Met Office

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Hello, and welcome to the session on SIGMETS. This is part 1, an introduction to SIGMETs and coding. Part 2 and 3 will look more closely at forecasting SIGMETs for Turbulence and Convection.

Met Office

Aim

- To introduce you to the code used to warn of significant en-route weather.

Learning Outcomes

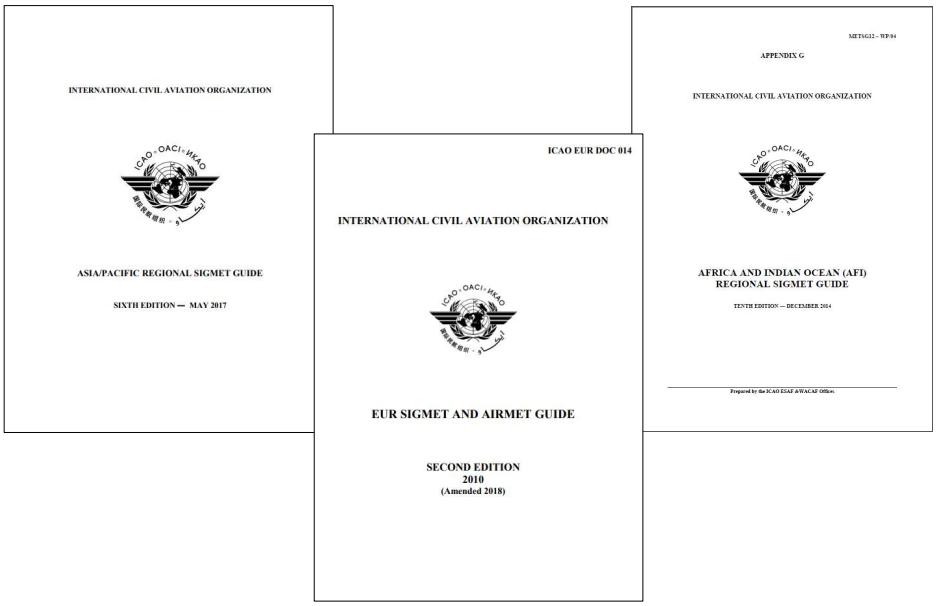
By the end of this session, you should be able to…

- Discuss the purpose of the SIGMET system.
- Recognise key components of the coded SIGMET message.

The aim of this session is to introduce you to the coding used to warn of significant en-route weather.

By the end of this session, you should be able to discuss the purpose of issuing SIGMETs and recognise key components of the coded SIGMET message.

ICAO Regional SIGMET Guides



For further information on SIGMETs I would suggest having a look at your ICAO regional SIGMET guide.

Met Office

WMO AMF Competencies

This lesson addresses the following knowledge requirements as listed in the CAeM AMF competency document (see “WMO and Aviation Competencies”.

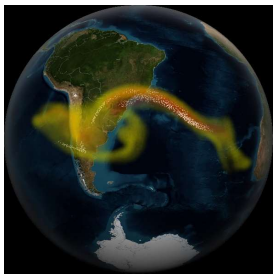
27. ICAO, WMO and national aeronautical meteorological codes and forms of data representation

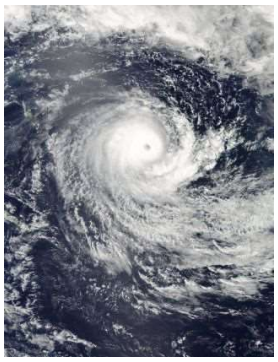
Knowledge of ICAO, WMO and national aeronautical meteorological codes and forms of data representation is vital to be WMO AMF compliant.

Met Office

SIGMETs

- **SIG**nificant **MET**eorological information
- Warnings to aircraft in flight, and on the ground, of specified meteorological conditions
- Cover Flight Information Regions (FIR's)
- Originated by a Met Watch Office (MWO)
- Issued for short periods
  - maximum validity is **4 hours**
  - except Volcanic Ash (and Tropical Cyclone) where the period of validity may be extended up to **6 hours**
  - **lead time of 1 hour** has been agreed as best practice
- Passed to pilots about to depart or in flight





So what is a SIGMET? SIGMET stands for Significant Meteorological information and provides warnings to aircraft in flight, or on the ground of any specified meteorological conditions.

They cover flight information regions, also know as F I R's and are produced by a Met Watch Office (MWO).

They have short validity periods of 4 hours, except for Volcanic ash and Tropical cyclones where the validity can be up to 6 hours.

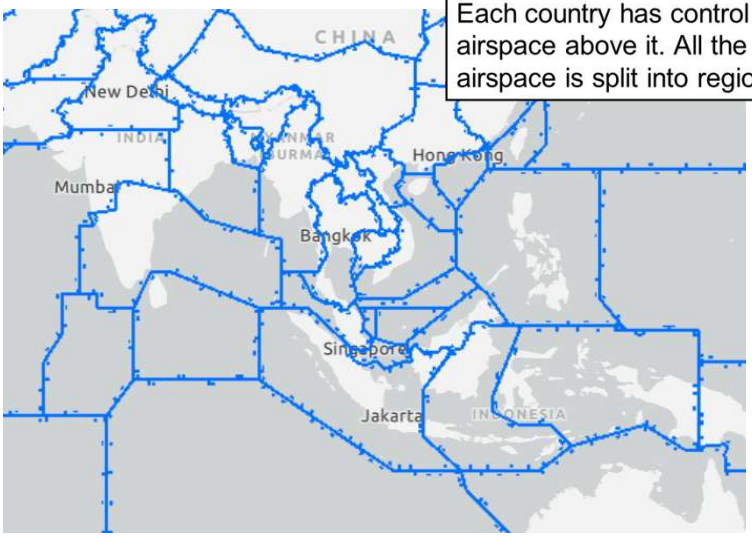
Best practice states that a lead time of 1 hour is desirable, however if a specified meteorological condition is observed then a SIGMET should be issued

as soon as possible.

