



MET SG/23 APANPIRG

WAFS 10 year plan

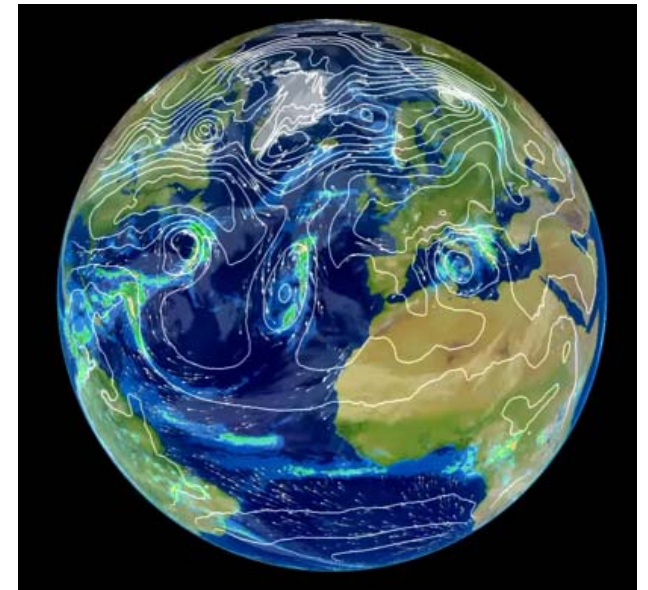
Presented by WAFC Washington





World Area Forecast System 10 Year Plan

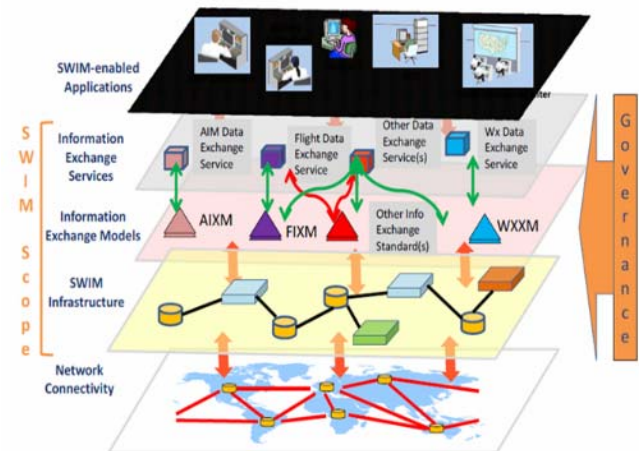
- Developed in conjunction with the ICAO Met Panel Meteorological Operations Group (MOG)
- Devised and agreed by both WAFC London and WAFC Washington
- Will ensure WAFS is fit for the future of the aviation industry
- Will bring higher resolution data sets and new data delivery systems





Why develop WAFS?

- To meet the objectives of the Global Air Navigation Plan (GANP), delivered through Aviation System Block Upgrade (ASBU) methodology
 - SWIM compliant systems that can handle the new data sets
- Flight patterns and airline requirements are changing :
 - Very long haul flights such as Auckland to Qatar and Perth to London
 - Business jets flying at FL500
- To introduce scientific/modelling improvements



An aerial photograph taken from an airplane window, showing a vast, deep blue body of water stretching to the horizon. The sky is a clear, bright blue with scattered white clouds. The wing of the airplane is visible in the lower-left corner. The text "What is on the horizon for WAFS....." is overlaid in the center of the image.

What is on the horizon for WAFS.....



November 2020

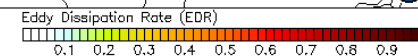
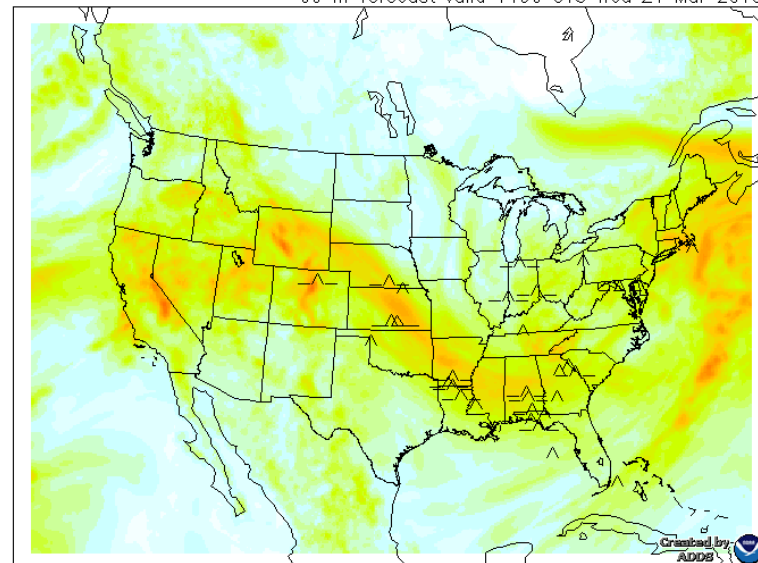
- Production of a 0.25 degree resolution hazard data sets using new icing and turbulence algorithms

