Operational Bridging (OB)/Collaborative Aviation Weather Statement (CAWS) Operational Suitability Assessment

Results Summary Briefing

Presented to: CDM WET

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Federal Aviation Administration

Operational Evaluation Objectives

- Assess OB/CAWS within the strategic TFM decision making process;
- Gather decision making strategies for the OB/CAWS processes and products as related to the TFM operational environment;
- Gather user feedback for OB/CAWS capability improvements as related to the TFM environment; and
- Observe and document CAWS development and collaboration process, notification, and dissemination protocols.

Approach

	Operational Observation	End of Season Interviews	NWS Chat Log Data Collection
Purpose	✓ To determine the uses and potential benefits of OB/CAWS for strategic TFM decision making. ✓ Identify issues associated with OB/CAWS. ✓ Document suggestions for improvements.	✓ To obtain structured feedback regarding the utility, usability and suitability of OB/CAWS. ✓ Gather data on OB/CAWS operational suitability including collaboration, creation, dissemination and potential forecast improvements. ✓ Document suggestions for improvements	✓ Determine which users are actively participating and to determine the types of conversations taking place.
Method	Data Collection forms were used to capture weather information, CAWS considerations and any other issues observed with the use of CAWS.	5-point Likert Scale Questionnaires and Structured Interviews were used, both were also available on a secure internet site.	Type of participants (FAA, NWS, Industry, or Other) and chat category (Meteorological, Air Traffic, Confirmation, or Other) was gathered at various times throughout the day, *typically* once in the morning, afternoon, and early evening.
Participants	ATCSCC • National System Strategy Team (NSST) Planner • NWS National Aviation Meteorologists. ARTCC • Traffic Management Unit (TMU) • NWS Center Weather Service Unit (CWSU) positions.	ATCSCC • NSST Planner • NSST severe weather positions • NWS National Aviation Meteorologists. ARTCC • TMU • NWS CWSU positions • Airline Operations Centers Strategic planning positions • NWS Aviation Weather Center (AWC) OB/CAWS forecasters.	All users logged in the NWS Chat Room.
Locations	• 2 site visits ZDC ARTCC • 1 site visit to ZAU ARTCC • 1 site visit to ZTL ARTCC • 4 site visits to ATCSCC	• ZDC ARTCC • ZAU ARTCC • ZTL ARTCC • ATCSCC • NOAA Aviation Weather Center in Kansas City, Missouri • Delta Airlines in Atlanta, Georgia	

RESULTS

Year over Year Monthly CAWS Frequency Comparison - Summary

- CAWS lead time improved throughout the summer, but still short of 4 hours
- CAWS became more temporally focused as time progressed with a decrease in duration over the 3-month period
- Fewer CAWS issued in 2016. Several reasons for change in number of CAWS issued
  - Fewer convective weather days
  - Changes in rules for issuing CAWS
  - Linkage of CAWS to CCFP performance
  - Decrease in the size of issued CAWS

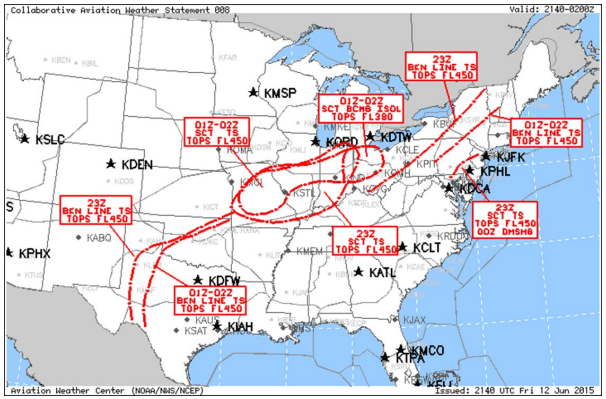
Average 2016 CAWS Lead Time (Hours)

2.9	3.1	3.1
April	May	June

Average 2016 CAWS Duration (Hours)