The SIGMET is then passed on to pilots about to depart, or already in flight for them to make informed decisions.

Met Office

FIR Regions



Flight Information Regions (FIR). Each country has control of the airspace above it. All the airspace is split into regions.

https://gis.icao.int/ICAOAVIATION/

Each county has control of the airspace above it. All airspace is split into areas known as Flight Information regions. Some countries can further split up a FIR into upper information regions. Smaller countries may only have 1 FIR, whilst larger countries may have several.

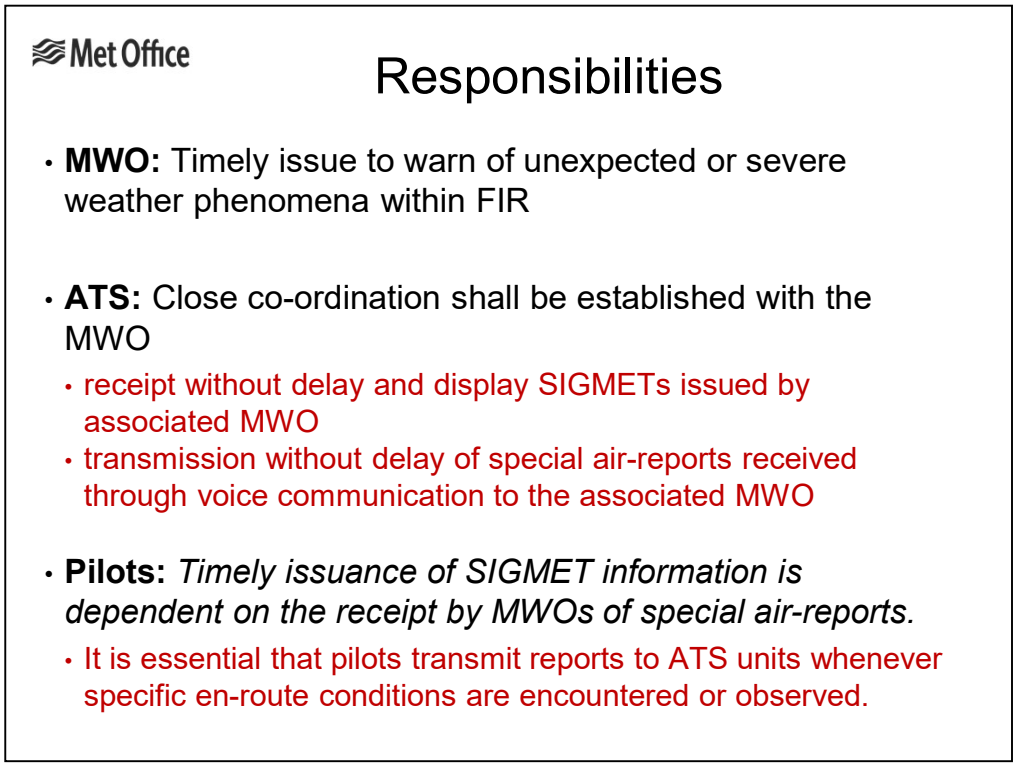
Met Office

SIGMETS

- There are 3 types of SIGMETS:
  - WS/ WV/ WC
- Issued in a sequential daily numbering system. i.e. the first SIGMET of the day in each FIR will be numbered ‘01’, then ‘02’
- VA SIGMETs have an independent numbering system to all other SIGMETs and should therefore be treated separately
  - This applies also for VA cancellation messages
- Not amended
  - If they are incorrect they are cancelled and the correct version transmitted as a new SIGMET.
  - The cancelled SIGMET should be numbered according to the normal sequential daily numbering system.

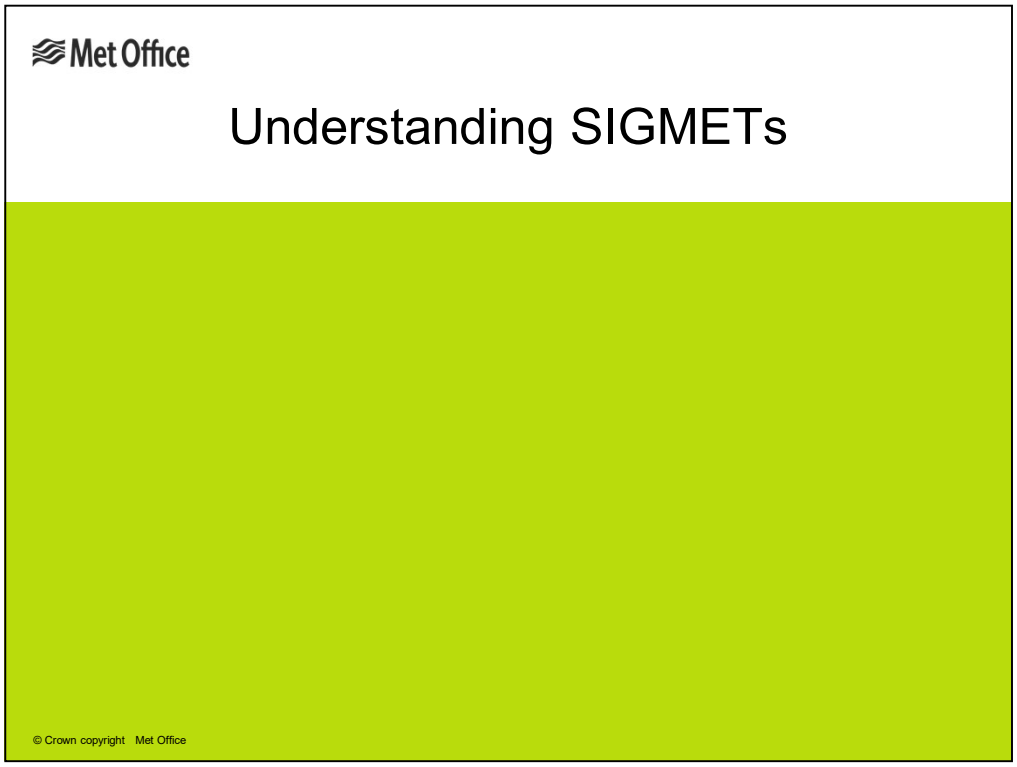
There are 3 types of SIGMETs, normal (WS), Volcanic (WV) and Tropical Cyclone (WC). They are issued in a sequential daily numbering system, which means that every day will reset back to 1. Volcanic ash SIGMETs have an independent numbering system and therefore should be treated differently.

