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Traffic Monitoring System

Elizabeth Suda
esuda@bgsu.edu

Traffic Monitoring System

Elizabeth J. Suda

HONORS PROJECT

Submitted to the Honors College at Bowling Green State University in partial fulfillment of the

requirements for graduation with

UNIVERSITY HONORS

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Catherine E. Smith, FAA Chief Flight Instructor, Faculty Teaching Professor, School of Aviation, Advisor

Bai-Yau Yeh, Applied Statistics, Faculty Teaching Professor, College of Business, Advisor

Introduction

Bowling Green State University (BGSU) is an Institution of Higher Education located in Bowling Green, Ohio. BGSU collaborated with Bowing Green Flight Center (BGFC) to form the university's first public/private academic partnership in 2014. BGFC serves as the exclusive flight training provider for BGSU, and together they operate one of two collegiate aviation programs in the country to have their flight operations and airport right on campus. In 2022, the Bowling Green Flight Center expanded its facilities located at the Wood County Regional Airport, opening the Flight Operations building. This facility houses a new dispatch center, instructor bay, and simulator space. The training fleet of Piper Archer and Piper Seminole aircraft operated by BGFC continues to increase. With this anticipated growth, there is an even greater need to have adequate separation and maintain safety in flight operations.

I am a Flight Technologies and Operations major at BGSU, minoring in Aviation Systems Operations, and I have been a flight student for four years now. I hold a FAA Commercial Pilot certificate with an Instrument Rating, and I am working towards my Flight Instructor Certification. I have been employed at the Bowling Green Flight Center as a Dispatcher for three years. As an employee and flight student, I am very involved with the flight program and understand the operation well.

At Bowling Green Flight Center, instructors oversee student training activities and make determinations if the flight can be conducted safely through the evaluation of preflight risk analysis factors. These preflight factors commonly include weather, available alternates, runway lengths, fuel requirements, Air Traffic Control delays, takeoff and landing distances, and Notices to Air Missions. After considering these factors, the flight instructor makes the final determination if the specified flight training event can safely take place. The Bowling Green Flight Center currently

operates a fleet of 19 aircraft, soon to be 33 by 2026. During a good weather day, nearly all of the

aircraft could be in the air simultaneously. Pilots rely on position reports, and equipment such as

Automatic Dependent Surveillance-Broadcast (ADS-B) and transponders, to determine aircraft

location and improve collision avoidance capabilities. Both ADS-B and transponders utilize on-

board receiver equipment, but ADS-B equipment relies on satellite navigation sensors and

transponders rely upon a radio-frequency interrogation from a ground station. Both of these

technological requirements contribute to positional awareness for both pilots and Air Traffic

Controllers. The desired outcome of this project is for flight instructors to have a visual

representation of how many aircraft are in a specified area and consider if their planned training

event should be conducted in an area with decreased air traffic volume.

Research Question

The honors project research question is: Will the design, implementation, and analysis of a

Traffic Monitoring System at the Bowling Green Flight Center be useful as a preflight planning tool

to increase situational awareness and safety margins in flight training.

A Review of the Literature

The Bowling Green Flight Center is dedicated to providing BGSU Aviation students with the

best flight training and resources necessary for their pilots to succeed. BGSU Aviation's vision is "to

excel in the preparation of aviation professionals for careers in the aviation industry while striving

to become one of the best aviation programs in the nation" (BGSU Aviation 2023.) BGFC

continuously monitors operations for ways to improve the training program and create a safe

place to learn. For these reasons, the Bowling Green Flight Center invested in the creation of a Traffic Monitoring System to add an extra layer of traffic awareness in flight training.

As a flight instructor conducts a lesson with a student, they must manage all aspects of the flight as pilot-in-command. Instructors must teach their students new concepts, operate the aircraft, maintain aircraft separation, distribute workload, monitor aircraft systems, and maintain situational awareness. Preflight planning is a critical step in managing workload and limiting distractions throughout the flight. When pilots have a greater awareness of the air traffic that may affect their flight event, they can focus more on the instructional event. Thorough preflight planning fosters a safer flight environment once airborne.

The Federal Aviation Administration (FAA) has mandated that before anyone can earn a pilot certificate, they must demonstrate an understanding of preflight procedures and the importance of checklist usage. They have published an Advisory Circular, providing information and guidance to demonstrate compliance with the regulations and standards for proper preflight procedures. This guidance also provides a checklist the FAA recommends pilots use when preparing for a flight. In addition to taking a close look at the aircraft itself, the FAA also recommends that "As part of the preflight familiarization with all available information concerning a flight, each pilot should review all appropriate sources (including but not limited to Chart Supplements, the AIM, and NOTAMs), for pertinent information on current traffic patterns at the departure and arrival airports, airport environment, routing, departure and approach procedures, NOTAMs, weather, crew duties, standard cockpit procedures, potential emergencies and their remedies, alternates, fuel and timing, and Take Off and Landing Data speeds" (FAA AC 91-92). Having prior knowledge of the intended positions of other aircraft will add an extra layer of information and awareness during completion of these preflight planning tasks.

Understanding how many aircraft are in an area at a given time, and choosing an area to fly in that is less densely populated with other aircraft, will decrease pilot workload while increasing situational awareness and collision avoidance capabilities. According to the Civil Aviation Authority of New Zealand, this would mean "having an understanding of the existing inter-relationship of location, flight conditions, configuration and energy state of the aircraft, as well as any other factors that could be about to affect its safety (e.g., terrain, obstructions, airspace reservation, and weather systems)" (CAA of New Zealand). Understanding the environment around you is an integral part of visual scanning for pilots.

According to the Civil Aviation Authority of New Zealand, there are three levels to building and maintaining situational awareness. These include:

1. Perception, which is gathering as much information about your surroundings as possible.
2. Comprehension, which is an interpretation of what we see based on our previous life experiences.
3. Projection, which is the person's ability to think ahead on what they have seen and comprehended.

"Failure to recognize the problem or state that requires a decision or action can result in accidents or serious incidents" (CAA of New Zealand). Several factors could lead to a breakdown in the steps to situational awareness including task saturation, distractions, and poor communication. Insufficient workload management and distractions are the most prevalent factors in the flight training environment. A pilot may be overloaded, or task saturated by such factors as simultaneously performing instruction, flying the aircraft, and communicating with Air Traffic Control for instance, and may have a breakdown in situational awareness without even being aware of it. Having prior knowledge of intended locations of other training aircraft will

increase situational awareness, allowing instructors to make informed decisions based upon the number of aircraft they should expect to locate and avoid in the specified airspace.

Bowling Green Flight Center currently utilizes several methods to track the location of its training aircraft fleet. All the aircraft are equipped with Automatic Dependent Surveillance–Broadcast (ADS-B) and Transponder receivers and are registered to display the aircraft's specific identification number. Those signals are then displayed on a moving map on the aircraft's Multi-Function Display (MFD). This means pilots have the technology to see the position of other aircraft relative to their own position on the aircraft flight displays. While this is helpful in real-time when airborne, this is not helpful during the preflight planning stage risk assessment. In addition to traffic depictions on the flight displays, pilots can also utilize air traffic websites such as Flight Radar 24. This website allows for aircraft route tracking, as well as real-time traffic volume depiction. The service allows users to track any aircraft by registration number, depicting the aircraft's current position. Many flight schools use this system to monitor their aircraft locations; however, there are some limitations to this tool. The website will show where the aircraft are located but does not always report data such as the destination, flight plan, or intentions for flight training. BGFC Dispatchers and Instructors often utilize this service to track students on cross-countries flights and to more accurately determine when an aircraft is expected to return. But, again, an instructor is not referencing this tool in the preflight planning stage since it is a real-time tracking depiction.

Flight Radar 24 has also reported several issues with the service itself. They have reported faulty transponder readings have led to inaccurate position reports of several hundred miles or more. They have also stated, "We maintain a database of over 250,000 aircraft, and making sure this database is up to date is something we work on daily. But try as we might, the database will

never be 100 percent correct… We can also end up showing the same flight twice. When we have an ADS-B or MLAT track and radar data but don't make a positive match between the two, we may show two icons for the same flight." (Flight Radar 2019). Similar aircraft registration numbers may also add to confusion.

The BGFC Traffic Monitoring System differs from FlightRadar24 in that it will only represent BGFC aircraft resources and their intended location of training with reference to organized training areas. It also allows instructors to briefly review it during the preflight preparation stage and consider if they should alter their intended training plan based on the depicted traffic volume in a specified area. It is anticipated that use of the TMS before training events will lead to a more thorough preflight preparation and in turn increase situational awareness and safety in the flight training environment.