3.3	3.1	2.4
April	May	June

Example CAWS from 2015



Questionnaire Results: General Effectiveness

General Feedback	FAA ATM N=30				NWS CWSU N=32				Industry Meteorologist N=1			
	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses
General Operational Effectiveness of OB Process to support strategic planning during convective weather?	3.1	4	5	30	3.6	4	3	31	4	4		1
General Operational Effectiveness of CAWS to support strategic planning during convective weather?	3	3.5	2	30	3.3	4	2	31	4	4		1

Questionnaire Results: National TMI Support

OB Process/CAWS TMI Decision Support	FAA ATM N=30				NWS CWSU N=32				Industry Meteorologist N=1			
	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses
AFP Support – Impact on planning AFP start times?	2.9	3	4	30	3.6	4	14	30	4	4		1
AFP Support – Impact on planning AFP exit strategies?	2.7	3	4	30	3	3	14	30	3	3		1
AFP Support – Impact on initial rate setting?	2.7	3	4	30	3	3	17	30	4	4		1
AFP Support – Impact on modifying rate setting?	2.9	3	5	30	3.2	3	17	30	4	4		1
GDP support - Impact on program rate setting?	2.8	3	4	30	3	3	16	30	4	4		1
GDP support. Impact on program timing?	3	3	4	30	3.3	3.5	14	30	4	4		1
Playbook reroutes - Impact on identification of playbook options?	3	3	1	30	3.2	4	13	30	4	4		1
Playbook reroutes - Impact on coordination of Playbook route usage?	3.1	4	3	30	3.2	3	14	31	4	4		1
Group Situation Awareness (SA) - Impact on collaborative decision-making?	3	3	3	30	3.8	4	12	31	4	4		1
Ground stop (GS) usage. Impact on GS usage?	2.7	3	5	30	2.4	3	15	31	4	4		1

Observation/Interview Summary

- **ATM Users**
  - There is a lot of “mental gymnastics” when trying to interpret the CAWS
    - Valid times often do not match
    - No way to see CCFP and CAWS on one display.
    - Can not see all of the CCFP’s and CAWS’ on one display.
  - CAWS does not provide needed information that is obtained from conversations with on-site meteorologists (impacts and timing).
  - More time spent discussing weather and validating plans because not everyone is using CAWS.
  - Overall impression of CAWS is it “justifies the need to implement plays”.
    - CAWS does not aid in the planning.
    - It is “just another tool.”
  - Need CAWS to be integrated on the TSD.
  - Two products makes planning confusing.
  - Users are losing confidence in CCFP.
  - The text is not read; therefore, all information should be integrated on the graphic.

Observation/Interview Summary

- **Producers/Meteorologist**
  - Vast majority requested whiteboard to aid in CAWS development and amendment process.
  - Process should be bottom-up with CAWS developed/amended locally and pushed up for review.
  - Due to the 51% rule, often times the ARTCCs do not get final say or provide feedback on the need of a CAWS.
  - Rules/guidelines are constantly changing making it difficult to know what the current CAWS triggers are.
  - The purpose of CAWS is not clear
    - Why do they have a product to correct another product?
    - Is there a need for two separate convective weather products?
  - Increased workload due to:
    - Monitoring and participating in chat.
    - Collaborating on the development/amendment of a CAWS.
  - Industry participation is minimal.

Summary

- **Overall, users rated most aspects of the OB/CAWS as borderline indicating it was neither effective nor ineffective in supporting strategic planning during convective weather.**
- **OB/CAWS role in strategic TFM decision-making**
  - OB/CAWS process does not adequately support the TFM decision making process due to:
    - Difficulty interpreting differences between CAWS and CCFP.
    - CAWS is not integrated on the TSD.
    - Weather and its impact is discussed with on-site meteorologists well in advance of an CAWS issuance.

Summary

- **OB/CAWS role in decision-making strategies in the TFM operational environment**
  - CAWS is used with other weather tools to aid in decision making, but not used solely to support decisions.
  - CAWS does not provide additional information above and beyond current tools.
  - Discontinuing CAWS would not impact users' processes or decisions.
  - Users indicated CAWS increases workload and decreases productivity.