Turbulence

- NOW: Turbulence Potential
- November 2020: Turbulence Severity
 - Will use the Graphical Turbulence Guidance (GTG) product developed by NOAA/NCAR
 - Provides output in units of Eddy Dissipation Rate (EDR), which is an aircraft independent measure of turbulence.
 - GTG can forecast Clear Air Turbulence and Mountain Wave Turbulence.

GTG - Max combined intensity (1000 ft. MSL to FL500)

00 hr forecast valid 1100 UTC Wed 21 Mar 2018

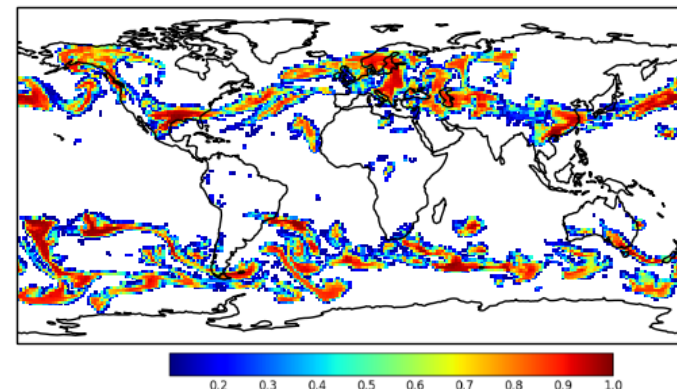


Turb PIREP Symbols

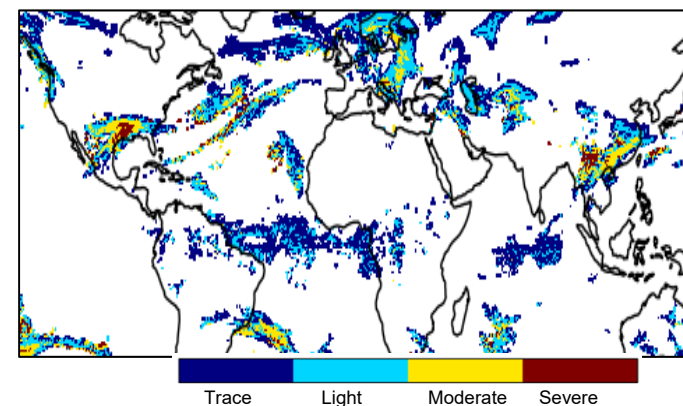
○ Smooth	△ Light	△ Moderate	△ Severe
— Smooth-Light	△ Light-Moderate	△ Moderate-Severe	△ Extreme



Current Icing Potential
07/12/2018 06Z t+24 at 600hPa



WAFC London Icing Severity
07/12/2018 06Z t+24 at 600hPa



November 2020

- Production of a 0.25 degree resolution hazard data sets using new icing and turbulence algorithms

Icing

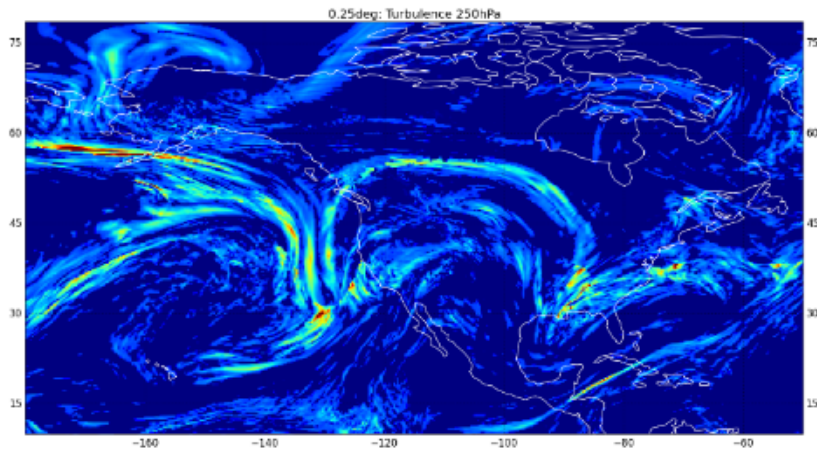
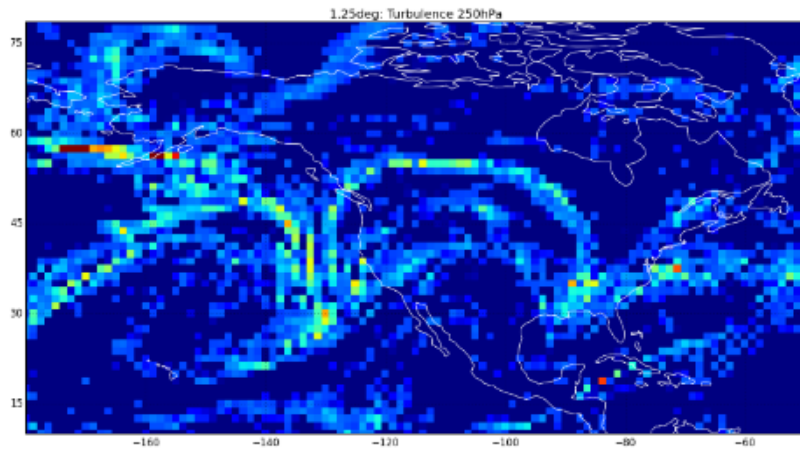
- NOW: Icing Potential
- Nov 2020: Icing Severity
 - More physically realistic as it takes into account a wider range of meteorological conditions conducive to icing
 - Will give a categorical measure of icing