SIGMETs are non-amendable. If there is an error in the SIGMET it will need to be cancelled and a new SIGMET issued.



It is the responsibility of the Met Watch Office to timely issue SIGMETs to warn of unexpected or severe weather phenomena withing a FIR.

The met watch office will have close co-ordination with the Air Traffic Service, who will transmit and display SIGMETs to pilots. Air Traffic Services are also responsible for relaying any special air-reports received from pilots to the Met Watch Office. Pilots are responsible tor transmitting reports of any specific on-route conditions that have been encountered or observed.



The next part of this session is going to have a look at SIGMET structure and coding.

Met Office

SIGMET structure

Three parts:

- WMO header

WSUK31 EGRR 092158

- First line of SIGMET indicating validity period

EGTT SIGMET 06 VALID 092300/100300 EGRR-

- Meteorological description
- **EGTT LONDON FIR SEV MTW FCST E OF W00530 FL050/250 STNR NC=**

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SIGMETs can easily be split into three parts,

The WMO header,

The first line of the SIGMET which provides information on the Validity period

And the Meteorological description which provides information on the hazards, its location and movement.

Met Office

SIGMET structure
WMO header

WSUK31 EGRR 092158

- **Data type designator**
  - **WS** – for SIGMET
  - **WC** – for SIGMET for tropical cyclone (not required in the EUR Region)
  - **WV** – for SIGMET for volcanic ash

Lets start with looking at the WMO header.

The first two letters indicate what type of SIGMET it is. WS is used for normal SIGMETs on Turbulence, Thunderstorms etc. WC is used for Tropical Cyclones and WV is used for Volcanic ash.

SIGMET structure
WMO header

WSUK31 EGRR 092158

- Country or territory designator

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The next two letters indicate the country or territory. In the example it is the UK. For Singapore it would be SR.

SIGMET structure
WMO header

WSUK31 EGRR 092158

- Bulletin number

The next two number are the Bulletin number. Again this changes depending on country. In the UK the bulletin number is 31. Singapore has the bulletin number 20

SIGMET structure
WMO header

WSUK31 **EGRR** 092158

- ICAO of the Disseminating Centre(could be the same as the MWO)

The next part of the WMO header is the ICAO of the Disseminating centre. This could be the same as the MWO, particularly in smaller countries.

SIGMET structure
WMO header

WSUK31 EGRR **092158**

- Date/time group

The next part is the date and time group. With time being in Zulu/UTC.

SIGMET structure
First line of SIGMET

EGTT SIGMET 06 VALID 092300/100300 EGRR-

- ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET refers

Now we move onto the second part of the SIGMET structure, which is what we call ‘The first line of SIGMET’.

The first part is the ICAO location indicator of the Air Traffic Service which is responsible for the Flight Information Region or Control Area for which the SIGMET refers to.

SIGMET structure
First line of SIGMET

EGTT **SIGMET** 06 VALID 092300/100300 EGRR-

- Message identifier

Next is the message identifier, which is SIGMET

Met Office

SIGMET structure
First line of SIGMET

EGTT SIGMET **06** VALID 092300/100300 EGRR-

- Daily sequence number
- Can consist of up to 3 symbols: 1, 2 …..
  01, 02 ……
  A01, A02 ……
- Cancellations of SIGMETS will have a new sequence number

This is then followed by the daily sequence number. SIGMETs are reset everyday at midnight. The SIGMET number can consist of up to 3 symbols, either 1,2,3 etc or could be 01, 02, 03. It is also possible to use letters as well, so A01, A02 etc. When cancelling a SIGMET you would give it the next number in the sequence. For example you have issued 3 SIGMETs and are wanting to cancel one, the SIGMET number would be 4.

Met Office

SIGMET structure
First line of SIGMET

EGTT SIGMET 06 **VALID 092300/100300** EGRR-

- Validity period of the SIGMET given by date/time group of the beginning and date/time group of the end of the period

The next part of the SIGMET is the validity period given by a date and time group and the beginning and end. So in this example the SIGMET is valid from 2300 on the 9th until 03000 on the 10th.

Met Office

SIGMET structure
First line of SIGMET

EGTT SIGMET 06 VALID 092300/100300 **EGRR-**

- ICAO location indicator of the MWO originating the message and –
  (hyphen, without space, to separate the preamble from the text)

The last part of the SIGMET first line is the ICAO location indicator of the Met Watch Office originating the message. And is then followed by a hyphen without a space. This helps to break up the header and first line to the Meteorological part of the SIGMET.

