Dive Into IWXXM & Start To SWIM

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CAeM-16 Side Event 26 July 2018

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World Meteorological Organization
Organisation météorologique mondiale

Why SWIM?

Need for change

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ICAO Doc 9854 (Global ATM Operational Concept):

- ✓ *"The ATM community will depend extensively on the provision of* *timely, relevant, accurate, accredited and quality-assured information* *to collaborate and make informed decisions. Sharing information on a system-wide basis will allow the ATM community to conduct its business and operations in a safe and efficient manner."*

ICAO Doc 9882 (Manual on ATM System Requirements): *some examples of IM related requirements*

- ✓ *Implement SWIM [R70]*
- ✓ *Establish information exchange protocols and procedures* *to ensure that appropriate performance can be achieved within the agreed rules [R12]*
- ✓ *Provide timely access to all relevant meteorological information [R164]*
- ✓ *To meet the expectations for the ATM system regarding interoperability… ensure that the communication media/protocols used … are agreed in conformance with internationally approved, open and non-proprietary standards, … [R173]*

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Today's ATM system:

- ✓ *Wide variety of applications developed for specific purposes*
- ✓ *Many custom communication protocols*
- ✓ *Self-contained information systems*
- ✓ *Custom designed interfaces with individual development, management and maintenance*
- ✓ *Dedicated (point to point) distribution (fixed addresses)*
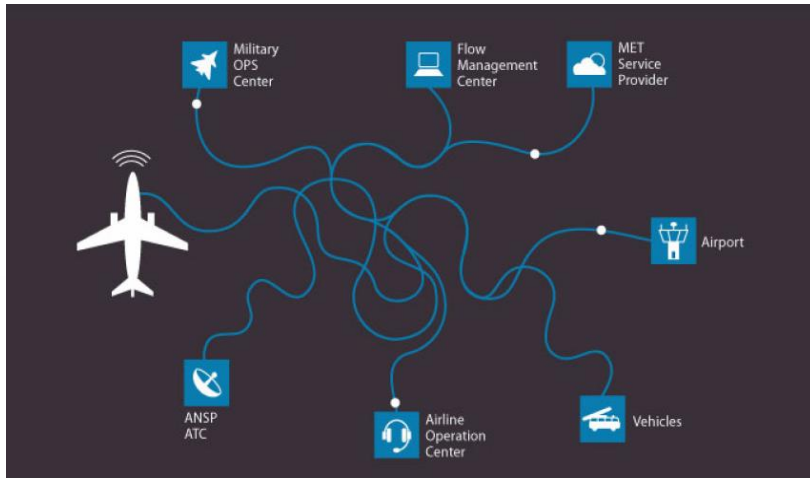
Future ATM system:

- ✓ *Reliant on accurate and timely information*
- ✓ *Requires information to be organized and provided through flexible means supporting interoperability & secured seamless information access and exchange*
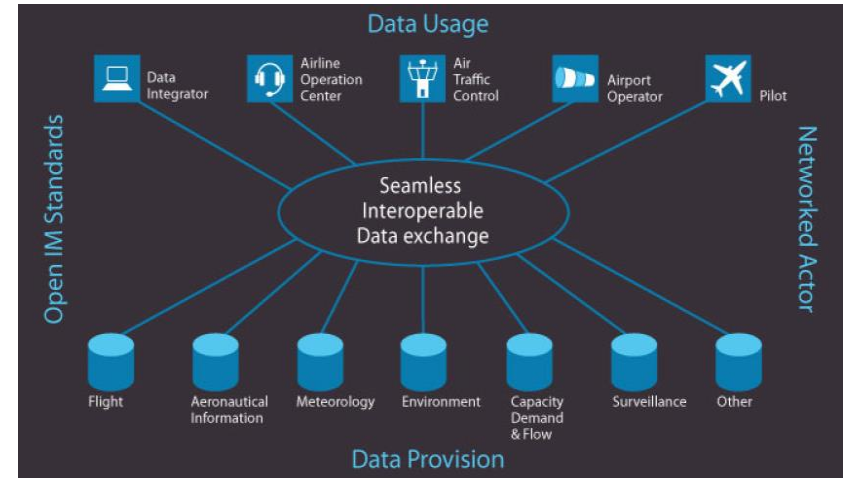
Today's MET Information:

- ✓ Product centric - *fixed update cycle & fixed dissemination*
- ✓ Not always computer interpretable
- ✓ Separate MET display for users – *up for interpretation*
- ✓ Use of free text
- ✓ Regional & local variances
- ✓ Use of *old-fashioned codes & abbreviated plain language*
- ✓ MET expert focus on *product generation & briefing*

Future MET Information:

- ✓ Data centric & service centric - *information available when & where required*
- ✓ Computer interpretable
- ✓ Integration in ATM systems – *decision support*
- ✓ Interoperable
- ✓ Regional & local extensions to global set of information
- ✓ Use of *open source data formats & web services*
- ✓ MET expert focus on providing *added-value advice & participation in CDM process*

TAF EBBR 052330Z 0600/0706 09015G25KT 6000 RA FEW007 SCT015 BKN025 TEMPO 0603/0605 2000 +RA B 17004KT 9999 NSW TE SHRA SCT008 BKN014CE

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METEOROLOGICAL ADVICE FOR RUNWAY SELECTION													
	12	13	14	15	16	17	18	19	20	21	22	23	00
WIND DIRECTION (DEG)	30	20	30	30	20	20	20	20	20	20	20	20	20
WIND SPEED (KT)	6	8	8	8	8	9	8	6	5	5	4	4	4
GUSTS (KT)	10	16	16	16	16	15	13	10	8	8	6	6	6
WIND DIRECTION DEVIATION (DEG)	30	20	20	20	20	20	20	20	20	30	30	30	30
WIND SPEED DEVIATION (KT)	2	3	3	3	3	3	3	2	2	2	2	2	2
25 MAX TAIL	7.7	10.3	12.3	12.3	10.3	9.6	8.4	6.4	5.1	5.1	3.9	3.9	3.9
07 MAX TAIL	-7.7	-10.3	-12.3	-12.3	-10.3	-9.6	-8.4	-6.4	-5.1	-5.1	-3.9	-3.9	-3.9
01 MAX TAIL	-9.4	-15.8	-15.0	-15.0	-15.8	-14.8	-12.8	-9.8	-7.9	-7.9	-5.9	-5.9	-5.9
19 (DEP ONLY) MAX TAIL	9.4	15.8	15.0	15.0	15.8	14.8	12.8	9.8	7.9	7.9	5.9	5.9	5.9
19 (DEP & ARR) MAX TAIL	9.4	15.8	15.0	15.0	15.8	14.8	12.8	9.8	7.9	7.9	5.9	5.9	5.9
25 MAX CROSS	6.4	12.3	10.3	10.3	12.3	11.5	10.0	7.7	6.1	6.1	4.6	4.6	4.6
07 MAX CROSS	6.4	12.3	10.3	10.3	12.3	11.5	10.0	7.7	6.1	6.1	4.6	4.6	4.6
01 MAX CROSS	3.4	2.8	5.5	5.5	2.8	2.6	2.3	1.7	1.4	1.4	1.0	1.0	1.0
19 (DEP ONLY) MAX CROSS	3.4	2.8	5.5	5.5	2.8	2.6	2.3	1.7	1.4	1.4	1.0	1.0	1.0
19 (DEP & ARR) MAX CROSS	3.4	2.8	5.5	5.5	2.8	2.6	2.3	1.7	1.4	1.4	1.0	1.0	1.0
PROB VIS/CLD BELOW PRS (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
PROB VIS/CLD BELOW LVP (%)	0	0	0	0	0	0	0	0	0	0	0	0	0

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SWIM & IWXXM Timeline?

ICAO GANP – ASBU
ICAO Annex 3

ET-ODR -

First global test to exchange METAR in XML format

Ref. CAeM XIV report

Activities of the Expert Team on Operational Data Representation (CBS/CAeM–ET-ODR)

7.6 The Commission noted with interest the progress of the work performed by the ET-ODR. The ET-ODR had agreed during its first meeting in November 2008 on the development of a pilot project for representing OPMET data in the future. In a first phase of this pilot project, the ability of the AFTN to handle basic XML-type messages was tested. The representation in an XML/type message of less than 1 800 characters over the AFTN has been demonstrated to be possible where each node handling the message has a full IA5 character set. It was further noted that it would possibly be 2025 before XML messages would be widely implemented and that the AFTN would no longer exist in its current state of technological capability. During the second meeting in October 2009 it was agreed that the remainder of the ET-ODR work should be included within the work programme of the CBS IPET-MDI and that CAeM should actively participate. It was also agreed that the ET-ODR would re-engage when candidate data-encodings are ready to test.