November 2020

Increase in Horizontal Resolution to 0.25 degrees

- Will be applied to the Icing, Turbulence and CB data sets initially
- What does it mean:
 - 1.25 degree equates to approx. 9 minutes flying time
 - 0.25 degree equates to about 1.75 minutes flying time





METEOROLOGY PANEL



November 2020

- NEW Turbulence algorithm
- NEW Icing algorithm
- Cumulonimbus, Icing and Turbulence data available at 0.25 degrees
- In-cloud turbulence data will be retired
- IWXXM format OPMET data will be made available



November 2022

Improved Vertical Resolution

- Data at 1000ft intervals
- Wind and temperature will be provided up to FL600



Flight Level	Geopotential Altitude (FT)	ICAO Standard Atmosphere pressure level (hPa)	Wind	Temp	Turbulence Severity	Icing Severity	Humidity
FL050	5000	843.1	X	X		X	X
FL060	6000	812.0	X	X		X	X
FL070	7000	781.9	X	X		X	X
FL080	8000	752.6	X	X		X	X
FL090	9000	724.3	X	X		X	X
FL100	10000	696.8	X	X	X	X	X
FL110	11000	670.2	X	X	X	X	X
FL120	12000	644.4	X	X	X	X	X
FL130	13000	619.4	X	X	X	X	X
FL140	14000	595.2	X	X	X	X	X
FL150	15000	571.8	X	X	X	X	X
FL160	16000	549.2	X	X	X	X	X
FL170	17000	527.2	X	X	X	X	X
FL180	18000	506.0	X	X	X	X	X
FL190	19000	485.5	X	X	X	X	
FL200	20000	465.6	X	X	X	X	
FL210	21000	446.5	X	X	X	X	
FL220	22000	427.9	X	X	X	X	
FL230	23000	410.0	X	X	X	X	
FL240	24000	392.7	X	X	X	X	
FL250	25000	376.0	X	X	X	X	
FL260	26000	359.9	X	X	X	X	
FL270	27000	344.3	X	X	X	X	
FL280	28000	329.3	X	X	X	X	
FL290	29000	314.9	X	X	X	X	
FL300	30000	300.9	X	X	X	X	
FL310	31000	287.4	X	X	X		
FL320	32000	274.5	X	X	X		
FL330	33000	262.0	X	X	X		
FL340	34000	250.0	X	X	X		
FL350	35000	238.4	X	X	X		

Flight Level	Geopotential Altitude (FT)	ICAO Standard Atmosphere pressure level (hPa)	Wind	Temp	Turbulence Severity	Icing Severity	Humidity
FL360	36000	227.3	X	X	X		
FL370	37000	216.6	X	X	X		
FL380	38000	206.5	X	X	X		
FL390	39000	196.8	X	X	X		
FL400	40000	187.5	X	X	X		
FL410	41000	178.7	X	X	X		
FL420	42000	170.4	X	X	X		
FL430	43000	162.4	X	X	X		
FL440	44000	154.7	X	X	X		
FL450	45000	147.5	X	X	X		
FL460	46000	140.6	X	X			
FL470	47000	134.0	X	X			
FL480	48000	127.7	X	X			
FL490	49000	121.7	X	X			
FL500	50000	116.0	X	X			
FL510	51000	110.5	X	X			
FL520	52000	105.3	X	X			
FL530	53000	100.4	X	X			
FL540	54000	95.7	X	X			
FL550	55000	91.2	X	X			
FL560	56000	87.0	X	X			
FL570	57000	82.8	X	X			
FL580	58000	79.0	X	X			
FL590	59000	75.2	X	X			
FL600	60000	71.7	X	X			

Note: Existing levels shown in blue.



