN040 12/11 Q1027 RMK RF00.0/000.4
NOSIG

YPPH NIL CURRENT
```

3.1.1 Adaptation

Number	Requirement
VAD01	VOLMET locations: the ordered list of aerodromes that are relevant to VOLMET. Initial value: [YSSY,YMML,YBBN,YPAD,YPPH,YBCS,YPDN,YBTL]
VAD02	VOLMET applicable duration: the period of time commencing from the VOLMET issue time in which applicable report and forecast products must fall. Initial value: 180 minutes.

3.1.2 TAF

Number	Requirement
VTF01	A TAF is included in a VOLMET broadcast if the TAF is significant with respect to the VOLMET broadcast.
VTF02	A TAF included in a VOLMET broadcast excludes any forecast elements whose effective period does not overlap the VOLMET period.
VTF03	A TAF included in a VOLMET broadcast excludes forecast temperatures.
VTF04	A TAF included in a VOLMET broadcast excludes forecast QNH.

3.1.3 METAR/SPECI

Number	Requirement
VMS01	A METAR/SPECI is included in a VOLMET broadcast if the METAR/SPECI is temporally applicable to the VOLMET broadcast.
	Notes: • A new METAR/SPECI replaces the existing product, so there can never be more than one active METAR/SPECI per location. • METAR/SPECI is included in a VOLMET broadcast regardless of whether or not it reports significant conditions. The nature of the METAR/SPECI dictates where it appears in the broadcast.
VMS02	If a METAR/SPECI is included in a VOLMET broadcast, and no TAF for the same location are included in the broadcast, the METAR/SPECI is presented with a NOSIG indication.

3.1.4 SIGMET

Number	Requirement
VSG01	Availability of SIGMET for Brisbane FIR (YBBB) is indicated in a VOLMET broadcast if: • a SIGMET is current for YBBB; and • the validity period of the SIGMET overlaps the VOLMET period.
VSG02	Availability of SIGMET for Melbourne FIR (YMMM) is indicated in a VOLMET broadcast if: • a SIGMET is current for YMMM; and • the validity period of the SIGMET overlaps the VOLMET period.
	The inclusion of SIGMET content would result in the length of the VOLMET broadcast exceeding its allocated time slot, so only an indication of availability is included.

3.1.5 Location

Number	Requirement
VLC01	A location for which there is no temporally applicable METAR/SPECI, there are temporally applicable TAF, and all such TAF are insignificant, is presented in a VOLMET broadcast with a NOSIG indication.
VLC02	A location for which there is no temporally applicable METAR/SPECI and no temporally applicable TAF is presented in a VOLMET broadcast with a NIL indication.

3.1.6 Presentation Order

Number	Requirement
VPO01	All products (TAF/METAR/SPECI) for a location are adjacent in the broadcast.
VPO02	If both a METAR/SPECI and a TAF for the same location are included a broadcast, the METAR/SPECI is presented before the TAF.
VPO03	If multiple TAF for a location are included in a VOLMET broadcast, the TAF are presented in issue time order.

Number	Requirement
VPO04	Those VOLMET locations that are significant are presented before any other locations.
VPO05	Where multiple locations satisfy rule VPO04, the locations are presented as per the order in VAD01.
VPO06	Indication of the availability of SIGMET is presented after the significant locations.
VPO07	Those VOLMET locations that are applicable (but not significant) are presented after the SIGMET availability indication.
VPO08	Where multiple locations satisfy rule VPO07, the locations are presented as per the order in rule VAD01.
VPO09	Those VOLMET locations that are neither significant nor applicable are presented last in the broadcast.
VPO10	Where multiple locations satisfy rule VPO09, the locations are presented as per the order in rule VAD01.

3.2 AERIS

AERIS is a broadcast of meteorological information (METAR/SPECI and TAF) over VHF. There are fourteen locations from which AERIS is broadcast (outlets), with the information broadcast dictated by utility to aircraft flying in the region. AERIS is broadcast for each outlet continuously, and the meteorological products included in the broadcast are refreshed on each cycle with the latest information available.

The AERIS rules define the composition of an AERIS broadcast. How the meteorological products are translated to speech for broadcast is not addressed in these rules.

Refer to the description of VOLMET for an outline of how AERIS broadcasts are compiled, and an example. The only difference is that AERIS broadcasts do not include information on availability of SIGMET.