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Performance Improvement Area 2:
Globally interoperable systems and data – through globally interoperable system-wide information management

2013	Block 0	2019	Block 1	2025	Block 2	2031	Block 3

B0-FICE
Increased interoperability, efficiency and capacity through ground-ground integration
Supports the coordination of ground-ground data communication between ATSUs, based on ATS interfacility data communication (AIDC) defined by ICAO Document 9694.

B1-FICE
Increased interoperability, efficiency and capacity through FF-ICE, Step 1 application before departure
Introduction of FF-ICE step 1, to implement ground-ground exchanges before departure using common flight information reference model, FIXM, XML and the flight object.

B2-FICE
Improved coordination through multi-centre ground-ground integration (FF-ICE, Step 1 and flight object, SWIM) including execution phase
FF-ICE supporting trajectory-based operations through exchange and distribution of information including execution phase for multicentre operations using flight object implementation and interoperability (IOP) standards.

B3-FICE
Improved operational performance through the introduction of Full FF-ICE
Data for all relevant flights is systematically shared between air and ground systems using SWIM in support of collaborative ATM and trajectory-based operations.

B0-DATM
Service improvement through digital aeronautical information management
Initial introduction of digital processing and management of information, by the implementation of AIS/AIM making use of AIXM, moving to electronic AIP and better quality and availability of data.

B1-DATM
Service improvement through integration of all digital ATM information
This module addresses the need for increased information integration and will support a new concept of ATM information exchange fostering access via internet-protocol-based tools Exchange models such as AIXM, FIXM, IWXXM and others relate their concepts to the AIRM fostering convergence, re-use, and collaborative alignment.

B2-SWIM
Enabling airborne participation in collaborative ATM through SWIM
Connection of the aircraft as an information node in SWIM enabling participation in collaborative ATM processes with exchange of data including meteorology.

B1-SWIM
Performance improvement through the application of system-wide information management (SWIM)
Implementation of SWIM services (applications and infrastructure) creating the aviation intranet based on standard data models, and internet-based protocols to maximize interoperability.

B0-AMET
Meteorological information supporting enhanced operational efficiency and safety
Global, regional and local meteorological information provided by world area forecast centres, volcanic ash advisory centres, tropical cyclone advisory centres, aerodrome meteorological offices and meteorological watch offices in support of flexible airspace management, improved situational awareness and collaborative decision-making, and dynamically-optimized flight trajectory planning.

B1-AMET
Enhanced operational decisions through integrated meteorological information (planning and near-term service)
Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.

B3-AMET
Enhanced operational decisions through integrated meteorological information (near-term and immediate service)
Meteorological information supporting both air and ground automated decision support aids for implementing immediate weather mitigation strategies.