November 2022

Improved Temporal Resolution

NOW:	T+6	T+9	T+12	T+15	T+18	T+21	T+24	T+27	T+30	T+33	T+36	
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NOV 2022:	T+6	T+7	T+8	T+9	T+10	T+11	T+12	T+13	T+14	T+15	T+16	T+17	T+18
	T+19	T+20	T+21	T+22	T+22	T+24	T+27	T+30	T+33	T+36	T+39	T+42	T+45
	T+48	T+54	T+60	T+66	T+72	T+78	T+84	T+90	T+96	T+102	T+108	T+114	T+120



November 2022

Introduction of multi-timestep SIGWX forecasts.

Why change the existing SIGWX?

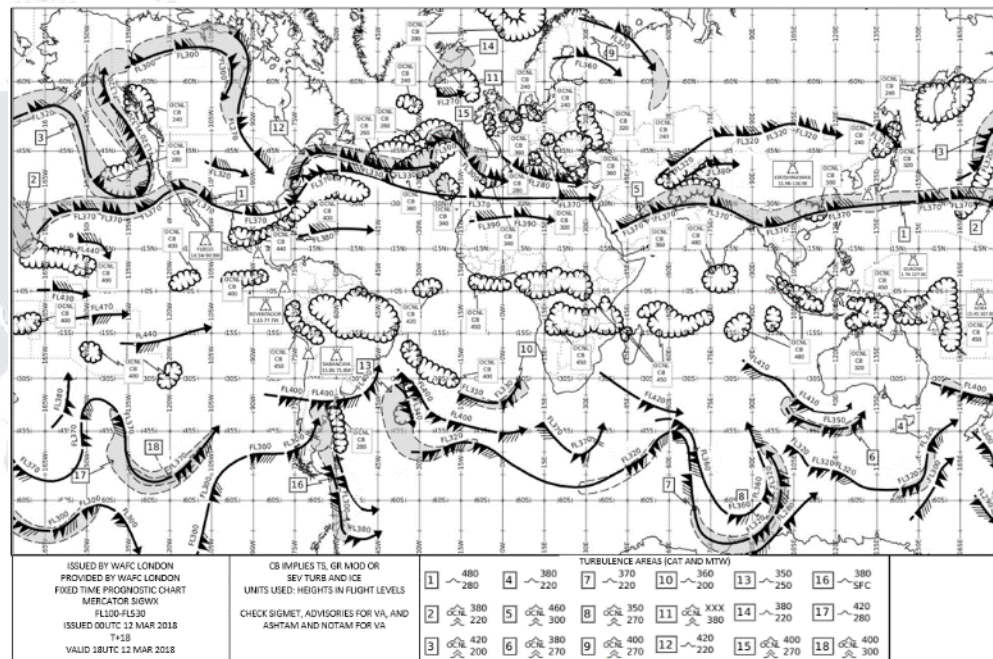
- WAFC London and Washington SIGWX forecasts will be harmonised
- SIGWX and WAFC gridded data sets will be harmonised
- Better suited to the needs of short haul (T+6 to T+12), and ultra long haul operations (>T+24)



SIGWX forecasts better suited to the needs of users:

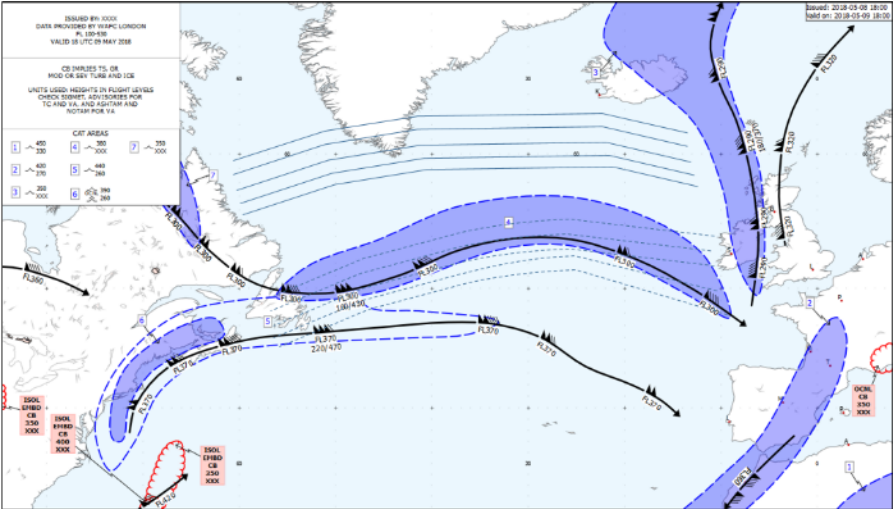
NOW:	T+24
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NOV 2022:	T+6	T+9	T+12	T+15
	T+18	T+21	T+24	T+27
	T+30	T+33	T+36	T+39
	T+42	T+45	T+48	