3.2.1 Adaptation

Number	Requirement
AAD01	Mt William locations: the set of aerodromes relevant to the AERIS Mt William outlet. Initial value: {YPAD,YMHB,YMLT,YMML,YPPH,YMIA}
AAD02	Mt Ginini locations: the set of aerodromes relevant to the AERIS Mt Ginini outlet. Initial value: {YPAD,YSCB,YMHB,YMML,YSWG}
AAD03	Mt Canobolas locations: the set of aerodromes relevant to the AERIS Mt Canobolas outlet. Initial value: {YPAD,YBAS,YBBN,YMML,YPPH,YSSY,YWLM}
AAD04	Point Lookout locations: the set of aerodromes relevant to the AERIS Point Lookout outlet. Initial value: {YAMB,YBBN,YBCG,YSCB,YMML,YBRK,YSSY,YWLM}

Number	Requirement
AAD05	Mt Mowbullan locations: the set of aerodromes relevant to the AERIS Mt Mowbullan outlet. Initial value: {YAMB,YBBN,YBCG,YBMK,YBRK,YBSU,YSSY}
AAD06	Mt Blackwood locations: the set of aerodromes relevant to the AERIS Mt Blackwood outlet. Initial value: {YBBN,YBCS,YBHM,YBMK,YBRK,YBTL}
AAD07	Mt Bellenden Kerr locations: the set of aerodromes relevant to the AERIS Bellenden Kerr outlet. Initial value: {YBBN,YBCS,YBHM,YBMK,YBRK,YBTL}
AAD08	Mt Isa locations: the set of aerodromes relevant to the AERIS Mt Isa outlet. Initial value: {YBAS,YBBN,YBCS,YBMA,YPTN,YBTL}
AAD09	Goochegoochera locations: the set of aerodromes relevant to the AERIS Goochegoochera outlet. Initial value: {YBAS,YBCS,YPDN,YTNK,YPTN,YBTL}
AAD10	Derby locations: the set of aerodromes relevant to the AERIS Derby outlet. Initial value: {YBRM,YPKU,YMEK,YPPH,YPPD}
AAD11	Meekatharra locations: the set of aerodromes relevant to the AERIS Meekatharra outlet. Initial value: {YBRM,YPKA,YMEK,YMOG,YPPH,YPPD}
AAD12	Ceduna locations: the set of aerodromes relevant to the AERIS Ceduna outlet. Initial value: {YPAD,YBAS,YPKG,YMML,YPPH,YSSY}
AAD13	Kalgoorlie locations: the set of aerodromes relevant to the AERIS Kalgoorlie outlet. Initial value: {YPAD,YBAS,YCDU,YPKG,YLTN,YPPH}
AAD14	Broken Hill locations: the set of aerodromes relevant to the AERIS Broken Hill outlet. Initial value: {YPAD,YBAS,YBBN,YPDN,YMML,YSSY}
AAD15	AERIS applicable duration: the period of time commencing from the AERIS issue time in which relevant report and forecast products fall. Initial value: 180 minutes.

3.2.2 TAF

Number	Requirement
ATF01	A TAF is included in an AERIS outlet broadcast if the TAF is significant with respect to the AERIS broadcast.
ATF02	A TAF included in an AERIS outlet broadcast excludes any forecast elements whose effective period does not overlap the AERIS period.
ATF03	A TAF included in an AERIS outlet broadcast excludes forecast temperatures.
ATF04	A TAF included in an AERIS outlet broadcast excludes forecast QNH.

3.2.3 METAR/SPECI

Number	Requirement
AMS01	A METAR/SPECI is included in an AERIS outlet broadcast if the METAR/SPECI is temporally applicable to the AERIS broadcast.
	Notes: • A new METAR/SPECI replaces the existing product, so there can never be more than one active METAR/SPECI per location. • METAR/SPECI is included in an AERIS outlet broadcast regardless of whether or not it reports significant conditions. The nature of the METAR/SPECI dictates where it appears in the broadcast.
AMS02	If a METAR/SPECI is included in an AERIS outlet broadcast, and no TAF for the same location are included in the broadcast, the METAR/SPECI is presented with a NOSIG indication.

3.2.4 Location

Number	Requirement
ALC01	A location for which there is no temporally applicable METAR/SPECI, there are temporally applicable TAF, and all such TAF are insignificant, is presented in an AERIS outlet broadcast with a NOSIG indication.
ALC02	A location for which there is no temporally applicable METAR/SPECI and no temporally applicable TAF is presented in an AERIS outlet broadcast with a NIL indication.