AMET-B0/4	DISSEMINATION OF METEOROLOGICAL PRODUCTS		
Main purpose	Dissemination of meteorological products in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning		
New capabilities	Commencement of the exchange of meteorological information using the ICAO Meteorological Information Exchange Model (IWXXM), being the conversion of Traditional Alphanumeric Code (TAC), using an IWXXM		
Description	**AMET-B1/4**	DISSEMINATION OF METEOROLOGICAL INFORMATION	
	Main purpose	Dissemination of meteorological information in support of automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.	
	New capabilities	Meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form starts to replace traditional alphanumeric code (TAC) products. Human-readable products will start to be derived from	
	Description	**AMET-B2/4**	METEOROLOGICAL INFORMATION SERVICE IN SWIM
		Main purpose	Integrated meteorological information service in the SWIM environment in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term.
		New capabilities	Implementation of a data-centric meteorological information service, integrated into the System Wide Information Management (SWIM) environment. User-defined products derived from meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form. Wider use of secure web
		Description	**AMET-B3/4** METEOROLOGICAL INFORMATION SERVICE IN SWIM
			Main purpose: Integrated meteorological information service in the SWIM environment in support of enhanced operational ground and air decision-making processes, for all flight phases and corresponding air traffic control operations.
			New capabilities: Implementation of a data-centric meteorological information service, integrated into the System Wide Information Management (SWIM) environment. Enhancement of ICAO Meteorological Information Exchange Model (IWXXM) with further schemas and formats for meteorological information exchange. User-defined products automatically derived from meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form. Extensive use of secure web services, in particular business-to-business services that allows full integration of meteorological information
			Description: The establishment of standards for global exchange of the MET information within the SWIM environment. This element represents the full integration of meteorological information into the System Wide Information Management (SWIM) environment. Extensive use of MET-SWIM services will support flexible airspace management, airborne re-routing, improved situational awareness, collaborative decision-making, including in terminal areas and at airports, dynamically optimized flight trajectory planning, ATM impact conversion and ATM decision support, hazard avoidance. Meteorological information to be more readily exchanged with the aircraft to improve operational awareness and decision making using air/ground data connectivity and aircraft on-board systems. MET-SWIM information services will support request/reply or publish/subscribe access mechanisms and will provide quality & timely information to users in a range of formats to best enable their optimal decision making.

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23 to 27 July

AMD76 Nov 2013	AMD77 Nov 2016	AMD78 Nov 2019	AMD78 Nov 2020
"… states in a position to do so …" may exchange METAR, SPECI, TAF and SIGMET in XML	"… recommendation to issue …" METAR, SPECI, TAF, SIGMET, AIRMET, VAA & TCA in XML/GML	"… recommendation to issue …" SWA in IWXXM GML	"… standard to issue …" METAR, SPECI, TAF, SIGMET, AIRMET, VAA, TCA & SWA in IWXXM GML

2024	2026
TAC downgrade to recommendation	TAC – The END

ICAO — International Standards and Recommended Practices

Annex 3 to the Convention on International Civil Aviation

Meteorological Service for International Air Navigation

Part I — Core SARPs
Part II — Appendices and Attachments
Nineteenth Edition, July 2016

This edition supersedes, on 10 November 2016, all previous editions of Annex 3.
For information regarding the applicability of the Standards and Recommended Practices, see Foreword.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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On 20 July 2017 and as a world's first, the MET service of Belgocontrol has started with the operational exchange of operational meteorological (OPMET) information in the IWXXM (ICAO Meteorological Information Exchange Model) format.