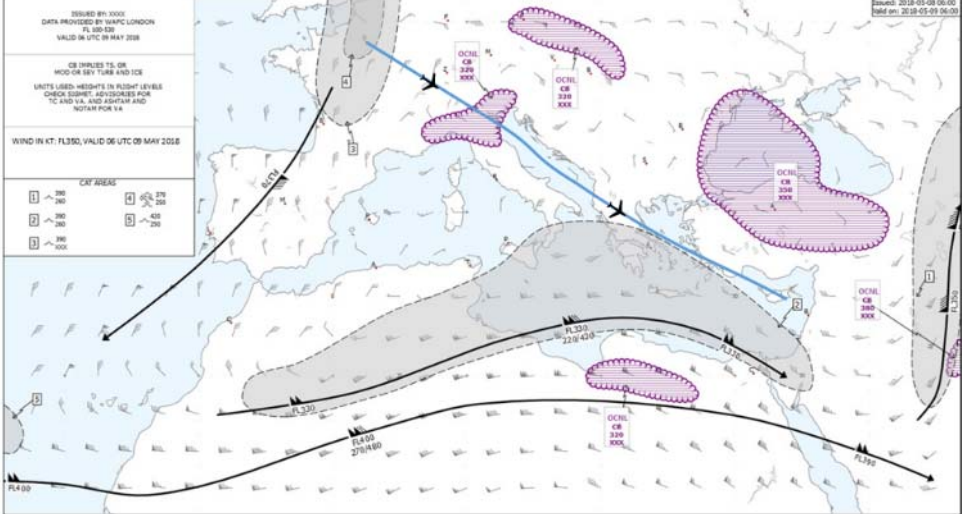


Note: multi-timestep SIGWX data will be supplied in IWXXM format

Add overlays or combine SIGWX and with the gridded data sets

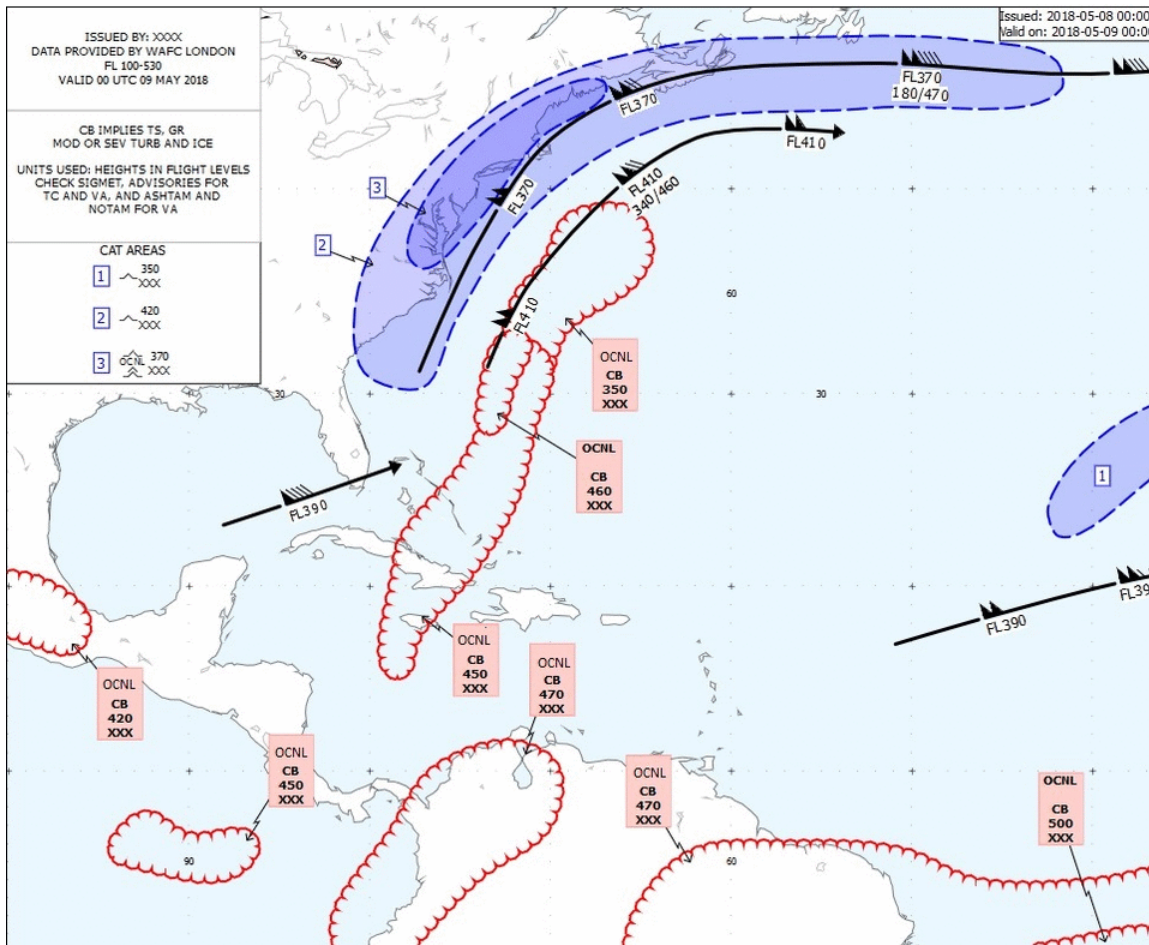


NAT Tracks

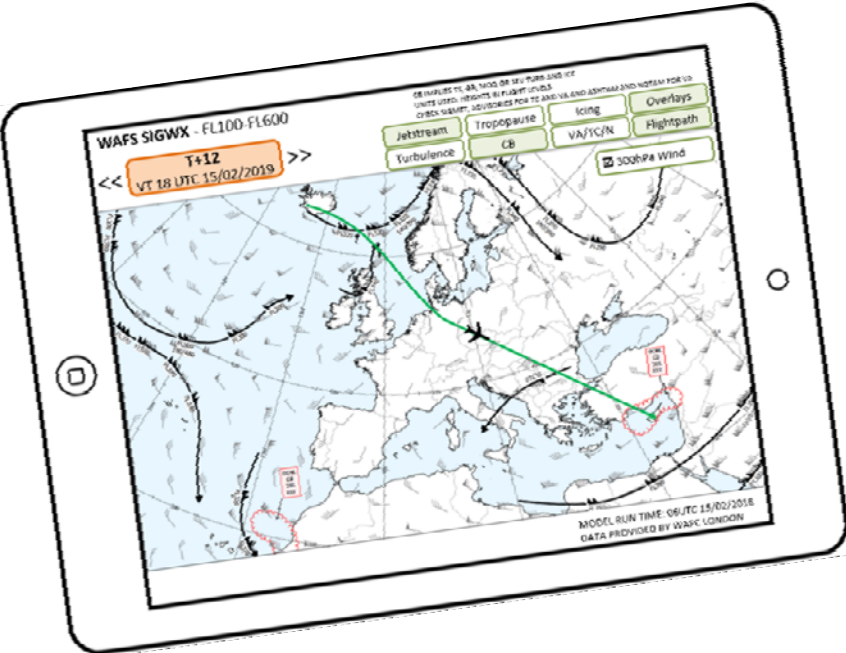


Flight path overlays

Track the movement of features through time



Integrate it into EFBs and other systems





SIGWX Compromises

To deliver SIGWX forecasts for extra timesteps we need to:

- Produce a single SIGWX data set (spanning FL100-FL600)
- Retire medium level charts
- Adjust the content of the WAFC produced paper copy charts, and then retire them in 2028
 - e.g we will not be able to calculate if a CB is embedded in other cloud.
 - Tropopause height will be provided as contours

But what will you get in return:

- Many extra timesteps
- Icing SIGWX objects for the whole globe
- IWXXM format SIGWX objects
- Data provided with a much shorter lead time
- Improved accuracy