Description of the System

The Traffic Monitoring System utilizes a large whiteboard, sectioned-off to represent designated flight training areas. These sections include Cross Countries, Practice Areas 0-2, Practice Areas 3-5, Instrument Approach Locations, and Traffic Pattern Locations. Two of the areas are broken down further into more specific locations. The Instrument Approach Location and the Traffic Pattern Location areas are further sub-divided into three to four commonly utilized airports where approach procedures or traffic pattern operations typically occur. Figure 1 depicts the original project design for the TMS.

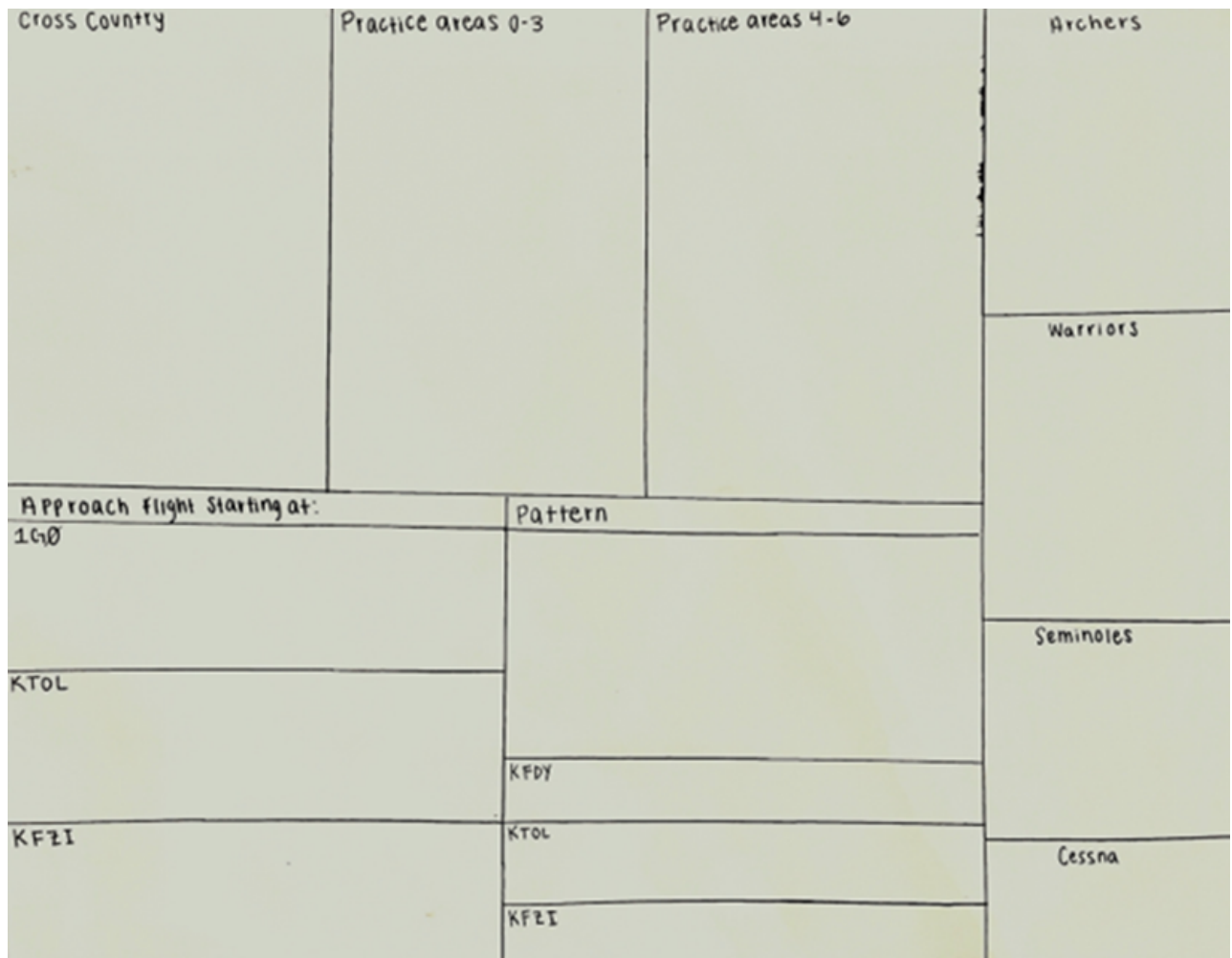| Cross Country	Practice areas 0-3	Practice areas 4-6	Archers
			Warriors
Approach flight Starting at: 1G0	Pattern		Seminoles
KTOL		KFDY	
KFZI		KTOL	Cessna
		KFZI	

Figure 1. Traffic Monitoring System Mockup

Magnetic aircraft icons are positioned on the far-right side of the TMS white board when not in use. When the pilot determines where the majority of the flight event will be performed, they select the specific aircraft numbered magnetic icon and move it to the intended whiteboard section. Figure 2 depicts the magnetic aircraft icons. After the training event is complete, the instructor transfers the magnetic aircraft icon representing their flight asset back to the appropriate resource section on the far-right side of the TMS white board.

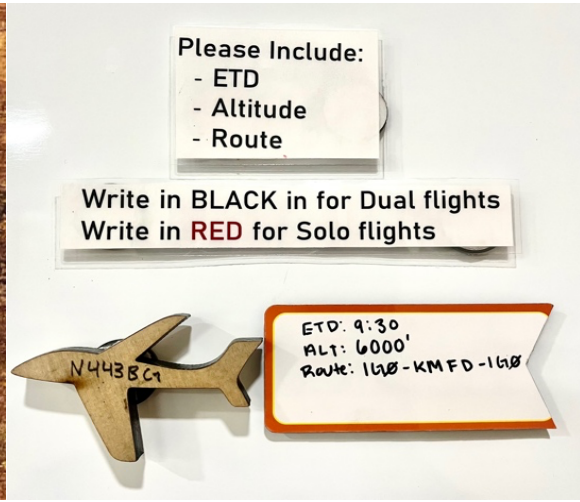Figure 2. Magnetic Aircraft Icon Mockups   Figure 3. Flight Data Tags

Flight Data Tags are utilized to provide additional flight information. Information depicted on the data tag includes the time of departure, route, and altitude. Figure 3 depicts the Flight Data Tags. Instructors will write Flight Data information with black dry erase markers to designate dual training events (Instructor and student onboard) and with red dry erase markers to designate solo events (no Instructor onboard). At a glance, instructors can not only detect where there may be a high volume of aircraft, but also if there is a solo student pilot in the area.

Planning

To prepare for the launch of the proposed Traffic Monitoring System, numerous meetings were conducted to discuss factors such as the layout, design elements, location of the TMS, survey questions, risk identification, hazard analysis, and cost. A timeline was proposed to launch the system and evaluate the project effectiveness during Bowling Green State University's Fall 2023 semester. Figure 4 illustrates the TMS project timeline. An analysis of the project elements and their associated costs was performed. This project, with cost analysis, was then proposed to

Bowling Flight Center, ultimately leading to the project being entirely funded by BGFC. Cost

analysis is depicted in Figure 5.

Tentative Project Outline- Honors Project

		Phase One- Planning
☐	June 1st	Initial Planning meeting with advisor
☐	June 15th	Proposal meeting to Assistant chiefs
☐	July 1st	Ordering of supplies
☐	July 15th	Create a Survey for Instructors
☐	July 31st	Apply for Honors Project Grant
☐	July 31st	Have annotated Bibliography and proposal completed

		Phase two- Building and Reviewing
☐	August 10th	Build magnets and white board
☐	September 10th	Record video and review PIF
☐	September 19th	Launch TMS
☐	October 11th /November 3rd	Sound out first and Second Survey
☐	November 5th	Meeting to go over results
☐	November 10th	Gather data and meet with second advisor
☐	November 10th	Renovations to project if needed and start Final Essay
☐	November 20th/ December 4th	Final essay draft completed + reviewed by Cathy, then submitted by due date

Figure 4. Proposed Timeline

Honors Project Cost Analysis

BGFC Traffic Monitoring System

$405.61

Item	Cost
Wooden Airplanes (53)	$45.10
Magnetic Banners	$15.00
Modge Podge (1)	$3.12
Washer Tape (2)	$10.00
Magnets (100)	$19.00
Dry Erase Tape (1)	$10.49
Poster Board	$5.00
White Board- estimate	$297.90

Figure 5. Cost Analysis

To gain additional feedback, a presentation of the proposed Traffic Monitoring System was made to a group of six FAA Assistant Chief Flight Instructors. They provided feedback on layout, design, potential issues of the system, and recommended solutions. The system was additionally reviewed by the FAA Chief Flight Instructor and the Bowling Green Flight Center Director of Safety to evaluate potential hazards and risk mitigation strategies.