METAR EBBR 310550Z 26003KT 240V300 CAVOK 16/11 Q1013 NOSIG=

```
<om:result>
  <iwxxm:MeteorologicalAerodromeObservationRecord gml:id="EBBR-0550-or1" cloudAndVisibilityOK="true">
    <iwxxm:airTemperature uom="Cel">16.0</iwxxm:airTemperature>
    <iwxxm:dewpointTemperature uom="Cel">11.0</iwxxm:dewpointTemperature>
    <iwxxm:qnh uom="hPa">1013</iwxxm:qnh>
    <iwxxm:surfaceWind>
      <iwxxm:AerodromeSurfaceWind variableWindDirection="false">
        <iwxxm:meanWindDirection uom="deg">260</iwxxm:meanWindDirection>
        <iwxxm:meanWindSpeed uom="[kn_i]">3.0</iwxxm:meanWindSpeed>
        <iwxxm:extremeClockwiseWindDirection uom="deg">300</iwxxm:extremeClockwiseWindDirection>
        <iwxxm:extremeCounterClockwiseWindDirection uom="deg">240</iwxxm:extremeCounterClockwiseWindDirection>
      </iwxxm:AerodromeSurfaceWind>
    </iwxxm:surfaceWind>
  </iwxxm:MeteorologicalAerodromeObservationRecord>
</om:result>
```
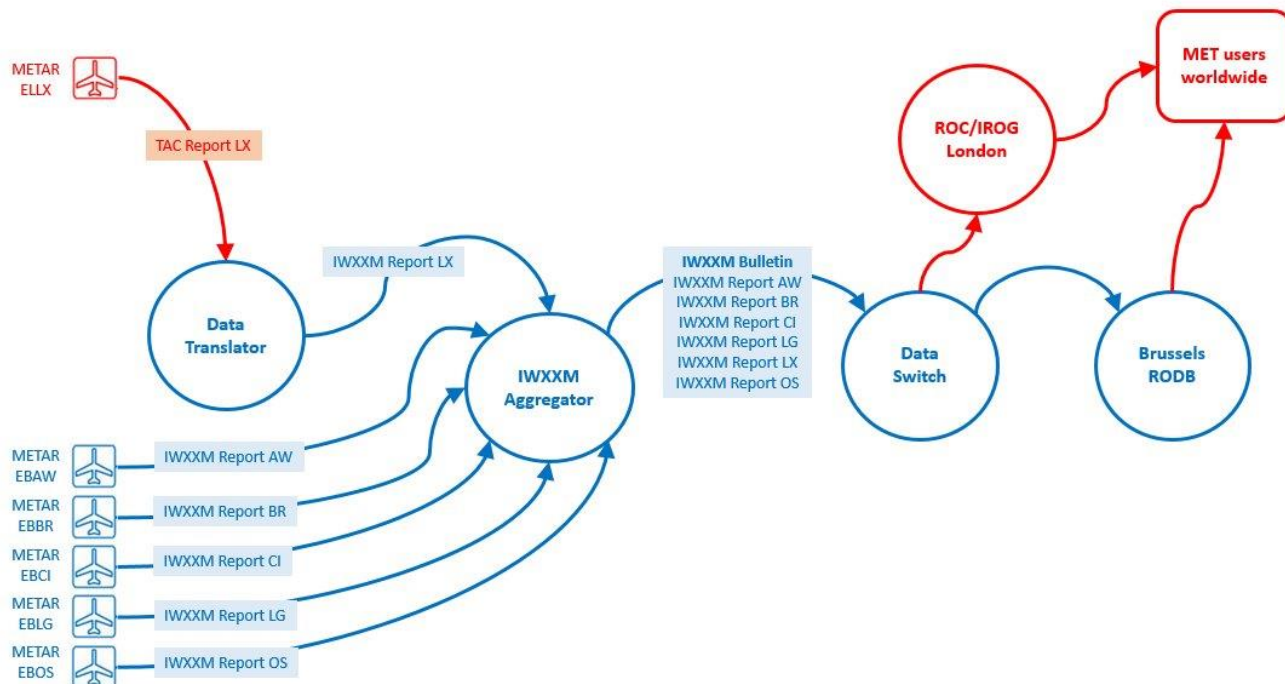
METAR ELLX

TAC Report LX

IWXXM Report LX

Data Translator

IWXXM Aggregator

IWXXM Bulletin
IWXXM Report AW
IWXXM Report BR
IWXXM Report CI
IWXXM Report LG
IWXXM Report LX
IWXXM Report OS

Data Switch

Brussels RODB

ROC/IROG London

MET users worldwide

METAR EBAW — IWXXM Report AW
METAR EBBR — IWXXM Report BR
METAR EBCI — IWXXM Report CI
METAR EBLG — IWXXM Report LG
METAR EBOS — IWXXM Report OS

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What is SWIM?

Definition & Scope

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SWIM consists of standards, infrastructure and governance enabling the management of ATM related information and its exchange between qualified partners via interoperable services

SWIM-enabled Applications of information providers and information consumers around the globe that publish and/or use information. Individuals and organizations, such as air traffic managers and airspace users, will interact through applications interoperating through SWIM.

Information Exchange Services, defined for each ATM Information Dom purposes where opportune, following governance specifications, and a stakeholders. SWIM-enabled applications will use information exchang

Information Exchange Models, using subject-specific standards for sha Information Exchange Services. The information exchange models defir the data exchanged by applications.

SWIM Infrastructure provides the infrastructure for sharing informatio such as interface management, request-reply and publish-subscribe me enterprise service management.

Network Connectivity provides consolidated telecommunications servi infrastructure is a collection of the interconnected network infrastructu stakeholders. These will be private/public Internet Protocol (IP) networ

EUROCONTROL Specification
for SWIM Service Description

Edition: 1.0
Edition date: 01/12/2017
Reference nr: EUROCONTROL-SPEC-168

Edition: 1.0
Edition date: 01/12/2017
Reference nr: EUROCONTROL-SPEC-169

Edition: 1.0
Edition date: 01/12/2017
Reference nr: EUROCONTROL-SPEC-170

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Screenshot 1 (top left – VFR & Radar map):

VFR & Radar

KCLT 35.051N/80.012W 35.3...