How are we going to deliver the next generation WAFS products

Next-generation SADIS/WIFS systems

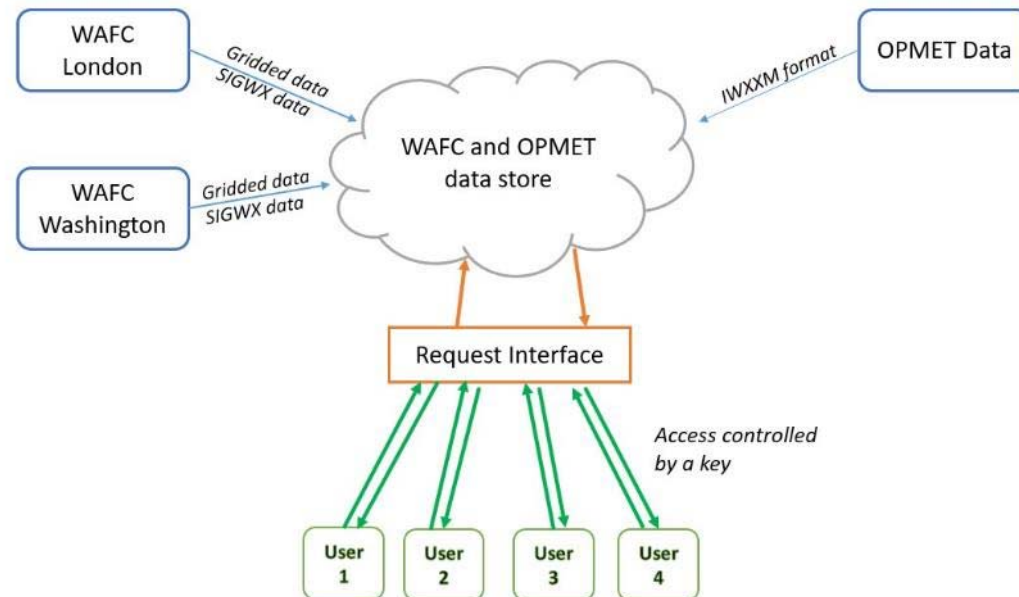
- ➔ Gridded model data sets will be much larger than now (more than 200x larger)
- ➔ SADIS (Secure Aviation Data Information System) and WIFS (WAFC Internet File Service) would slow to a crawl if everyone tried to download the data in the same way that they do now “download everything” approach
- ➔ The Global Air Navigation Plan (GANP) Aviation System Block Upgrades (ASBU) want SWIM compliant services
 - “Data centric approach”
 - “Flexible data requests”
 - Interoperable with other SWIM compliant systems (e.g. SESAR MET-GATE and ATC systems)



Next Generation SADIS

- Will live in the “cloud”
- Will scale according to demand
- Resilient

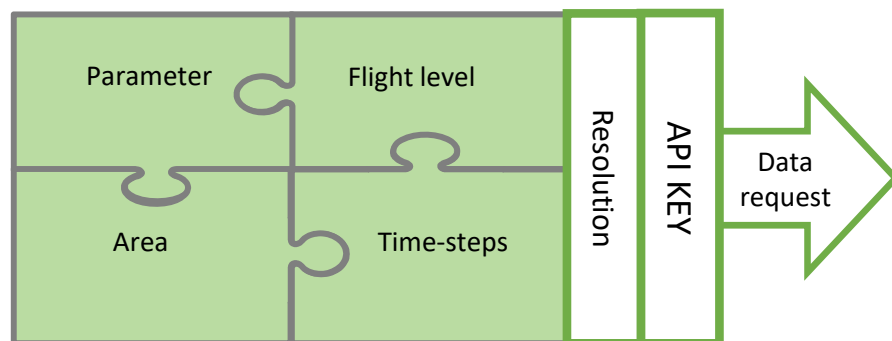
- Will be SWIM compliant and use API
- Users will be able to subscribe to different data feeds
- Pre-set areas of gridded data will be available
- Data for specific flight plans/corridors downloadable on request





Next Generation SADIS API example

Model Data

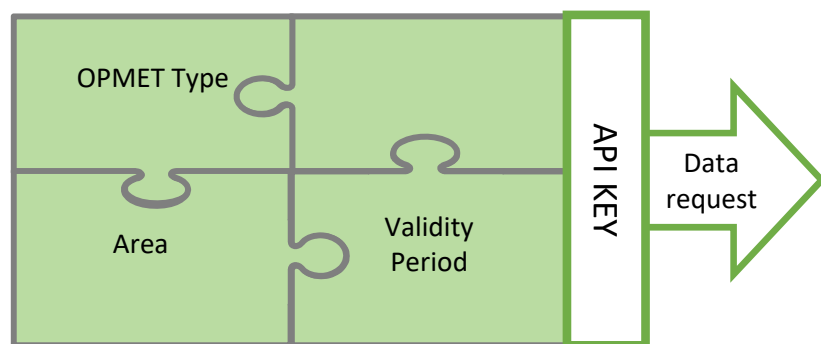


Component	Likely Options
Parameter	Single or multiple WAFC gridded data type e.g. temperature and/or turbulence. Choice of EGRR or KWBC data.
Area	Defined by a set of co-ordinates or latitude-longitude. Pre-set areas
Flight Level	Single level, multiple levels, or all.
Time-steps	Single time-step, selection, or all within a specified range.
Resolution	0.25 degree hazard data. 1.25 degree and 0.25 degree wind/temp/humidity data



Next Generation SADIS API example

OPMET Data



Component	Probable Options
OPMET Type	Single selectable data feed
Area	Perhaps defined by pre-set area or specified via start of the ICAO identifier and wildcard.
Validity period	Latest, last hour, last 6 hours, last 12 hours