Safety

A risk analysis was performed in accordance with the Flight Center Safety Management System by the BGFC Director of Safety and FAA Chief Flight Instructor prior to the TMS launch.

There were primarily two potential hazards identified:

1. Employee Training on the use of the new traffic system.
2. Effective location of the Traffic Monitoring System white board.

The two identified hazards included three additional potential subsection hazards:

1. The instructor may not move the magnetic aircraft icon back to the far-right side of the TMS whiteboard at the completion of a flight event, leading to a misrepresentation of aircraft volume in a depicted area.
2. The flight instructor staff may underutilize the traffic monitoring system tool, and do not place the magnetic aircraft icon in the intended training area prior to their lesson departure, again depicting a misrepresentation of aircraft volume in a depicted area.
3. Tampering with the TMS magnetic aircraft icons by individuals not associated with the flight event, leading to an inaccurate depiction of aircraft.

Solutions identified to mitigate these potential risks included:

1. Providing Instructor and Dispatcher staff training on the system during the next Instructor meeting.
2. Creating an instructional video and publishing it for employee training and reference.
3. Publishing a BGFC Pilot Information File (PIF) Memorandum explaining the TMS, and requiring each Instructor to review it, as well as brief their student on the use of the TMS prior to conducting their next flight training event.

An instructional video, four minute and thirty seconds in duration, was created to depict and explain the Traffic Monitoring System and display its functionality. The TMS Instructional

Video was uploaded to YouTube and located on the Bowling Green Flight Center SharePoint in the Student Hub digital landing page for student and staff viewing access. Figure 6 illustrates a screenshot of the TMS Instructional Video.
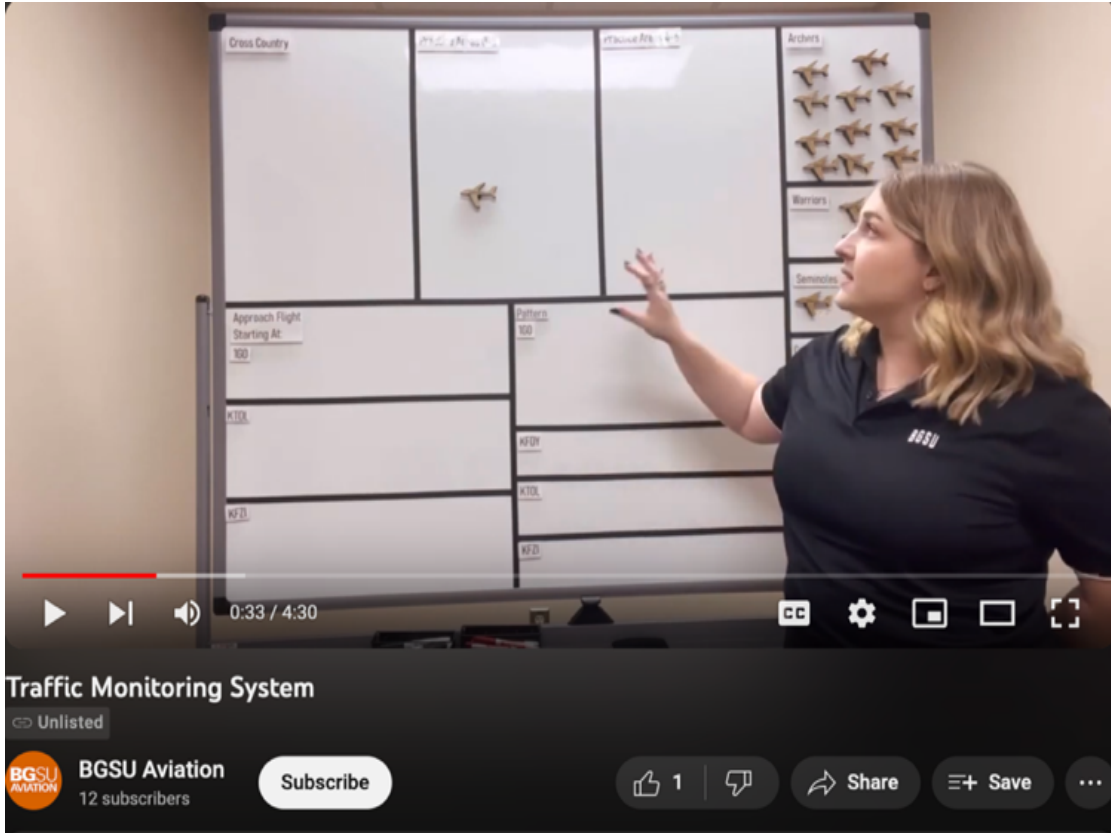

Figure 6. TMS Instructional Video

The Traffic Monitoring System Pilot Information File Memorandum was uploaded to BGFC's flight scheduling program Talon for employees to read and acknowledge. A copy of the PIF is depicted in Figure 7. The implemented Traffic Management System policy and guidance will be incorporated into the Flight Operation Handbook for BGSU's spring 2024 semester. This handbook is briefed with each new flight student and accessible thereafter by all flight students for continued reference and safety awareness.

The Official Flight Training Provider for Bowling Green State University

To: BGFC Flight Operations
From: Catherine E. Smith, Chief Flight Instructor   *Catherine E. Smith*
Date: September 22, 2023
RE: Pilot Information File – BGFC Traffic Monitoring System (TMS)

This Pilot Information File (PIF) Memo is being issued to BGFC Instructors, Dispatchers, Flight Support Personnel.

This PIF Memo serves to introduce and explain the BGFC Traffic Monitoring System (TMS). The intended purpose of the TMS is to: 1) create better pre-flight planning awareness for traffic volume associated with the typical BGSU training areas, 2) allow the CFI to make a more informed decision about the dual or solo training route or selected practice area, and 3) to bring a greater awareness to the overall volume of training aircraft so it can be maintained at a safe level, preventing overpopulation of an area.

905 East Poe Road | Bowling Green, Ohio 43402 | 419.372.9458 | bgsu.edu/aviation

Figure 7. Traffic Monitoring System PIF

Explanation of use:

When an Instructor is in the pre-flight preparation steps, they should reference the TMS to visualize the planned volume of traffic in the depicted areas. This information is meant to be utilized as a step in determining if the area of intended use or route they are planning for is saturated, and that consideration should be given to altering the area of choice/route to a less congested alternative.

When the Instructor has determined which area/route they intend to utilize, they will place the appropriate tail number specific aircraft icon into that area. When they return from that flight event, they will move the aircraft icon back to the "parking area" on the far-right side of the TMS board. If a data tag was utilized for a solo local, dual/solo cross-country route, or for an approach flight route, the Instructor will wipe the data tag clean before returning it to the Information area. *If an Instructor is not at the facility when a solo flight returns, Dispatch will move the aircraft icon back to the far right side of the TMS board (Flight Support will do this if after hours when Dispatch not present).

The Traffic Monitoring System (TMS) is broken down into the following areas:
- Cross Country – Complete a Data Tag with the 1) ETD, 2) Initial Altitude, 3) Route
- Practice Areas 0-2
- Practice Areas 3-5
- Approach Flight Starting At:
  - 1G0, or KTOL, or KFZI
  - Place the aircraft icon at the facility you plan to start your Approach Flight route at. Complete a Data Tag with the 1) ETD, 2) Initial Altitude, 3) Route
- Pattern
  - 1G0, or KTOL, or KFZI
- Aircraft – Archers
- Aircraft – Warriors
- Aircraft – Seminoles
- Aircraft – Cessna / Information, Magnets, Approach/Cross Country Data Tags

Instructors, Dispatchers, and Flight Support Personnel should watch a video of the TMS prior to utilizing it. This can be accessed on the Bowling Green Flight Center Share Point website, in the Student Hub section. The TMS will go live on 9/26/2023.

Notes:

- The TMS **does not** preclude an Instructor from changing their pre-flight intention once airborne.

- Solo local or solo cross country data tags will utilize the red dry erase markers to heighten visual awareness of experience levels.

- Dual cross country or dual approach starting flight data tags will utilize the black dry erase markers.

- Instructors will **not** write directly on the white board; they will utilize the data tags as defined above.