3.2.5 Presentation Order

Number	Requirement
APO01	All products (TAF/METAR/SPECI) for a location are adjacent in the broadcast.
APO02	If both a METAR/SPECI and a TAF for the same location are included in a broadcast, the METAR/SPECI is presented before the TAF.
APO03	If multiple TAF for a location are included in a broadcast, the TAF are presented in issue time order.
APO04	Those AERIS outlet locations that are significant are presented before any other locations.
APO05	Those AERIS outlet locations that are applicable (but not significant) are presented after the significant locations.
APO06	Those AERIS outlet locations that are neither significant nor applicable are presented last in the broadcast.

3.3 TAF Filtering

A TAF commences with the forecast conditions at the start of the validity period of the TAF, followed by seven collections that appear in strict order in the TAF text.

1. Significant changes to the forecast conditions during the validity period of the TAF. A significant change is either a FM (from) element or a BECMG (becoming) element.

2. Significant variations to the forecast elements for periods of up to 30 minutes (INTER) or between 30 and 60 minutes (TEMPO).
3. Significant variations where the probability of variation is 30% or 40% (the significant variations of item 2 have a probability of at least 50%).
4. Periods when there is a possibility of low visibility or thunderstorms with a probability of 30% or 40%.
5. Periods when significant low level turbulence is forecast.
6. Forecast temperatures; a maximum of four, valid for consecutive three hour periods.
7. Forecast QNH values; a maximum of four, valid for consecutive three hour periods.

In each of the seven collections, where there is more than one element, then the elements are presented in increasing temporal order. In all but items 6 and 7 there may be zero or more elements. Consider the example TAF

TAF YSSY 251010Z 2510/2612
33018G28KT 9999 -SHRA SCT020 BKN030
FM251200 14025G35KT 9999 -SHRA SCT010 BKN020
FM251600 17015KT 9999 -SHRA BKN020
BECMG2521/2522 20015KT 9999 -SHRA BKN025
FM260400 22015KT 9999 SCT030
INTER 2510/2512 4000 SHRA BKN010
TEMPO 2512/2516 3000 SHRA BKN008
INTER 2516/2524 4000 SHRA BKN010
RMK FM251000 MOD TURB BLW 5000FT
T 28 33 32 31 Q 1006 1002 998 998

There are four elements of item 1, three elements of item 2, zero elements of items 3 and 4, one element of item 5, four elements of item 6, and four elements of item 7. Within each collection the forecast elements appear in increasing temporal order.

Each collection is independent; they are not temporally related. In the example the FM elements and the INTER/TEMPO elements are interleaved in time. As such, when determining those elements to filter from the TAF, each of the collections is assessed independently.

The effective period of the initial forecast starts with the commencement of the TAF validity period, and ends at the start time of the first FM/BECMG element in the TAF, or the end of the period of validity of the TAF if there is no FM/BECMG element.

Item 1 provides a time from when the new forecast element is in force. The effective period starts at the time specified in the element, and ends at the time specified in the next element (since at that time the new forecast takes effect). In the case of the last element, the effective period starts at the time specified in the element, and ends at the end of the period of validity of the TAF.

For items 2, 3 and 4, both a start and end time is given, fully delineating the effective period.

For item 5 a start time is given, with the end time being optional. The effective period starts at the time specified in the element, and ends at:

- the end time if specified explicitly; or
- the start time of the next element; or

- the end of the period of validity of the TAF if it is the last element in the collection and an explicit end time is not specified.

Each of the (up to four) elements in item 6 is valid for three hours. They are consecutive with the first commencing at the commencement time of the TAF. Consequently, the temperature forecasts cover a period of up to 12 hours.

Each of the (up to four) elements in item 7 is valid for three hours. They are consecutive with the first commencing at the commencement time of the TAF. Like temperatures, the QNH forecasts cover a period of up to 12 hours.

Example

The validity period of the above TAF is 251000–261200. The table below presents the effective period of each forecast element of the delineated TAF.