Summary

- **OB/CAWS capability improvements as related to TFM environment.**
  - CAWS is too difficult to understand and interpret.
  - Users need one tool that includes routes impacted, when routes will be impacted and for how long.
  - CAWS has to be integrated with the TSD and provide route information.
- **CAWS development, collaboration, notification, and dissemination**
  - The rules/guidelines need to be clearly defined to decrease confusion.
  - The development/amendment process needs to be changed to a bottom-up process.
  - ARTCCs should have more input and final say into the CAWS issuance/amendments.

All issues are the same.

Conclusions Compared to 2015

- ATM users and meteorologists rated most aspects of the OB Process and the CAWS product as borderline indicating they were neither effective nor ineffective in supporting strategic planning during convective weather.
- Both ATM users and meteorologists agreed the OB process facilitated more communication between the ATM and weather communities; however, additional work is needed.
- The OB/CAWS process and product received borderline ratings for most aspects.
  - MET users identified:
    - Workload increased supporting chat.
    - CAWS triggers were unclear.
    - CAWS related impacts are not clearly defined.
    - CAWS was not a well collaborated product (airline participation was minimal)
    - Need additional capabilities (whiteboard, amendments, additional graphic coding options)
  - ATM users identified:
    - Difficult to use for strategic planning because it is not integrated onto ATM systems.
    - CAWS is considered to be “just another tool”.
    - Two separate tools, CCFP and CAWS, made planning confusing
    - Lead times need to be improved.
    - Only used the graphic, did not read the text.
    - Express concern over CCFP performance during convective weather season

END OF SEASON QUESTIONNAIRE RESULTS

BACK-UP SLIDES

Weather Criteria for OB Engagement	FAA ATM N=30				FAA CWSU[1] N=32				Industry Meteorologist N=1[2]			
	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses
Weather Criteria for OB Engagement	3.7	4	13	28	3.3	3.5		32	4	4		1
Initiation of Collaboration Process	3.8	4	12	29	3.6	4		32	4	4		1
Effectiveness of Collaborative Process	3.5	4	11	29	3.4	4		32	4	4		1
Development of the CAWS	3.3	4	10	30	3.3	4		32	4	4		1
Dissemination of CAWS	3.8	4	6	30	3.7	4		32	4	4		1
Notification of CAWS Issuance	4.3	4	5	30	3.8	4		32	4	4		1

[1] The FAA CWSU user group includes: ATCSCC NAM's, ARTCC CWSU's, and AWC Meteorologists.

[2] The number of respondents in the Industry MET group is not a representative sample. Therefore, no valid conclusions can be made based on the data.

CAWS Product	FAA ATM N=30				FAA CWSU N=32				Industry Meteorologist N=1			
	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses	Mean	Median	NA Responses	Number of Responses
CAWS Accessibility	3.9	4		30	3.6	4		32	4	4		1
CAWS Header Information	3.6	4	1	30	4.1	4	3	32	4	4		1
CAWS Graphic: Interpretation	3.5	4	1	30	3.3	4		31	3	3		1
CAWS Graphic: Utility	3.5	4	1	29	3.5	4	2	31	4	4		1
CAWS Graphic: NAS Element Overlays	3.3	3.5	2	30	3.3	3	3	30	3	3		1
CAWS Graphic: Use of Color/Symbols	3.4	4	1	30	3.3	4	2	31	4	4		1
CAWS Text: Interpretation	3.4	4	3	30	3.4	3.5	1	31	4	4		1
CAWS Text: Utility	3.2	4	2	28	3.3	3	2	29	4	4		1
CAWS Text: NAS Elements Affected	3.1	3.5	1	29	3.6	4	1	30	4	4		1
CAWS Text: Summary Statement	3.7	4	1	30	3.5	4	1	31	4	4		1
CAWS Text: Discussion	3.5	4	3	30	3.4	4	2	31	4	4		1

OB Support for Planning Horizons	FAA ATM N=30				FAA CWSU N=32				Industry Meteorologist N=1			
	Mean	Median	NA **Responses**	Number of Responses	Mean	Median	NA **Responses**	Number of Responses	Mean	Median	NA **Responses**	Number of Responses
Sufficiency of CAWS for strategic planning: (0-2 Hour Timeframe)	3.2	3	1	30	**2.7**	3	2	31	3	3		1
Sufficiency of CAWS for strategic planning: (2-4 Hour Timeframe)	3.1	3	1	30	3.9	4	2	31	4	4		1

END OF SEASON STRUCTURED INTERVIEW RESULTS

FAA ATM

What characteristics of the OB Process and CAWS product are most helpful for strategic planning?