Figure 7. Traffic Monitoring System PIF (continued)

A Risk Analysis Matrix was utilized by the BGFC Director of Safety and FAA Chief Flight Instructor prior to the launch of the Traffic Monitoring System. A Risk Analysis Matrix is an assessment that identifies and processes potential hazards that may negatively affect an organizations environment. The Risk Analysis Matrix plots identified hazards and assigns them a color. These color categorizations represent:

1. Green- Low Acceptable Risk, which means it is accepted with no further action.
2. Yellow- Medium Tolerable Risk, meaning the risk may not yet be as low as reasonably possible.
3. Red- Unacceptable, representing high severity risk.

SEVERITY	LIKELIHOOD				
	Extremely Improbable (1)	Improbable (2)	Remote (3)	Occasional (4)	Frequent (5)
Negligible (A)	A1	A2	A3	A4	A5
Minor (B)	B1	B2	B3	B4	B5
Major (C)	C1	C2	C3	C4	C5
Hazardous (D)	D1	D2	D3	D4	D5
Catastrophic (E)	E1	E2	E3	E4	E5

Figure 8. BGFC Risk Analysis Matrix

The identified potential TMS safety hazards and their associated risks were categorized based on the level of severity and their likelihood of occurrence. The first and second risks involving misrepresentation of traffic volume were rated to be a B5 (medium tolerable risk) categorization on the matrix. After the corrective risk mitigation solutions were in place, they were downgraded to a B4 categorization (low acceptable risk). The last risk involving tampering with the TMS white board was initially rated as a B3 (low acceptable risk) categorization and was downgraded to a B2 (low acceptable risk) categorization. After the risks were mitigated to the

greatest extent, the next step of the project was implementation of the TMS at the Bowling Green

Flight Center. Figure 8 represents the Risk Analysis Matrix utilized in the project risk categorization.

Method and Results

To gain further understanding into the effectiveness of the TMS system, a Google Survey

tool was utilized to measure the flight instructors' sentiment and solicit quantitative and

qualitative feedback. The survey was administered to Instructors twice over a three-week period

in order to gauge initial feedback and measure for consistency or changes in responses over time.

The survey was also utilized to determine if the instructors became more, less, or neutrally

receptive to the TMS as familiarity increased.

The TMS survey tool consisted of seven questions, with each question offering an

opportunity for both quantitative and qualitative data response. Each question offered a

standardized response, based on a Likert scale. This allowed for a quantitative representation of

responses depicted in bar graphs for data analyzation. Additionally, each survey question had a

corresponding open comment response option. Responses to the open comment portion of the

survey question were not mandatory, but encouraged, allowing for the collection of qualitative

data responses.   The seven-question Traffic Monitoring System survey tool questions included:

Question 1. I feel the Traffic Monitoring System is user-friendly.

Question 2. Is the Location of the Traffic Monitoring System is effective.

Question 3. I utilize the Traffic Monitoring System often when pre-planning for flight

events.

Question 4. The aircraft represented on the Traffic Monitoring System has influenced a change to your intended flight event. (i.e., intended to complete a pattern activity but changed location to KFZI due to high traffic volume at 1G0)

Question 5. The Traffic Monitoring System improved your ability to select and operate training in a less congested area.

Question 6. The Traffic Monitoring System improved your ability to select and operate training in a less congested area.

Question 7. The implementation of the Traffic Monitoring System improved your traffic and situational awareness more than before the implementation of the system.

After the initial survey was launched, 14 responses were received, all predominantly positive. In the second survey, 16 responses were received. Survey responses were plotted utilizing bar charts for further analysis. Survey data sets were represented by Series 1 in dark blue for the first survey data, and by Series 2 in light blue for the second survey.
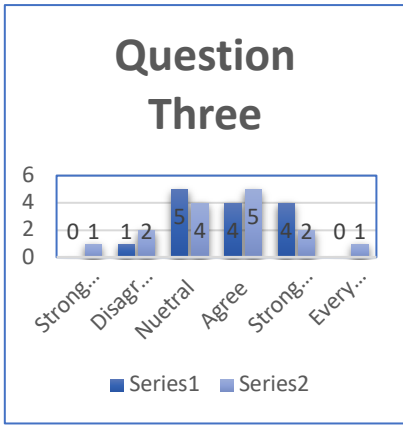
The results of the survey questionnaire for both survey one and survey two were analyzed from a qualitative and quantitative standpoint. The responses for each question were plotted on a bar graph to analyze the effectiveness of the TMS.
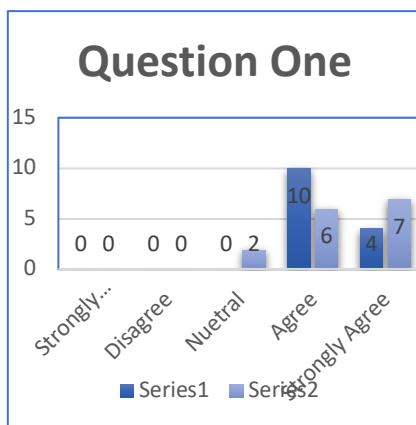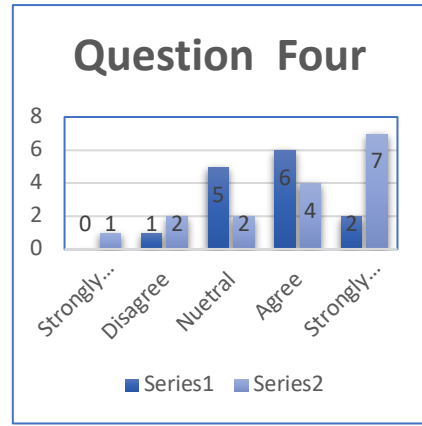

Bar Graph 1. Both Surveys - Question 1
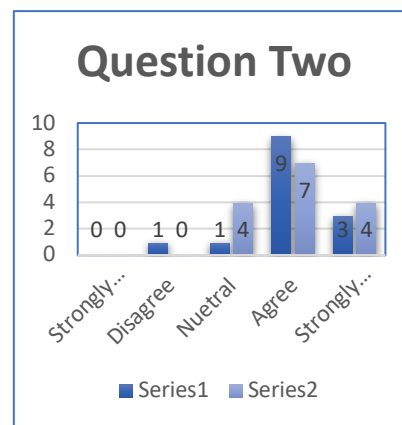
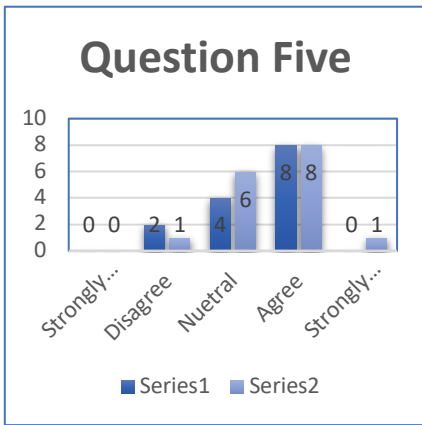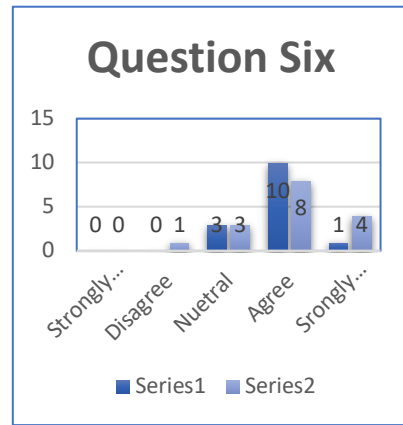Bar Graph 2. Both Surveys -Question 2
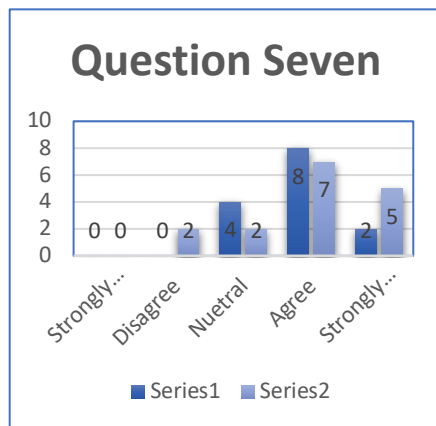
Bar Graph 3. Both Surveys- Question 3

Bar Graph 4. Both Surveys Results- Question 4

Bar Graph 5. Both Surveys- Question 7

Bar Graph 6. Both Surveys- Question 6

Bar Graph 7. Both Surveys- Question 7

Description

Based on the survey results from question one, survey one had more agree responses and less strongly agree responses. Survey two contained more strongly agree than agrees, suggesting that the TMS became more user-friendly with greater familiarity and use. However, in survey two, the were two instructors who selected a response of neutrality to this question. The comments from this section were predominantly positive, including "Makes sense to me, wish it was more widely used" and "The layout is very user friendly." According to these results, the majority of Instructors indicated that they agreed the TMS is user-friendly.