11:40 AM EST
Stratus, 8 towers

35.30'N / 79.60'W
35.05'N / 80.01'W
34.91'N / 80.71'W

34.92°N
80.50°W

10:52 PM   Not Charging

ETE Dest	Groundspeed	GPS Altitude	Track	Accuracy (Stratus)	Vertical Speed	Current Lat/Lon	ETE Next
2h39m	178 kts	7,238'	76°M	1m	-205 ft/m	34.92°N 80.50°W	8m32s

Airports Maps Plates Documents Imagery File & Brief ScratchPad More

Screenshot 2 (top middle – METAR / TAF):

Carrier   8:04 PM

‹ METAR / TAF Default group
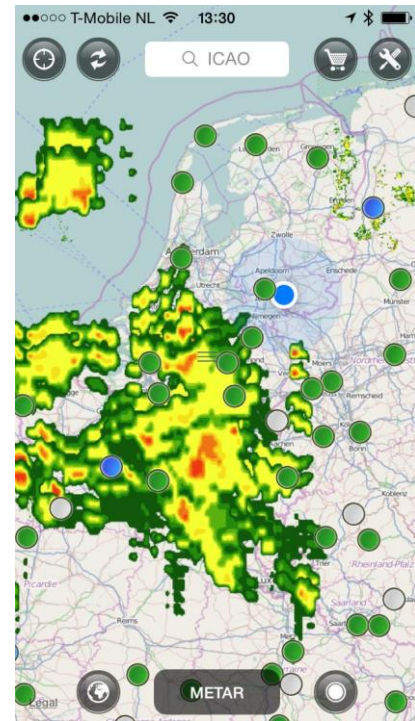
Munich International   EDDM   14 min
▼ 120° (60-170°) 3 kt   4 °C
CAVOK   3 °C | 93 %
1013 hPa

Cologne Bonn   EDDK   14 min
▲ 170° 8 kt   8 °C
> 10 km   4 °C | 76 %
• Light Rain
◯ No significant clouds   1009 hPa

Münster Osnabrück   EDDG   14 min
▼ 140° 4 kt   6 °C
CAVOK   3 °C | 81 %
1008 hPa

Erfurt   EDDE   14 min
◄ 210° 7 kt   5 °C

METAR / TAF GAFOR Berichte Bilder More

Screenshot 3 (top right – radar map):

•• ○○○ T-Mobile NL   13:30

Q ICAO

METAR

Screenshot 4 (bottom – Threshold Settings):

Threshold Settings   12:11 PM 3G R

Wind

Max Wind   12 mph

Wind Altitude   10 m

Weather

Min Temperature   25 F

Adjust For Wind Chill

Max Precip %   40 %

Conditions Forecast Map Settings Help

Screenshot 5 (Conditions):

Conditions   7:52 PM

Last update: a few seconds ago

Not Good To Fly

Weather	Sun ↑06:28 ↓18:28	Wind Chill 30°C
Wind @10m 9 km/h	Gusts @10m 15 km/h	Wind Dir. ↓
Precip Prob 1%	Cloud Cover 30%	Visibility 2 km
Visible Sats 21	Kp 2	Sats Locked 18.1

No no-fly zones nearby

Conditions Forecast Wind Profile Map Settings Help

Screenshot 6 (Wind Profile):

Wind Profile   7:53 PM

Last update: a minute ago

Altitude AGL	Wind Speed →	Gust Speed →	Temperature
1500m	33 km/h	49 km/h	15°C
1400m	33 km/h	49 km/h	16°C
1300m	32 km/h	48 km/h	17°C
1200m	31 km/h	47 km/h	18°C
1100m	31 km/h	47 km/h	19°C
1000m	30 km/h	46 km/h	20°C
900m	29 km/h	45 km/h	21°C
800m	28 km/h	44 km/h	22°C
700m	27 km/h	43 km/h	23°C
600m	26 km/h	42 km/h	24°C
500m	25 km/h	40 km/h	25°C
400m	24 km/h	37 km/h	26°C
300m	22 km/h	34 km/h	27°C
200m	20 km/h	32 km/h	28°C
100m	17 km/h	28 km/h	29°C
50m	14 km/h	24 km/h	30°C
10m	9 km/h	15 km/h	30°C