Forecast Element	Effective Period
33018G28KT 9999 -SHRA SCT020 BKN030	251000-251200
FM251200 14025G35KT 9999 -SHRA SCT010 BKN020	251200-251600
FM251600 17015KT 9999 -SHRA BKN020	251600-252100
BECMG2521/2522 20015KT 9999 -SHRA BKN025	252100-260400
FM260400 22015KT 9999 SCT030	260400-261200
INTER 2510/2512 4000 SHRA BKN010	251000-251200
TEMPO 2512/2516 3000 SHRA BKN008	251200-251600
INTER 2516/2524 4000 SHRA BKN010	251600-252400 (260000)
RMK FM251000 MOD TURB BLW 5000FT	251000-261200
28	251000-251300
33	251300-251600
32	251600-251900
31	251900-252200
1006	251000-251300
1002	251300-251600
998	251600-251900
998	251900-252200

Number	Requirement
FLT01	A filtered TAF includes the initial forecast if the effective period of the delineated initial forecast overlaps the period of interest; otherwise it excludes the initial forecast.
FLT02	A filtered TAF includes a significant change if the effective period of the delineated significant change overlaps the period of interest, otherwise it excludes the significant change.

Number	Requirement
FLT03	A filtered TAF includes a significant variation if the effective period of the delineated significant variation overlaps the period of interest, otherwise it excludes the significant variation.
FLT04	A filtered TAF includes a probable significant variation if the effective period of the delineated probable significant variation overlaps the period of interest, otherwise it excludes the probable significant variation.
FLT05	A filtered TAF includes a visibility/thunderstorm forecast if the effective period of the delineated visibility/thunderstorm forecast overlaps the period of interest, otherwise it excludes the visibility/thunderstorm forecast.
FLT06	A filtered TAF includes a forecast turbulence if the effective period of the delineated forecast turbulence overlaps the period of interest, otherwise it excludes the forecast turbulence.
FLT07	A filtered TAF includes a forecast temperature if the effective period of the delineated forecast temperature overlaps the period of interest, otherwise it excludes the forecast temperature.
FLT08	A filtered TAF includes a forecast QNH if the effective period of the delineated forecast QNH overlaps the period of interest, otherwise it excludes the forecast QNH.

4 Definitions

Delineated TAF	A delineated TAF is a TAF message in which the start and end period of validity (effective period) of every forecast element has been assigned explicitly.
Filtered TAF	A filtered TAF with respect to a period of interest is the TAF that is the result of removing from a delineated TAF those forecast elements whose effective period does not overlap the period of interest.
AERIS	Automatic En-Route Information Service Repetitive broadcast of meteorological information for select aerodromes over VHF.
AERIS Outlet	A location from which AERIS is broadcast. Each location has a set of associated aerodromes. The set of aerodromes for two different outlets are not necessarily disjoint.
AERIS Period	The period of time commencing from the issue time of the AERIS and lasting for the AERIS applicable duration (**AAD15**).
VOLMET	Periodic broadcast of meteorological information for select international aerodromes over HF.
VOLMET Period	The period of time commencing from the broadcast time of the VOLMET and lasting for the VOLMET applicable duration (**VAD02**).
Temporally Applicable METAR/SPECI	A METAR/SPECI is temporally applicable with respect to a broadcast if: • the validity period of the METAR/SPECI overlaps the broadcast period.
Significant METAR/SPECI	A METAR/SPECI is significant with respect to a broadcast if: • the METAR/SPECI is temporally applicable to the broadcast; and • the METAR/SPECI reports below alternate minima conditions or thunderstorms.

Temporally Applicable TAF	A TAF is temporally applicable with respect to a broadcast if: • the validity period of the TAF overlaps the broadcast period.
Significant TAF	A TAF is significant with respect to a broadcast if: • the TAF is temporally applicable to the broadcast; and • the TAF after filtering by the broadcast period forecasts below alternate minima conditions, or thunderstorms, or turbulence.
Insignificant TAF	A TAF is insignificant with respect to a broadcast if: • the TAF is temporally applicable to the broadcast; and • the TAF after filtering by the broadcast period does not forecast below alternate minima conditions, or thunderstorms, or turbulence.
Significant Location	A location is significant with respect to a broadcast if: • the location is relevant to the broadcast as defined in adaptation; • the broadcast includes a significant product (TAF/METAR/SPECI) for the location.
Applicable Location	A location is applicable with respect to a broadcast if: • the location is relevant to the broadcast as defined in adaptation; • a METAR/SPECI that is not significant is included in the broadcast; and • no TAF for the location are included in the broadcast.

5 References

Title	Number
Review of Trend Forecast services for the aviation industry. Final report. 10/10/2016.	
TAF3 Implementation Project Plan, version 1.0, Bureau of Meteorology, 2019	