Responses on the effectiveness of the Traffic Monitoring System location in question two indicated one disagree, but nine agree responses in survey one. Survey two indicated no disagree, seven agree, and four strongly agree responses, indicating an increase in positive responses. Survey two did have more neutral responses than survey one did. One Instructor comment stated, "Sometimes I forget to utilize it before every flight if I am running behind between students, and I frequently forget to take the aircraft down whenever I'm back. This can lead to confusion as others may assume that the aircraft is still operating in that area. I feel as though if it is placed behind dispatch, where they could disperse the planes as they're ramped out and take them down when they're back, it may be utilized better and more efficiently. This would also mean that instructors and students could still look at it, but it would probably be updated more frequently than it currently is. I know from the instructor standpoint I am not always prioritizing it like I should when heading to my next flight due to timing and location of it." This feedback and has led to further discussion of what will be the most effective location for the TMS. During initial project design and planning stages, special consideration was given to location of the TMS and while it has been

placed in what seems to be the most effective location, the white board is on wheels and could be moved to a new location if necessary.

Question three had a large range of answers about the instructor's use of the Traffic Monitoring System in preflight planning. There were a lot of positive responses, but also one strongly disagrees response. In survey one, most of the instructors stated neutral responses. In survey two, the majority indicated responses of agree. In the second survey, there were less strongly agreed responses, and one instructor stated they use the TMS every day for daily planning. Two instructors in the second survey disagreed and commented, "Still getting used to it but trying my best" and "I try to ensure that I utilize it before every flight, but sometimes I am in a rush and don't always look at other events taking place." Others responded with, "It helps the most for traffic pattern flight. I know where airports have openings for me and my student to go to." The airport traffic pattern is a high-risk environment, and these responses support the conclusion that the TMS has been an effective tool in reducing the risk associated with aircraft collision hazards.

Responses to question four's inquiry of the influence the TMS has on an instructor's decision-making in preflight planning revealed prominently neutral and agree responses in survey one. In contrast, survey two revealed the most significant spread of responses, having three in the negative range and eleven in the agree/strongly agree range. While survey two did have strongly disagree responses, it also indicated a greater number of strongly agree responses than survey one did. One instructor provided the following feedback, "If many airplanes are flying in the pattern or the practice areas, I will divert to Fostoria for pattern work," while another stated, "Sometimes it is misleading, in that I think it makes sense to stay at 1G0, and then additional unmarked traffic shows up after." Referencing this last comment, it is important to note that the TMS is a preflight

planning tool and does not depict non-BGFC traffic volume in any of the depicted areas, nor would it relieve the pilot-in-command of their responsibility to scan for additional air traffic beyond what was displayed on the TMS.

Question five responses about the TMS improving the instructor's ability to select and operate in a less congested area resulted in similar findings in both survey one and two. Both surveys indicated eight agree responses, as well as similar numbers of responses for neutral and disagree. The responses to this survey questions fell in the median range. The comments supported the data. For example, one instructor commented, "I have noticed that there are fewer people situated in only just a few practice areas," while another stated, "Crews often traverse through the practice areas to avoid traffic and congestion and don't stay exclusively in the ones they've planned for." The instructional video for the TMS stated that if you place your aircraft in a practice area, you do not have to remain exclusively in that area in the case of aircraft separation. It seems from the responses people are still traveling to avoid other aircraft. We do not assign practice areas to instructors, so they have the freedom to maneuver as needed".

When asked about the TMS improving instructor's ability to select and operate training in a less congested area, question six revealed a majority of agree responses. There was only one response of disagree from survey two, with the rest of the answers being in neutral, agree, or strongly agree. In survey two, more strongly agree responses than survey one. Some comments include "The location of the Traffic Monitoring System is effective" and "Sometimes it is misleading because it doesn't say when other flights begin and end; I think the addition of time slots or if a display of when AC is expected back could further improve detail." This question has identified a potential point of failure when instructors do not remove their magnetic aircraft icon

back to the right side of the TMS white board at the completion of their flight training event. This will be addressed in future training, and through improved system familiarity and use.

The final survey question inquired about instructor perception of whether the system improved their situational awareness in comparison to operations prior to its implementation. Instructors indicated primarily positive responses in question seven for an improvement in situational awareness. The primary goal of the TMS was to improve situational awareness and the results of this question seem to support that. There are primarily positive responses with an increase in strongly agree from survey one to survey two. While there are two disagrees in survey two, the majority lands with agree and strongly agree. The comments are also primarily positive for this question. For example, an instructor commented, "If I see that another aircraft is in the same location as me and the instructor or solo student is there, it helps to brief what I plan on doing, and they do the same. This has greatly helped my situation awareness, especially in higher congested areas." Another instructor commented, "Provides me a forecast of where to expect traffic".

Implications for Future Research and Practice

To return to the original research question, "Will the design, implementation, and analysis of a Traffic Monitoring System at the Bowling Green Flight Center be useful as a preflight planning tool to increase situational awareness and safety margins in flight training."

The evidence supports a conclusion that the TMS will continue to positively impact flight training operations at Bowling Green State University. The project data reveals that the TMS system has led to improved pilot Situational Awareness and reduced the risk associated with collision hazards. The robust hiring occurring in the aviation industry at the moment has caused

high turnover in the instructor positions at all flight training departments. Having effective standard operating procedures and policies in place will improve overall safety. Tools such as the BGFC Traffic Monitoring System will increase awareness and facilitate more effective preflight planning, leading to a decrease in collision hazards for students and instructors alike.

Much like other standard operating procedures and policies, the TMS system may require further evaluation and revision as we gain experience with its usage. This system was designed to be dynamic and adaptable as aircraft resources, training areas, and curriculum change, incorporating such features as wheels, removable magnetic tape boundaries, and exchangeable section headings.

In conclusion, the BGFC Traffic Monitoring System has already had a positive impact on the flight training program at BGSU. Future program and fleet growth will be supported by a greater level of situational awareness and safety-minded focus on aircraft volume in training operations, ultimately leading a simple tool to create a significant impact.

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Traffic Monitoring System Survey

Hello,

My
 name is Lizz Suda, I am a Dispatcher and Flight Student at BGFC. For my
 honors project I have been working with Catherine Smith to design and
implement a Traffic Monitoring System at the Flight Center. As a part of
 my academic review of the project I am distributing a survey to BGFC
Flight Instructors to solicit feedback of the project. There is a
comment section after each question for personal experiences that will
help enhance my report. They are not mandatory but would be extremely
helpful.
The survey will be open from 8:00am on October 11, 2023 until 5:00pm on October 16,
2023.

1.   I feel the Traffic Monitoring System is user friendly.

   Mark only one oval.

   ◯ Strongly Disagree

   ◯ Disagree

   ◯ Neutral

   ◯ Agree

   ◯ Strongly Agree

   ◯ Other: _____

2.   Q1. Comments (not required but encouraged)

27

3. The location of the Traffic Monitoring System is effective.

Mark only one oval.

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

◯ Other: _____

4. Q2. Comments

5. I utilize the Traffic Monitoring System often when pre-planning for flight events.

Mark only one oval.

◯ Strongly Disagree

◯ Disagree

◯ Nuetral

◯ Agree

◯ Strongly Agree

◯ Other:

6. Q3. Comments

7. The aircraft represented on the Traffic Monitoring System has influenced a change to your intended flight event. (i.e intended to complete a pattern activity but changed location to KFZI due to high traffic volume at 1G0)

Mark only one oval.

- ( ) Strongly Disagree
- ( ) Disagree
- ( ) Neutral
- ( ) Agree
- ( ) Strongly Agree
- ( ) Other:

8. Q4. Comments

_____

9. The Traffic Monitoring System has led to a more evenly distributed amount of traffic volume across the designated areas.

Mark only one oval.

- ( ) Strongly Disagree
- ( ) Disagree
- ( ) Neutral
- ( ) Agree
- ( ) Strongly Agree
- ( ) Other: _____

10. Q5. Comments

_____

11. The Traffic Monitoring System improved your ability to select and operate
    training in a less congested area.

    Mark only one oval.