Met Office

SIGMET structure:

Meteorological part of SIGMET (not VA)

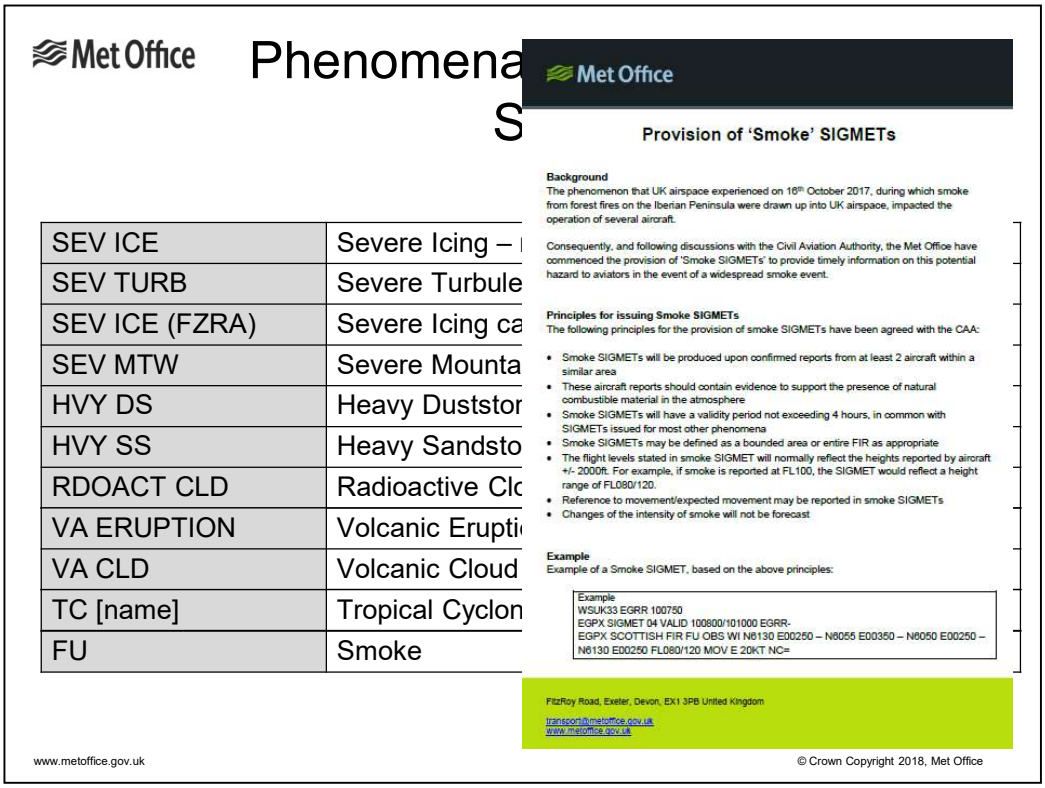
EGTT LONDON FIR SEV MTW FCST E OF W00530 FL050/250 STNR NC=

1	2	3	4	5	6	7	8	9
Name of the FIR/UIR or CTA	Phenomenon	Observed or forecast phenomenon	Location	Level	Movement *or* expected movement	Changes in intensity	Forecast time	Forecast position
<Name> FIR or CTA	<Phenomenon>	OBS [AT<GGggZ>] Or FCST	Geographic location given by coordinates, geographic object, location indicators	FL/M/FT <nnn> FL <nnn/nnn> [TOP, ABV, BLW]	MOV <direction, Speed> KMH[KT] Or STNR	INTSF WKN NC	FCST AT GGggZ	Location expected at forecast time

Now we move onto the meterological part of the SIGMET. This can easily be broken down further.

The first part is the ICAO location indicator and full name of Flight Information Region. EGTT is the ICAO and London FIR is the name.

Next identifies which hazard the SIGMET is in reference to. There are specified phenomena which are allowed to be reported on a SIGMET. Only 1 weather hazard is allowed per SIGMET. For example if in an area you are expecting Heavy Sandstorms and severe mountain waves, two SIGMETs should be issued.



You can have severe icing and turbulence that is not associated with convective clouds, severe icing caused by freezing rain, and severe mountain waves, which in the UK is classified as anything above 600 Feet per Minute. Heavy Dust and Sandstorms, Radioactive Cloud. Volcanic eruptions and clouds would come under a WV SIGMET and Tropical cyclone would be a WC SIGMET. In response to European forest fires in 2017 the CAA has agreed that a smoke SIGMET can be produced if two or more aircraft report the phenomena within a similar area. This is currently being issued by the UK met office, however might not be a wider agreement. The other phenomena to be reported in SIGMETs is thunderstorms.

Thunderstorm phenomena to be reported by SIGMET

OBSC TS	**Obscured thunderstorm(s)** by haze or smoke or cannot be readily seen due to darkness
EMBD TS	**Embedded thunderstorm(s)** within cloud layers and cannot be readily recognised
FRQ TS	**Frequent thunderstorm(s)-** area of thunderstorms within which there is little or no separation between adjacent thunderstorms with a maximum spatial coverage >75% of the area affected
SQL TS	**Squall line thunderstorm(s)** indicates thunderstorms along a line with little or no space between individual clouds
OBSC TSGR	**Obscured thunderstorm(s) with hail**
EMBD TSGR	**Embedded thunderstorm(s) with hail**
FRQ TSGR	**Frequent thunderstorm(s) with hail**
SQL TSGR	**Squall line thunderstorm(s) with hail**

A SIGMET is not issued for an isolated thunderstorm which can be easily seen by a pilot. If a thunderstorm SIGMET is issued no mention, nor issue of severe icing or severe turbulence is necessary because these are implicit. Several identifiers can be used with Thunderstorms to further describe the hazard.