Positives:

- "Fixes" the CCFP.
- Human input in the development Provides more accurate information**.**

Negatives

- CAWS only points out what is wrong with the CCFP.
- Users are loosing "trust" in CCFP.
- CAWS is only good to provide justification to implement plays.
- Do not use CAWS for planning ("just another tool" to reference).
- Biggest asset for planning are local meteorologists.
- ATM knows what the issues are before CAWS is developed.

FAA ATM

What characteristics of the OB Process and CAWS product are most helpful for strategic planning?

Negatives

- Sometimes areas are too large, need more refinement and specificity to areas impacted.
- Does not give specific information such as: which routes will be impacted, how long will they be impacted, what time will the impact will occur, and the likeliness of the impact happening.

FAA ATM

Did the CAWS provide enough information to make a strategic planning decisions?

- CAWS is used in conjunction with other tools (It is “just another tool.”)
- Would not rely on only one tool for decision making.
- Need specific information such as: impacted routes, length of impact, time of impact, and the likeliness of the impact happening (currently receive this information from on-site meteorologists).

What information was the most important, from the CAWS, that aided you in decision making?

- Highlighted areas that “fix” the CCFP.
- Human input from local meteorologist's.
- Get local meteorologist input before CAWS is drawn.
- Overall, not used in the decision making.

FAA ATM

How did the OB Process and/or CAWS product impact your traffic management planning?

- CAWS makes it easier to implement needed plans.
- Provides justification for plans.
- Increases planning time.
- More time is being spent on discussing the weather, over traffic, and validating recommendations.
- Use CAWS as “just another tool” to aid in planning.

FAA ATM

What improvements or additional features would you like to see added to the CAWS?

- Integrated on the TSD.
- Impacted routes.
- Length of time routes will be impacted.
- The time the impact will occur.
- The likeliness of the impact happening.
- Would like to see high coverage.
- Process needs to be improved: the local Center should be pushing CAWS and have majority say.
- Better training.

FAA ATM

What weather forecast products do you currently use? Did the CAWS provide any additional information useful for decision making related to the implementation of TMIs above and beyond the forecast products you use?

- CCFP
- CAWS
- Day1
- SREF
- LAMP
- HRRR
- COSPA
- WARP
- ITWS
- TAFs
- METARS
- COD-EDU Forecast
- Weather Channel

- CAWS is not providing information above and beyond what users get from other weather products or on-site meteorologists.

FAA ATM

Was the CAWS issued with sufficient lead time to support your decisions regarding TMIs? If not, how can the issuance of the CAWS be modified to better support decision making?

- "For the most part" CAWS is timely.
- Amendments to a CAWS are not timely.
  - Suggestions to "fix" the timeliness give the ARTCCs the ability to push and modify CAWS.

Did the event-based information in CAWS provide value beyond the information contained in the CCFP? Did this additional information influence your planning, cancelling or adjustment of TMIs? How?

- CAWS "fixes" the CCFP.
- Beyond "fixing" the CCFP, there's no additional information.
- Users are loosing confidence in the CCFP.

FAA ATM

Were the color coding and other information in the CAWS graphic useful for decision support? What improvements, if any, would aid in understanding the graphic?

- Text has to be integrated into the graphic.
- Some users stated the overlapping timeframes are hard to interpret with the current color scheme.
- If CAWS is displayed with CCFP in the future, the color coding will have to change to delineate the two on one graphic.

Did you actively participate in the chat? Why or why not?

- None of the ATM's participated in chat.
  - Not ATM's responsibility.
  - Do not have login information.
  - Do not know when chats take place.
  - Do not have the time.

FAA ATM

If you did not use CAWS to aid in your strategic planning, what tools did you use and why?

- The biggest influence on planning is talking directly with on-site meteorologists.
- Tools used are:
  - CCFP
  - Day1
  - LAMP
  - COSPA
  - ITWS
  - METARS
  - COD-EDU Forecast
  - Weather Channel
  - -CAWS
  - -SREF
  - -HRRR
  - -WARP
  - -TAFs

Meteorologist/Producer

What aspects of OB are most helpful?