    ◯ Strongly Disagree

    ◯ Disagree

    ◯ Neutral

    ◯ Agree

    ◯ Strongly Agree

    ◯ Other: _____

12. Q6. Comments

    _____

13. The implementation of the Traffic Monitoring System improved your traffic and
    situational awareness more so than before implementation of the system.

    Mark only one oval.

    ◯ Strongly Disagree

    ◯ Disagree

    ◯ Neutral

    ◯ Agree

    ◯ Strongly Agree

    ◯ Other: _____

14. Q7. Comments

    _____

**U.S. Department
of Transportation
Federal Aviation
Administration**

Advisory Circular

Subject: Pilot's Guide to a Preflight Briefing	**Date:**	3/15/21	**AC No:** 91-92	
	Initiated by: AFS-800		**Change:**	

1 **PURPOSE OF THIS ADVISORY CIRCULAR (AC).** This AC provides an educational roadmap for the development and implementation of preflight self-briefings, including planning, weather interpretation, and risk identification/mitigation skills. Pilots adopting these guidelines will be better prepared to interpret and utilize real-time weather information before departure and en route, in the cockpit, via technology like Automatic Dependent Surveillance-Broadcast (ADS-B) and via third-party providers. This AC provides guidance for required preflight actions under Title 14 of the Code of Federal Regulations (14 CFR) part 91, § 91.103, which states, "Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight." This AC will also encourage pilots to utilize Flight Service in a consultative capacity, when needed. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

2 **AUDIENCE.** This AC applies to all pilots, flight instructors, and operators, with emphasis on operations conducted under part 91.

3 **WHERE YOU CAN FIND THIS AC.** You can find this AC on the Federal Aviation Administration (FAA) website at https://www.faa.gov/regulations_policies/advisory_circulars.

4 **DEFINITIONS.**

4.1 **Automatic Dependent Surveillance-Broadcast (ADS-B).** ADS-B is a foundational Next Generation Air Transportation System (NextGen) technology that uses information from the Global Positioning System (GPS) satellite system to track aircraft in real-time and improve situational awareness. The system architecture is composed of aircraft avionics and a ground infrastructure. Onboard avionics determine the position of the aircraft by using the Global Navigation Satellite System (GNSS) and transmitting this and additional information about the aircraft to ground stations for use by air traffic control (ATC), to ADS-B-equipped aircraft, and to other aviation service providers.

4.2 **ADS-B In.** ADS-B In offers traffic, weather, and flight information on permanently mounted ADS-B In receivers or handheld receivers.

4.3   ADS-B Out. ADS-B Out is a surveillance system that allows ATC to better identify aircraft at lower altitudes compared to radar. This permits flight following at altitudes not previously available, depending on the location of the ADS-B ground station. ADS-B Out provides significantly more accurate position information to ATC because it transmits the aircraft's GPS position (and other flight information) every second.

4.4   Crew Resource Management (CRM). CRM is a concept that involves a pilot's thorough use of all available resources, both inside and outside the cockpit. This includes accessing all weather and aeronautical information relating to flight planning, preflight, flight, and postflight.

4.5   FAA Weather Camera Program. The Weather Camera Program, https://weathercams.faa.gov/, provides web-based accessibility to a network of cameras and supplies aviation professionals with near-real-time imagery and weather information.

4.6   Flight Information Service-Broadcast (FIS-B). FIS-B is available to aircraft that can receive data over 978 megahertz (MHz) Universal Access Transceivers (UAT). FIS-B automatically transmits a wide range of weather products with national and regional focus to all equipped aircraft.

4.7   Flight Service. Flight Service provides aeronautical information and Meteorological Information (METI) and services to pilots before, during, and after flight. Flight Service communicates directly with pilots for pilot briefings, flight plans, in-flight advisory services, Search and Rescue (SAR) initiation, aircraft emergencies, and Notices to Airmen (NOTAM).

4.8   Flight Service Pilot Web Portal. The Flight Service Web Portal, https://www.1800wxbrief.com, allows pilots to receive online preflight briefings, file flight plans, and get automatic notifications and alerts, including flight plan closure reminders. Registering for automatic notifications and alerts keeps pilots informed when new or adverse conditions arise, such as a severe weather forecast or observation, an airport closure, a NOTAM, or a temporary flight restriction (TFR).

4.9   From the Flight Deck. To help reduce the occurrence of wrong surface incidents, runway incursions, and other high-risk events at U.S. airports, the FAA has developed the "From the Flight Deck" YouTube video series, targeted to General Aviation (GA) audiences. Each 4- to 5-minute video focuses on approach, landing, and taxi scenarios at selected U.S. airports. The videos feature high-definition footage from cockpit-mounted cameras, along with professional graphics, animations, runway diagrams, and narration to help identify and illustrate airfield hazards and hotspots. All "From the Flight Deck" videos are available at https://www.faa.gov/airports/runway_safety/videos/.

4.10   IMSAFE Checklist. A self-assessment checklist to assist pilots in determining their physical and mental health as part of planning before a flight. The acronym stands for Illness, Medication, Stress, Alcohol, Fatigue, and Emotion.

4.11 National Oceanic and Atmospheric Administration (NOAA). A scientific agency within the U.S. Department of Commerce that focuses on the conditions of the oceans, major waterways, and the atmosphere.

4.12 National Weather Service (NWS). The NWS is an agency tasked with providing weather forecasts, warnings of hazardous weather, and other weather-related products to organizations and the public. It is a part of NOAA.

4.13 Notices to Airmen (NOTAM). A NOTAM informs pilots of abnormal status, unanticipated or temporary changes to services, components, or hazards in the National Airspace System (NAS). Additionally, NOTAMs advise users of permanent changes or outages until the information is published.

4.14 PAVE. Acronym for a personal minimum and preflight planning checklist that divides the risks of flight into four categories: Pilot in command, Aircraft, enVironment, and External pressures. Using PAVE is part of the risk management process.

4.15 Personal Minimum. A pilot's set of procedures, rules, criteria, and guidelines that help the pilot decide whether and under what conditions to operate or continue operating in the NAS. Personal minimums may change with pilot experience, proficiency, currency, and other factors.

4.16 Pilot Briefing. Pilot briefings are the gathering and translation of weather and aeronautical information into a form usable by the pilot to assist in flight planning and decision making for the safe and efficient operation of aircraft. These briefings include but are not limited to weather observations and forecasts and aeronautical information including but not limited to NOTAMs, military activities, flow control information, and TFRs.

4.17 Pilot Weather Reports (PIREP). PIREPs are a valuable source of in-flight information regarding en route conditions including turbulence, icing, visibility, temperature, and winds aloft. They are actual reports of weather events encountered by pilots while airborne and on the ground that have the potential to prevent accidents and loss of life. Reports of observed adverse weather serve as a warning to other pilots and inform ATC about potential hazards in order to keep pilots clear of weather risks. However, PIREPs are not just for adverse weather and should be submitted when favorable weather is encountered in areas where adverse conditions had been forecast. PIREPs help National Weather Service (NWS) meteorologists identify conditions warranting certain types of weather advisories. The NWS utilizes PIREPs to validate and adjust forecasts. Data obtained from PIREPs is also incorporated into numerical weather models, ultimately improving forecast accuracy and usefulness. They may be submitted to any ATC facility or Flight Service when en route or by telephone after landing or by electronic submission.

4.18 Receiver Autonomous Integrity Monitoring (RAIM). Technology developed to assess the integrity of GPS signals in a GPS receiver system.

3

4.19 **Self-Briefing.** A self-briefing uses all means and sources of reporting, including automation, to provide a thorough evaluation of weather and aeronautical information in advance of flight. Available sources are listed in Appendix A.

4.20 **Single Pilot Resource Management (SRM).** SRM is the art of managing all onboard and outside resources available to a single pilot before and during a flight to help ensure a safe and successful outcome. A part of the risk management process, identification of risk factors, and determination of personal minimums.

4.21 **Weather Technology in the Cockpit (WTIC).** The WTIC program is an FAA NextGen weather research program that develops minimum weather service recommendations for cockpit weather information and its rendering, pilot weather training, and cockpit weather technology for incorporation into standards, guidance documents, training materials, and technical transfer or Government agencies for implementation. WTIC uses System Wide Information Management (SWIM) and ADS-B to deliver enhanced weather information, presentations and technology for the cockpit.

5   RELATED READING MATERIAL.

5.1   Guidance Materials for Pilots.

1. Leidos Flight Service (the FAA-contracted Flight Service provider/resource): https://www.1800wxbrief.com.

   Note: Pilots are encouraged to establish an online account with Leidos to obtain enhanced weather and aeronautical information and services.