Obscured means it can not be readily seen due to haze, smoke or darkness.

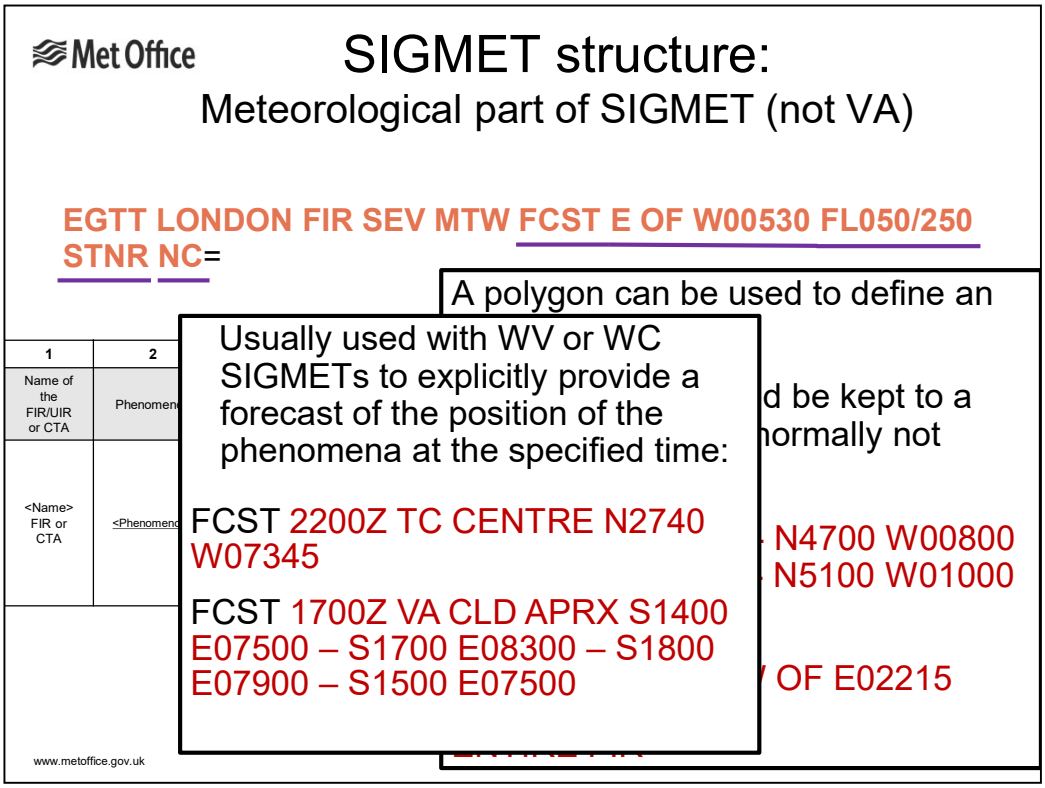
Embedded means it is within a layer of cloud and therefore cannot be easily recognised.

Frequent thunderstorms, of which there is little separation and cover over 75% of an area.

Squall line thunderstorms are used to describe a line of thunderstorms where there is little to no spacing between the clouds. This would make passing through the line difficult.

The same identifiers can be issued when thunderstorms occur with or without hail. If hail is present TSGR would be used.

If more than one thunderstorm condition is expected to occur simultaneously, then the following order should be adopted: Squall trumps frequent which trumps Embedded which trumps obscured.



The next section tells us if the phenomenon is either forecast to occur or has already been observed and is expected to continue to occur. A time of observation can also be included. For example, Observed at 1245Z.

Next we have the location of the hazardous area. This can be done in several ways. A polygon can be used to define an area within the FIR and is usually with the abbreviation WI which stands for Within. When selecting points it should go in an clockwise direction in order to make interpretation by the pilot easier. Turning points of the polygon should be kept to a minimum, and should generally not exceed seven. Location can also be described by a direction from a given line or point,

Eg, South of line x. Or as a single point, or a radius from a single point. The later usually refers to cyclones or volcanic ash, where the hazard has a centre. Location can also refer to the entire FIR.

The next part indicates at what level the hazard is at. This can be expressed as either a Flight level, in feet or in meters. It can be at one particular height, between two height levels or Above/ below a point. Or the Top of the phenomena might just be reported.

Next we have movement or expected movement with a direction and speed. Speed can either be in KMH or KT. STNR is used if the phenomena is stationary.

The next part is any changes in intensity. Here you can have INTSF for Intensifying, WKN for weakening and NC for no change.

The next two parts are an outlook beyond the valid time and is used for cyclone and volcanic ash SIGMETs only. Used to describe the forecast position of the

cyclone or ash centre at a given time. For example: forecast at 2200Z the Tropical Cyclone centre will be N27,40 and W073,45. Can be used instead of movement, but can be used together as well.

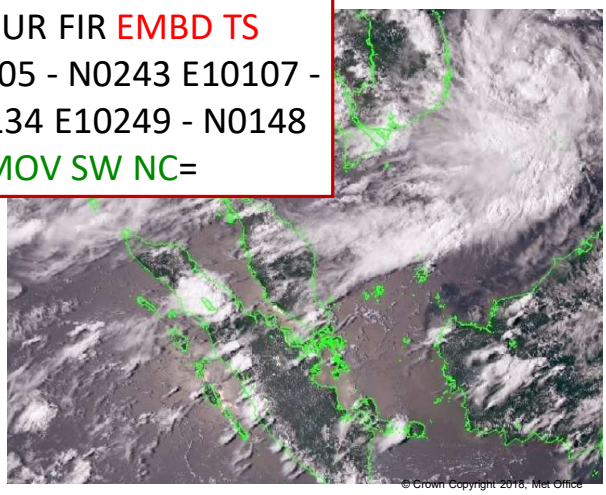
Met Office

Example

Lets look at an example of a SIGMET then.