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- Data at 1000ft intervals
- All parameters available at 0.25 degree resolution
- Extra timesteps of data, and data out to T+120
- New multi timestep SIGWX forecasts
- Retirement of medium level SIGWX charts
- Data provided via a Web Coverage Service (API)
- Customisable data downloads



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- All parameters available at 0.25 degree resolution
- Extra timesteps of data, and data out to T+120
- New multi timestep SIGWX forecasts
- Retirement of medium level SIGWX charts
- Data provided via a Web Coverage Service (API) on the next generation SADIS system
- Customisable data downloads

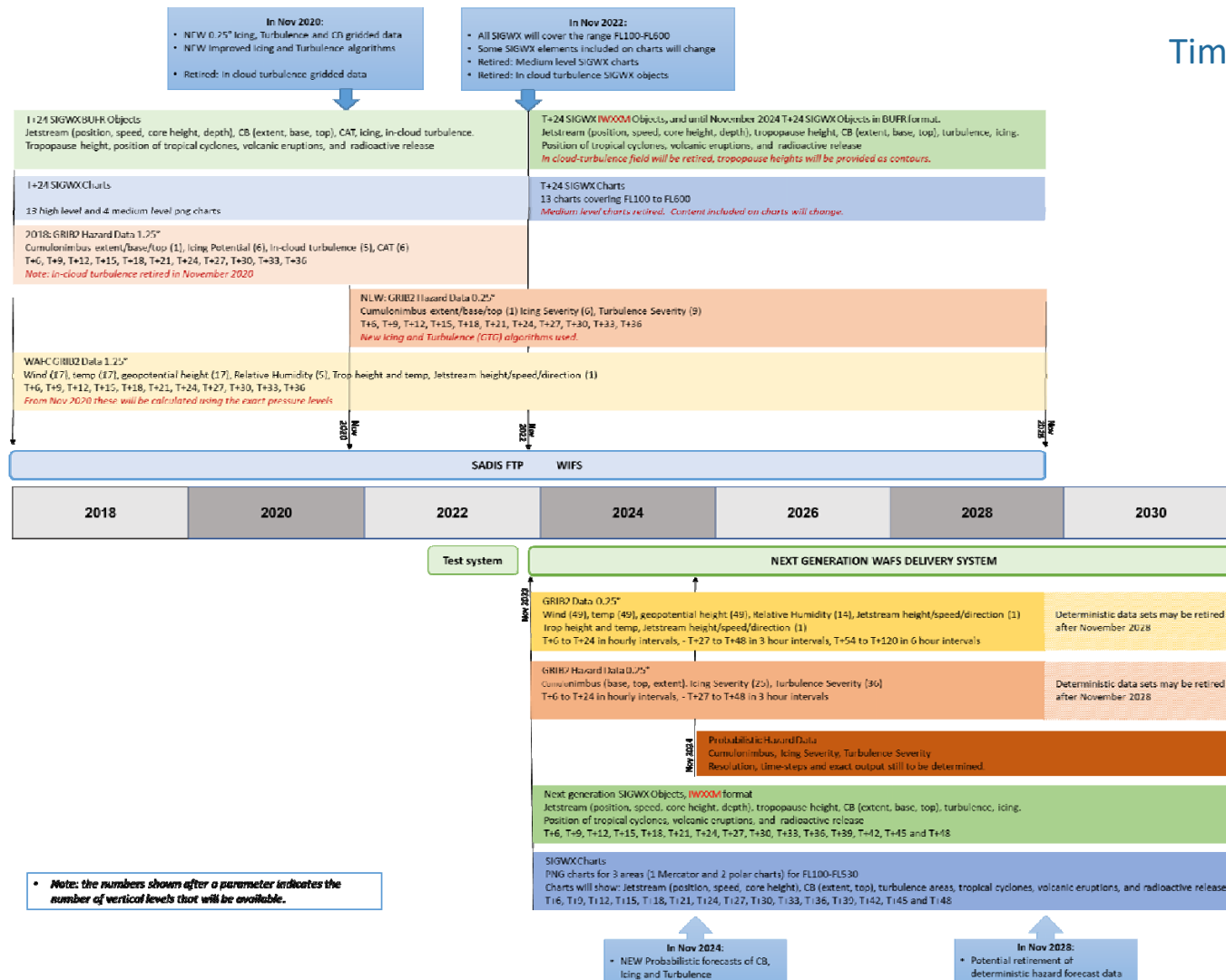
November 2024

- Probabilistic data sets

November 2028

- SADIS ftp server turned off
- WAFC produced SIGWX charts retired.

Timeline of changes





Any Questions