2. Leidos Flight Service Briefing Videos:

   - Preflight Briefing: https://www.youtube.com/watch?v=br2D6Cg9oFg&list=PLJfjhkAOKxKucil-m9ZPLgT9MfM38ibrY&index=1.

   - Adverse Weather Briefing: https://www.youtube.com/watch?v=2BL71Rr0IGY&list=PLJfjhkAOKxKucil-m9ZPLgT9MfM38ibrY&index=3.

   - International Civil Aviation Organization (ICAO) Flight Plan Filing: https://www.youtube.com/watch?v=LZPXpbAKShg&list=PLJfjhkAOKxKucil-m9ZPLgT9MfM38ibrY&index=2.

3. Aeronautical Charts:

   - Visual Flight Rules (VFR) Charts: https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/vfrcharts/.

   - Instrument Flight Rules (IFR) Charts: https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/IFRCharts/.

4. Aeronautical Information Manual (AIM): https://www.faa.gov/air_traffic/publications/.

5. Aeronautical Information Publication (AIP): https://www.faa.gov/air_traffic/publications/atpubs/aip_html/index.html.

4

6. Airplane Flying Handbook (FAA-H-8083-3B): https://www.faa.gov/regulations_polic ies/handbooks_manuals/aviation/airplane_handbook/media/airplane_flying_handboo k.pdf.

7. Alaskan Aviation Weather Unit (AAWU): https://www.weather.gov/aawu.

8. AVCAM (Aviation Weather Camera-Alaska/Canada/Colorado): https://weathercams.faa.gov/.

9. Aviation Instructor's Handbook (FAA-H-8083-9): https://www.faa.gov/regulations_p olicies/handbooks_manuals/aviation/aviation_instructors_handbook/.

10. Aviation Routine Weather Report (METAR)/Terminal Aerodrome Forecast (TAF) Key: https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/sy stemops/fs/alaskan/alaska/fai/weather/media/METAR_KEY.pdf.

11. Aviation Weather Center: https://www.aviationweather.gov (the Graphical Forecasts for Aviation (GFA) tool gives a comprehensive picture of weather that may impact a flight).

12. Digital-Chart Supplements (d-CS) (formerly Airport/Facility Directories): https://ww w.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/.

13. FAA NOTAMs Search: https://notams.aim.faa.gov/notamSearch/.

   • International NOTAMs: https://www.faa.gov/air_traffic/publications/international notices/.

   • Domestic Notices: https://www.faa.gov/air_traffic/publications/domesticnotices/.

   • Airport Construction Notices: https://www.faa.gov/air_traffic/flight_info/aeronav/ Aero_Data/Apt_Constr_Notices/.

Note: The Federal NOTAM System (FNS) will automate the publication of Airport Construction Notices. At that time, the Airport Construction Notices web page will be disabled and users will be redirected to the FNS NOTAM Search web page.

14. From the Flight Deck Videos: https://www.faa.gov/airports/runway_safety/videos/.

15. NWS: https://www.weather.gov/aviation/.

16. NWS Glossary (NOAA): https://www.weather.gov/glossary/.

17. PAVE Personal Minimums Checklist: https://www.faa.gov/training_testing/training/fi ts/guidance/media/personal%20minimums%20checklist.pdf.

18. Pilot's Handbook of Aeronautical Knowledge (PHAK) (FAA-H-8083-25B): https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/pi lot_handbook.pdf.

19. Risk Management Handbook (FAA-H-8083-2): https://www.faa.gov/regulations_poli cies/handbooks_manuals/aviation/media/risk_management_hb_change_1.pdf.

5.2 ACs. The current editions of the following ACs contain useful weather information for pilots:

1. AC 00-6, Aviation Weather.

2. AC 00-45, Aviation Weather Services.

3. AC 00-63, Use of Flight Deck Displays of Digital Weather and Aeronautical Information.

4. AC 90-114, Automatic Dependent Surveillance-Broadcast Operations.

5. AC 107-2, Small Unmanned Aircraft System (Small UAS).

6 BACKGROUND AND SCOPE.

6.1 Flight Service (https://www.1800wxbrief.com) provides service and value to users of the NAS, leveraging advanced technologies to safely and efficiently deliver Flight Services in the continental United States (CONUS), Hawaii, Puerto Rico, and Alaska. Flight Service provides continuous assessment of Flight Services based on feedback and continued research and development of new aviation technology to enhance efficiency and add value for pilots. Flight Service increases aviation safety by making aeronautical information and METI accessible where and when you need it with the evolution of pilot weather briefings conducted using automated resources.

6.2 The FAA encourages innovation in the delivery of services to pilots. User preferences for automation and new distribution methods make communication with pilots easier and faster. Pilots are encouraged to utilize online automated weather resources to conduct self-briefings prior to contacting Flight Service. Pilots who have preflight weather/risk assessment and risk mitigation skills are better prepared to make in-flight decisions as real-time weather information is consumed. This allows Flight Service to become a consultative resource that can be utilized when needed.

6.3 Developing self-briefing skills helps to identify areas that require closer investigation. The more doubtful the weather, the more information you need to obtain about the route, runway conditions, and destination and alternate airports. The use of all resources, combined with Single Pilot Resource Management (SRM) and Risk-Based Decision Making (RBDM) skills, will help the pilot be better prepared to conduct flights safely in the NAS.

7 GENERAL OPERATING PRACTICES.

7.1 Preflight Actions. As part of the preflight familiarization with all available information concerning a flight, each pilot should review all appropriate sources (including but not limited to Chart Supplements, the AIM, and NOTAMs), for pertinent information on current traffic patterns at the departure and arrival airports, airport environment, routing, departure and approach procedures, NOTAMs, weather, GNSS availability (if required), crew duties, standard cockpit procedures (e.g., transferring aircraft control), protected phrases, potential emergencies and their remedies, alternates and alternative mission options, fuel and timing, and Take Off and Landing Data (TOLD) speeds. Preflight

actions are a rehearsal of the whole flight with contingencies added. Pilots should use a checklist to ensure they do not miss any area of the operation (see Appendix B for a sample preflight checklist). For many GA pilots, the Flight Service Station (FSS) remains an important source of comprehensive weather and aeronautical information. However, most pilots have become more accustomed to performing a self-briefing than calling an FSS. The FAA considers that a self-briefing may be compliant with current Federal aviation regulations. By self-briefing, pilots can often improve their knowledge of weather and aeronautical information. Flight Service personnel are available should a pilot need assistance.

7.2 Types of Briefings.

7.2.1 <u>Standard Briefing</u>. A standard briefing will include conditions and Significant Meteorological Information (SIGMET) that may influence the pilot in planning, altering, or cancelling a proposed route or flight.

7.2.2 <u>Abbreviated Briefing</u>. An abbreviated briefing supplements mass disseminated data or updates a previous briefing, or is limited to specific information.

7.2.3 <u>Outlook Briefing</u>. An outlook briefing should be obtained when the proposed departure is 6 hours or more from the time of the briefing. This type of briefing is provided for planning purposes only.

Table 1. Briefing Types

Briefing Type	Value	Time Frame
Outlook	• Provides weather information that is available in advance • For planning purposes when departure is 6 hours or more from the time of the briefing • Gives you an indication of which weather elements may be a factor for your flight	6–48 hours before flight
Standard	• Provides a complete and detailed depiction of the weather elements for the intended flight • Pilot will have a clear indication of the weather-related risk factors for the flight	• Within 6 hours of flight • Can be obtained multiple times for flights during dynamic weather
Abbreviated	• Provides pilots with updated information for specific weather elements • Focuses on the more dynamic weather elements that may have changed since the standard weather briefing was obtained • Helps pilots focus on the specific risk areas for the intended flight in an efficient manner • Allows pilots to be proactive in reacting to changing weather while in flight	As soon as practical before flight

7.3   Briefing Sources.

Briefing Type	Online (Self-Brief)	Flight Service	In-Cockpit Technology
Outlook	X	X	
Standard	X	X	
Abbreviated	X	X	X

7.3.1   Flight Service offers three basic briefing packages (these may be offered by third-party providers as well):

• Standard (for a comprehensive weather and aeronautical information briefing),

• Abbreviated (to update specific items), and

• Outlook (for flights departing in 6 or more hours).

Note: The following resources and checklists are suggested aids to help pilots conduct a thorough self-briefing and ensure they do not miss any area of preflight preparation.