Met Office

WSMS31 WMKK 221257
WMFC SIGMET 7 VALID 221300/221600
WMKK-
WMFC KUALA LUMPUR FIR EMBD TS
OBS WI N0148 E10205 - N0243 E10107 -
N0312 E10206 - N0134 E10249 - N0148
E10205 TOP FL510 MOV SW NC=



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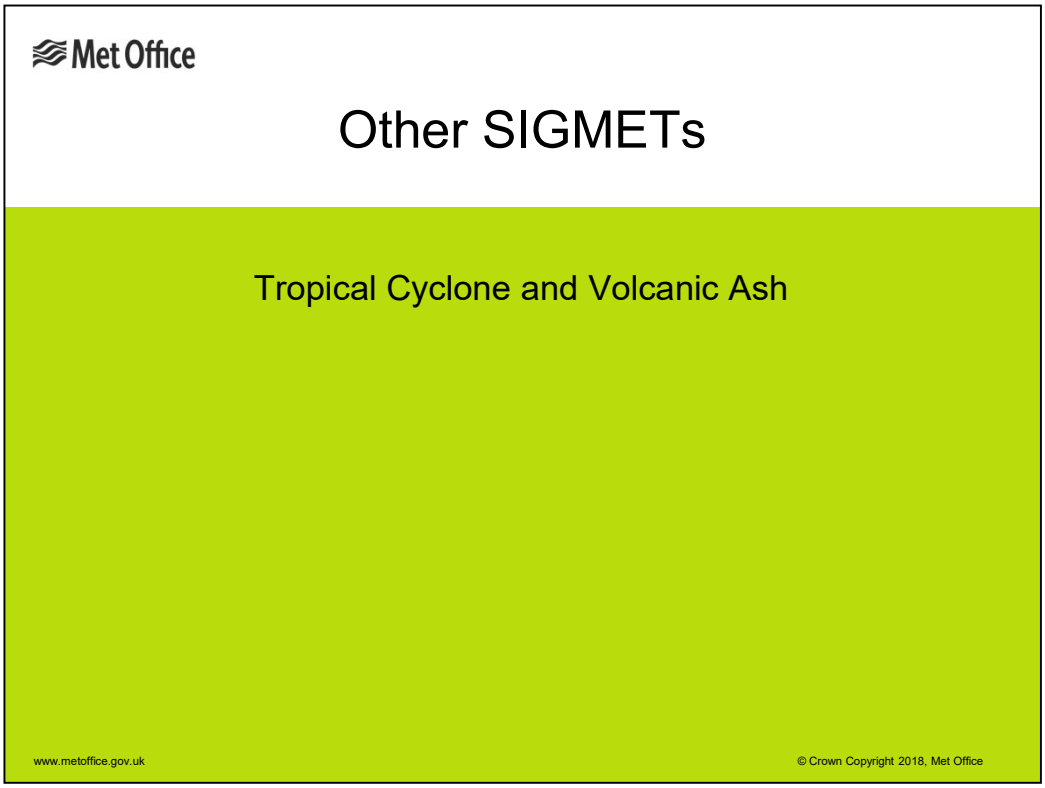
So this is a normal SIGMET (WS) produced by Malaysia (MS), with bulletin number 31. ICAO disseminating centre is Kuala Lumpur International Airport. The date is 22nd and the time of issue is 1257 Zulu. The ICAO of the air traffic service is WMFC. The message is a Sigmet and is number 7 for the day. Validity of the SIGMET is between 1300 and 1600 on the 22nd. The ICAO and name of the FIR the Sigmet is in reference to is WMFC Kuala Lumper FIR. The phenomenon is Embedded thunderstorms. Therefore we know that thunderstorms are within cloud and can not be readily seen. The phenomenon has been observed. The location of the thunderstorms are within the following grid points. Thunderstorms are expected up until flight level 510, and are moving south

westwards with no change in intensity.



The example we just looked at was for a WS SIGMET. However there are also specific Tropical Cyclone and Volcanic Ash SIGMETs. Going to have a quick look at the difference with these.