Conditions Forecast Wind Profile Map Settings Help

Screenshot 7 (Forecast):

Forecast   7:53 PM

Last update: a minute ago

Time	Wind (km/h)	Temp (°C)	Precip	Cloud Cover	Visibility (km)	Visible Sats	Kp	Est. Sats Locked	Good To Fly?

Current Conditions

| 19:52 | 9 ↓ | 30°C | 1% | 30% | 2 | 21 | 2 | 18.1 | no |

Sunday 2017-10-01: sunrise 06:29, sunset 18:27

07:00	9 ↓	28°C	0%	46%	n/a	16	4	15.4	yes
08:00	8 ↙	28°C	0%	54%	n/a	16	4	15.5	yes
09:00	8 ↓	29°C	0%	56%	n/a	18	3	17.1	yes
10:00	8 ↓	31°C	0%	51%	n/a	18	3	16.9	yes
11:00	9 ↓	32°C	0%	44%	n/a	18	3	17.1	yes
12:00	10 ↓	33°C	0%	38%	n/a	17	2	16.8	yes
13:00	12 ↓	34°C	0%	31%	n/a	19	2	18.0	yes
14:00	14 ↓	34°C	0%	26%	n/a	18	2	17.2	yes

Conditions Forecast Wind Profile Map Settings Help

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SWIM – Food for thought

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Where are you today?
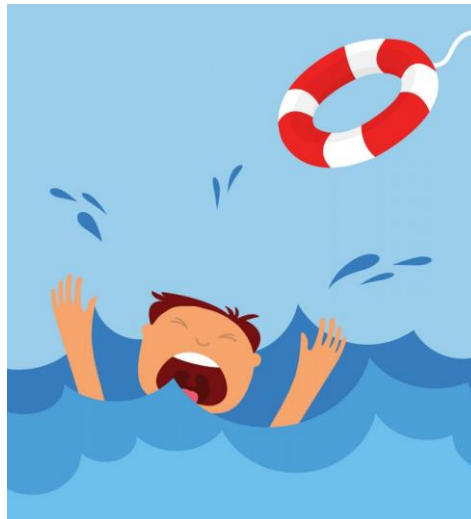

Fear

Try

Use

Discover

sea of opportunities

Note that you are not alone!
Don't be afraid to co-operate, even with industry!

Future MET Services to ATM - SWIM as enabler?

Further (technical) reading?

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SWIM (Europe)	
SWIM (Eurocontrol)	https://www.eurocontrol.int/swim
SWIM wiki (Eurocontrol)	http://im.eurocontrol.int/wiki/index.php/Main_Page
SWIM Specification (EUROCONTROL)	http://www.eurocontrol.int/publications/eurocontrol-specifications-system-wide-information-management-swim http://www.eurocontrol.int/events/eurocontrol-swim-standards-evolution-workshop
SWIM solution (SESAR)	https://www.sesarju.eu/sesar-solutions/swim-technology-solution
SWIM registry	https://eur-registry.swim.aero/
SWIM (US)	
SWIM (FAA)	http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/atc_comms_services/swim/
SWIM (ICAO)	
	ICAO Doc 10003: Manual on the Digital Exchange of Aeronautical Meteorological Information
	ICAO Doc 10039: Manual on System Wide Information Management (SWIM) Concept
	Working Group MET Information Exchange (WG-MIE) of the MET Panel
Exchange models	
IWXXM & METCE (**WMO TT-AvXML**)	https://wiswiki.wmo.int/tiki-index.php?page=TT-AvXML https://github.com/wmo-im/iwxxm
WXXM	http://wxxm.aero/
WXXM (US)	https://wiki.ucar.edu/display/CSSWX/WXXM
WMO newsletters Including SWIM/IWXXM articles	https://us14.campaign-archive.com/home/?u=83129ffe49a9bfe6fed634362&id=5e36458ba3

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Thank you
Merci

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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