Positive

- Collaboration
- Second opinions.
- Having a common operating picture.
- Agreed upon weather forecast.
- More confidence in forecast.

Negative

- Different rules/guidelines across the NAS makes the process inefficient and difficult.
- Collaboration is time consuming and increases workload.
- 51% rule.
  - Sometimes a CAWS is requested but is not issued.
  - CAWS is developed when one isn't needed.

Meteorologist/Producer

What improvements are needed in the OB Process to improve your coordination with other users? How would the improvement help?

- Include a whiteboard for the CAWS development and amendment process (ability to draw/adjust proposed impacted areas is faster than typing out in chat.
- Process needs to be bottom-up, request and development should occur locally and pushed up for review.
  - ARTCCs should have majority say in the overall product.
  - This would reduce the amount of time to develop and implement a CAWS because only stakeholders would be involved in the process.
- Rules/guidelines change too often and vary depending on location (simplifying would improve consistency and reduce frustration among participants).
- Need to see all CAWS' and CCFP on one view per time period (would reduce the "mental gymnastics" needed to interpret the CAWS).
- Need one product; two products confuses the message (would increase trust and reduce frustration if only one product).
- Need collaboration from all vested parties, including airlines (should result in less time spent on discussing weather and justifying strategies).

Meteorologist/Producer

What characteristics of the CAWS creation and development process are most helpful?

- Collaboration among CWSU's, AWC, and NAMs which provides a common understanding and agreement on the weather picture resulting in a more accurate weather forecast.

What improvements are needed to the CAWS creation and development process? How would the improvement help?

- Include a whiteboard for the CAWS development and amendment process.
  - Draw/adjust proposed impacted areas is easier and quicker than explaining in chat.
- The process needs to bottom-up.
- ARTCCs should have 51% in the overall product leading to reduction in time to develop and implement a CAWS because only stakeholders would be involved in the process.
- The rules/guidelines are changing too often and vary depending on location. Consistent rules would improve consistency and reduce frustration among participants.

Meteorologist/Producer

In your opinion, does the OB Process and/or CAWS product impact TFM decisions and planning in the 2-4 hour window? 4-6 hours? How? If the CAWS is not used in decision making, why do you think it is not used?

- **2-4 hour window:** CAWS does not have much impact in 2-4 hour window because decisions are made from direct consultation with the forecaster.
- **4-6 hour window:** CAWS does provide input for TFM decisions during the 4-6 hour window. During this timeframe it is one, of many tools, used for strategic planning**.**
- **If the CAWS is not used in decision making, why do you think it is not used?**
  - Users do not know what to do with the information.
  - Users typically do not have proper training on how to use and interpret the CAWS product.
  - Users already know, from talking with meteorologists and using other weather products, the possible weather impacts. As a result, users have already made decisions prior to CAWS implementation.
  - It is not available on the TSD.

Meteorologist/Producer

Do the CAWS lead times support decision making in your facility? If not, how can the issuance of the CAWS be modified to better support decision making? Different times for different decisions?

- For the most part, the lead times are good.
- In most cases, decisions have been made before the CAWS is issued based on local meteorologists' direct support.
- Issues with lead times arise when an amendment is needed.

Meteorologist/Producer

In your opinion, does the color coding and other information contained in the graphic support TFM decision making? What improvements, if any, would aid in understanding the graphic?

- Capability to view both CAWS and CCFP on one display (all of them) leading to a reduction in "mental gymnastics" interpreting the CAWS vs. CCFP.
- Provide different color coding for different timeframes.
- Provide impact based information:
  - Different color coding (sparse and medium areas).
  - Impacted routes
  - Impacted timeframes
  - Likelihood of impact
- Do not include text, no one reads the text.
  - All information should be in the graphic.

Meteorologist/Producer

Did you actively participate in the chat? Why or why not?