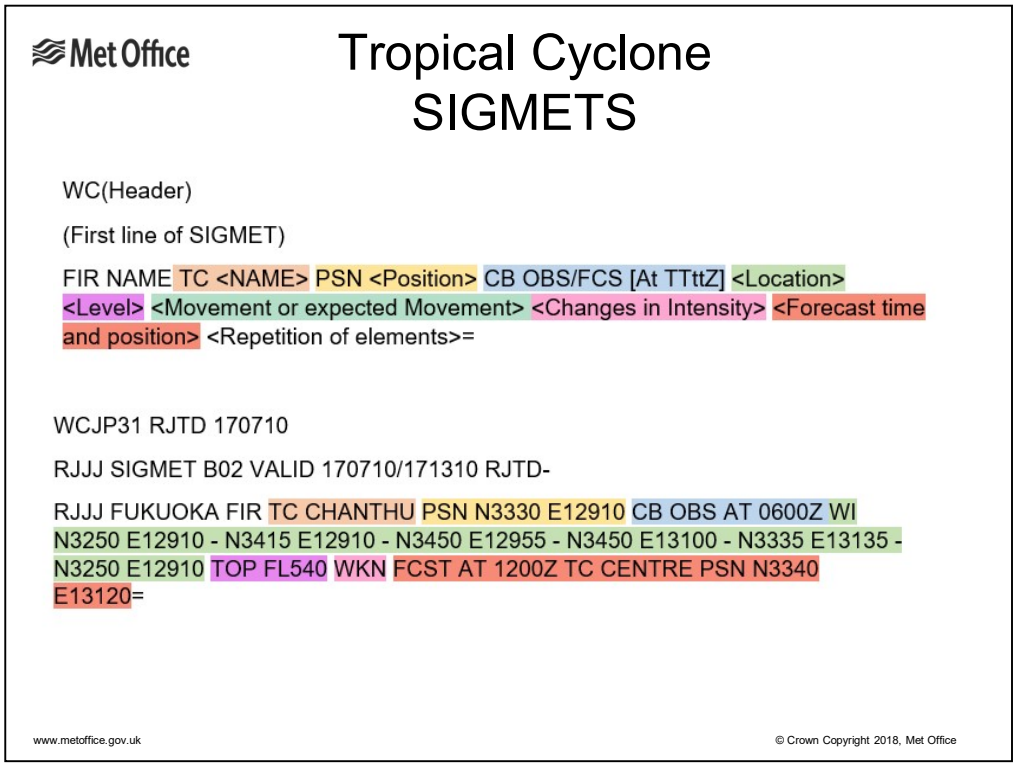
Met Office

Tropical Cyclone Advisory Centre (TCAC)

Provides advisory information to Met Watch Offices about observed or forecast Cyclone activity. Includes info on:

- Position and depth of TC centre
- Movement
- Maximum surface winds

A Tropical Cyclone Advisory Centre provides information to Met Watch Offices about any observed or forecast cyclone activity. They provide position, depth, movement and wind speed information. This information can then be used to produce a SIGMET.



The structure of Tropical cyclone SIGMETs are not very different to normal SIGMETs and they use the same numbering system. The difference being that you include TC name and position. So in the example below the Tropical Cylclone is Chanthu (Chan-to) and is located at North 33,30 and East 129,10. The structure there on is the same as a normal SIGMET. No movements or expected movement is given as forecast time and position is used instead. Repetition of elements is used when two tropical cyclones occur simultaneously in an FIR. The descriptor AND is used to separate the elements for each tropical cyclone. The same goes for Volcanic ash sigmets with more than one ash cloud in a FIR.

If a Tropical Cyclone is observed a SIGMET should be issued immediately. If a Tropical Cyclone is forecast to enter or develop in a FIR then a SIGMET can be issued up to 12 hours before.

Volcanic Ash (WV) SIGMETs

Source of Information

Source of Information	Types of Information	Issue a VA SIGMET
VAAC	Advice that ash is observed or is expected to enter the MWO's FIR at a specific time in the future.	Issue immediately
Volcano Observatory	Details of an eruption with either no information about any ash or the extent of any ash cloud. These may be received in the form of a Volcano Observatory Notice for Aviation (VONA).	Issue immediately
Pilot Report, Met Office, ATS Unit	Report of an eruption with or without associated ash, or an ash encounter without any reference to a specific volcano. Note: All reports should be forwarded on to the responsible VAAC without delay.	Issue immediately, even if no information received from a VAAC

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There are 9 Volcanic Ash Advisory Centers that provide information on observed or expected ash in an area. Information can also come from volcano observatories and pilot reports. SIGMETs need to be issued immediately at any report of volcanic ash. Again the structure of the SIGMET is very similar, however it has its own number system. Just like the Tropical Cyclone SIGMETs the Name and position of the Volcanic eruption is given. In the example below the Volcano was MT La PALMA in the Canarias. Again a forecast time and position is given, but is also used in conjunction with a movement.

Met Office

WV(Header)

(First line of SIGMET)

FIR NAME VA ERUPTION MT <NAME> PSN <Position> VA CLD OBS/FCS [At TTttZ] <Location> <Level> <Movement or expected Movement> <Changes in Intensity> <Forecast time and position> <Repetition of elements>=