- Every Producer interviewed participated in chat.
  - To facilitate the effective and safe planning of traffic re-routes during weather events.
  - To "protect" the interests of their facility.
  - To communicate operational plan.
  - To make a better product.
  - Maintain situation awareness.
  - To get feedback and guidance from other meteorologists.
- Issues with chat:
  - There is no whiteboard
  - Too demanding, it increases workload.

NWS CHAT LOG RESULTS
JUNE 20TH – JULY 15

% of Each Category logged-in

- **NWS:**
  - June 20-24 (74%)
  - June 27 – July 1 (73%)
  - July 5-8 (76%)
  - July 11-15 (73%)
- **Industry**
  - June 20-24 (20%)
  - June 27 – July 1 (20%)
  - July 5-8 (19%)
  - July 11-15 (21%)
- **FAA**
  - June 20-24 (4%)
  - June 27 – July 1 (4%)
  - July 5-8 (3%)
  - July 11-15 (3%)

% of Chats by Category

- **NWS:**
  - June 20-24 (92%)
  - June 27 – July 1 (88%)
  - July 5-8 (89%)
  - July 11-15 (88%)
- **Industry**
  - June 20-24 (1%)
  - June 27 – July 1 (5%)
  - July 5-8 (.66%)
  - July 11-15 (1%)
- **FAA**
  - June 20-24 (.30%)
  - June 27 – July 1 (.62%)
  - July 5-8 (.11%)
  - July 11-15 (2%)

Type of Chats %

- **Meteorological**
  - June 20-24 (60%)
  - June 27 – July 1 (50%)
  - July 5-8 (65%)
  - July 11-15 (48%)
- **ATC**
  - June 20-24 (4%)
  - June 27 – July 1 (6%)
  - July 5-8 (5%)
  - July 11-15 (4%)

- **Confirmation**
  - June 20-24 (11%)
  - June 27 – July 1 (15%)
  - July 5-8 (9%)
  - July 11-15 (17%)
- **Other**
  - June 20-24 (26%)
  - June 27 – July 1 (30%)
  - July 5-8 (22%)
  - July 11-15 (31%)

Category and Type of Chat Totals and %

NWS

- **Meteorological**
  - June 20-24 (509, 86%)
  - June 27–July 1 (457, 82%)
  - July 5-8 (493, 83%)
  - July 11-15 (451, 78%)
- **ATC**
  - June 20-24 (34, 100%)
  - June 27–July 1 (61, 98%)
  - July 5-8 (40, 98%)
  - July 11-15 (53, 100%)
- **Confirmation**
  - June 20-24 (105, 98%)
  - June 27–July 1 (158, 92%)
  - July 5-8 (77, 99%)
  - July 11-15 (197, 96%)
- **Other**
  - June 20-24 (254, 99%)
  - June 27–July 1 (317, 94%)
  - July 5-8 (201, 99.5%)
  - July 11-15 (361, 97%)

Industry

- **Meteorological**
  - June 20-24 (7, 1%)
  - June 27-July 1 (21, 4%)
  - July 5-8 (4, .7%)
  - July 11-15 (10, 2%)
- **ATC**
  - June 20-24 (0)
  - June 27-July 1(1, 2%)
  - July 5-8 (0)
  - July 11-15 (0)
- **Confirmation**
  - June 20-24 (2, 2%)
  - June 27-July 1(11, 6%)
  - July 5-8 (1, 1.3%)
  - July 11-15 (3, 2%)
- **Other**
  - June 20-24 (1, .4%)
  - June 27-July 1(17, 5%)
  - July 5-8 (1, .5%)
  - July 11-15 (1, .3%)

FAA

- **Meteorological**
  - June 20-24 (2, .3%)
  - June 27-July 1(4. .7%)
  - July 5-8 (0)
  - July 11-15 (9, 2%)
- **ATC**
  - June 20-24 (0)
  - June 27-July 1(0)
  - July 5-8 (1, 2%)
  - July 11-15 (0)
- **Confirmation**
  - June 20-24 (0)
  - June 27-July 1(2, 1%)
  - July 5-8 (0)
  - July 11-15 (5, 2%)
- **Other**
  - June 20-24 (1, .4%)
  - June 27-July 1(1, .3%)
  - July 5-8 (0)
  - July 11-15 (10, 3%)