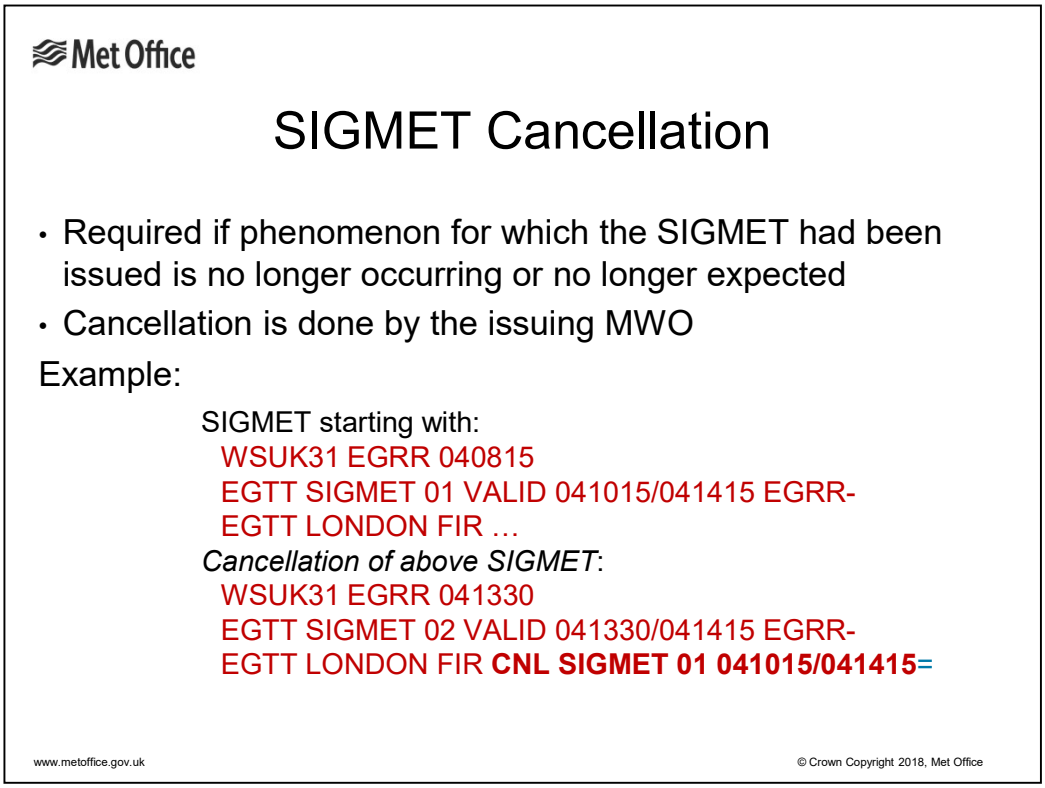
WVCR31 LEMM 200400

GCCC SIGMET 2 VALID 200400/201200 GCGC-

GCCC CANARIAS FIR/UIR VA ERUPTION MT LA PALMA PSN N2834 W01749 VA CLD OBS AT 0300Z N2836 W01751 - N2825 W017 - N28 W017 - N28 W01720 FL100/ABV150 MOV SE 10KT FCST AT 0300Z N2836 W01751 - N2825 W01715 - N28 W01640 - N28 W01720 W01740 FL100/ABV150=

Met Office

Cancellation of SIGMETs



SIGMETs are cancelled if the phenomenon is no longer occurring or expected or if an amendment is needed. As SIGMETS aren't amendable, you would need to cancel the original message, and then issue a new SIGMET. The cancellation is done by the issuing MWO.

Lets talk through an example of cancelling the following SIGMET. So this was issued on the 4th at 0815 with the validity being between 1015 and 1415. For whatever reason we need to cancel the SIGMET. The header will be the same, with the current time included. So at 1330. For the first line of the SIGMET we will include the next

number in the daily sequence. For this example it is 02. The validity is from the time of issue (1330) until the original end of the SIGMET. In the main body of the SIGMET we will again state the ICAO and name of the FIR and then will be followed with: CNL (for cancel) SIGMET, and then state the SIGMET you want to cancel and its validity. So we want to cancel SIGMET 01 which was valid between 041015/041415.

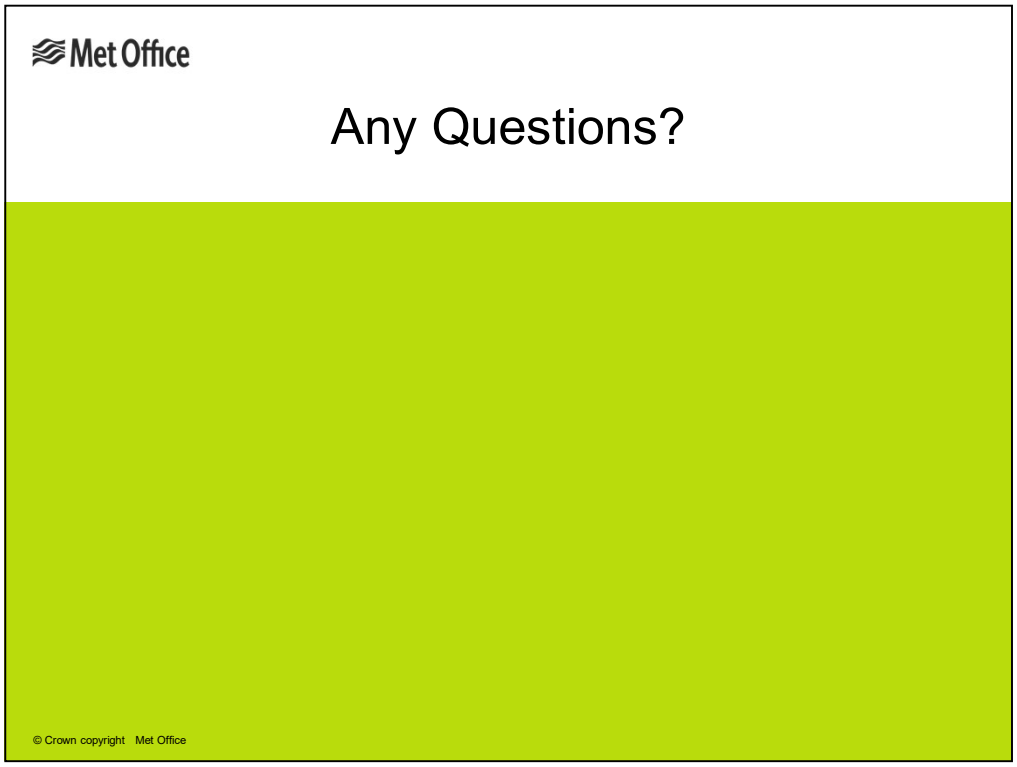
Met Office

Conclusions

You should now be able to:

- Discuss the purpose of the SIGMET system.
- Recognise key components of the coded SIGMET message.

We have now gone over the basic coding of SIGMETs. There may be some variations depending on countries and agreements made on specific phenomena. It is important that SIGMETs are issued promptly and accurately to enable pilots to make informed decisions. For more in depth coding of SIGMETs please look at your ICAO regional SIGMET guides.



This is now the end of the seminar introduction into SIGMETs. Please now watch the further Seminars on Turbulence forecasting for SIGMETs, and Thunderstorm forecasting for SIGMETs. Thank you for watching, and any questions you have on this topic we will happily answer at the live Q&A session.