7.4 **Standard Briefing Checklist.** Gather all information for the intended flight prior to conducting an initial self-briefing:

- Type of flight planned (IFR/VFR).
- Aircraft identification.
- Aircraft type.
- Departure point.
- Route of flight.
- Destination (alternate airports if needed).
- Flight altitude(s).
- Estimated time of departure (ETD) and estimated time en route (ETE).

7.4.1 Online Sources. Use online sources for weather and aeronautical information to obtain the following data applicable to the proposed flight.

7.4.1.1 **Adverse Conditions.** Include this element when meteorological or aeronautical conditions are reported or forecast that might influence the pilot to alter the proposed flight, such as:

1. Low-level wind shear.
2. Thunderstorms.
3. Reported icing.
4. Frontal zones along the route of flight.
5. NOTAMs (e.g., airport/runway closures, air traffic delays, and TFRs).
6. Weather advisories:
   - SIGMETs.
   - Airmen's Meteorological Information (AIRMET).
   - Convective SIGMETs.
   - Center Weather Advisories (CWA).
   - Aviation Watch Notification Messages.

9

7.4.1.2   **Online FAA Resources.** In addition to other online aviation flight planning services, the following are online FAA resources for adverse conditions:

- Leidos: https://www.1800wxbrief.com.

Note: This is available through a Leidos online account.

- Aviation Weather Center (AWC): https://www.aviationweather.gov.
- National Weather Service (NWS) Storm Prediction Center: https://www.spc.noaa.gov.
- Alaska Aviation Weather Unit (AAWU): https://www.weather.gov/aawu/.

7.4.1.3   **Synopsis.** Review the type, location, and movement of weather systems and/or air masses that might affect the proposed flight by using surface analysis, weather depictions, radar summary, and constant pressure charts. In addition to other online aviation flight planning services, the following are online FAA resources for synopses:

- Leidos.
- AWC.
- NWS.

7.4.1.4   **Current Conditions.** Review current observations, including Aviation Routine Weather Reports (METAR), PIREPs, and satellite and radar imagery. Review information at the departure, along the route, and at the destination. This element may be omitted if the proposed time of departure is beyond 2 hours. In addition to other online aviation flight planning services, the following are online FAA resources for current conditions:

- Leidos.
- AWC.

7.4.1.5   **En Route Forecast.** Review forecast information that may affect the proposed flight (e.g., GFA for CONUS, Caribbean, and Gulf of Mexico users, Area Forecasts (FA) for Alaska users, TAFs, prognosis charts, weather advisories, GNSS, or RAIM predictions). Review information in a logical order (i.e., climbout, en route, and descent). In addition to other online aviation flight planning services, the following are online FAA resources for en route forecasts:

- Leidos.
- AWC.
- NWS.

7.4.1.6   Destination Forecast. Review the destination forecast, including significant changes expected within 1 hour before and after the estimated time of arrival (ETA). Select an alternate airport if needed. In addition to other online aviation flight planning services, the following are online FAA resources for destination forecasts:

- Leidos.
- AWC.
- NWS.

7.4.1.7   Winds Aloft. Review forecast winds aloft for the flight using degrees of the compass. Interpolate wind directions and speeds between levels and stations, noting any large shifts in speeds or direction as a means to identify wind shifts. Check temperature information if needed. In addition to other online aviation flight planning services, the following are online FAA resources for winds aloft:

- Leidos.
- AWC.

7.4.1.8   NOTAMs. Check NOTAM information affecting the flight. This includes:

- Domestic NOTAMs.
- International NOTAMs (when flight extends beyond U.S. airspace).
- Special Use Airspace (SUA) NOTAMs (e.g., restricted areas, aerial refueling, night vision goggles (NVG) operations, military operations areas, military training routes, and warning areas).
- NOTAMs for field conditions (FICON).

7.4.1.8.1   In addition to other online aviation flight planning services, the following are online FAA resources for NOTAMs:

- Leidos.
- TFRs: https://tfr.faa.gov/tfr2/list.html.
- Published NOTAMs (the Notice to Airmen Publication (NTAP) was discontinued effective June 18, 2020): https://www.faa.gov/air_traffic/publications/notices/.

7.4.1.9   Restricted Airspace or Special Use Airspace (SUA). These include Prohibited Areas P-40 and P-56 and the Special Flight Rules Area (SFRA) for Washington, DC. Include these when pertinent to the route of flight.

Note: VFR flight within 60 miles of the DCA very high frequency omni-directional range station/distance measuring equipment (VOR/DME) requires special awareness training, which can be accessed through the FAA Safety Team's (FAASTeam) website at https://www.faasafety.gov/.

7.4.1.10   **ATC Delays.** Look for any ATC delays and/or flow control advisories that might affect the proposed flight. In addition to other online aviation flight planning services, the following are online FAA resources for ATC delays:

- Air Traffic Control System Command Center (ATCSCC): https://www.fly.faa.gov/flyfaa/usmap.jsp.

- FAA Mobile: https://www.faa.gov/mobile/.

- Aviation Information System (AIS): https://www.fly.faa.gov/ais/jsp/ais.jsp.

    Note: Users would subscribe to this service.

7.4.1.11   **Additional Preflight Items to Consider:**

- Published SUAs (not included in NOTAMs): https://sua.faa.gov/sua/siteFrame.app.

- Density altitude data.

- Information regarding Air Traffic Service (ATS) and rules, customs and immigration procedures, Air Defense Identification Zone (ADIZ) rules, and SAR.

- Military NOTAMs.

- Special flight data center (FDC) instrument approach procedure changes.

- FDC NOTAMs containing amendments to airways, airports, and facility IFR procedures and general information.

- TFRs.

- Airport construction/runway and taxiway closures.

- Airport/runway hot spots.

7.5   **Abbreviated Briefing Checklist.** An abbreviated briefing is specific information to update a previous briefing. The following data should be checked even when only specific information is needed:

- Any updates to adverse conditions that are reported or forecast along the route of flight.

- Changes in meteorological and aeronautical conditions since the previous briefing.

- TFR updates since the previous briefing.

7.6   Outlook Briefing Checklist. Review the following items when the departure time is 6 hours or more away:

- Reported or forecast meteorological or aeronautical conditions that might influence or alter the proposed flight. These conditions may include low-level wind shear, thunderstorms, reported icing, frontal zones along the route of flight, and NOTAMs (e.g., airport/runway closures, air traffic delays, and TFRs).

- Weather advisories (SIGMETs, AIRMETs, Convective SIGMETs, CWAs, and Aviation Watch Notification Messages).

- Synopsis. Review the type, location, and movement of weather systems and/or air masses that might affect the proposed flight.

- En route forecast. Review forecast information that will affect the proposed flight (e.g., GFAs, TAFs, prognosis charts, and weather advisories). Review information in a logical order (i.e., climbout, en route, and descent).

- Destination forecast(s). Review the destination forecast, including significant changes expected within 1 hour before and after the ETA. Include an alternate airport forecast if an alternate airport is deemed necessary.

7.7   Additional Tools—NextGen, WTIC, and FIS-B. With the aid of technology (e.g., ADS-B In), pilots can receive weather information in the cockpit. It is important to understand the proper use of METI and the operational shortfalls to enable consistent and effective pilot decision making relative to adverse weather. Next generation weather radar (NEXRAD) is made up of a mosaic of data sets that can be 15 to 20 minutes old by the time they are assembled and displayed in a cockpit. This latency may contribute to a pilot's inability to correlate, interpret, and apply weather information related to VFR into instrument meteorological conditions (IMC) weather factors (e.g., convection, icing, lowered ceilings, quickly emerging weather events, and precipitation), to real-time flight scenarios. However, having current weather and aeronautical information in the cockpit can help pilots plan more safe and efficient flightpaths, and make better strategic decisions during flight to avoid potentially hazardous developing weather. FIS-B is a part of the ADS-B system that automatically transmits a wide range of weather products available in the cockpit through the NWS:

- AIRmen's METeorological Information (AIRMET).

- SIGnificant METeorological Information (SIGMET) and Convective SIGMET.

- Aviation Routine Weather Reports (METAR) and SPECIal Report of Meteorological Conditions (SPECI).

13

- Next generation weather radar (NEXRAD), regional and national.
- Notice to Airmen (NOTAM).

  Note: FIS-B METI and aeronautical information do not include all of the weather products or NOTAMs. As a result, FIS-B METI and aeronautical information may not include all of the weather products or NOTAMs that a preflight briefing includes. NOTAM information is limited to the past 30 days. TFR NOTAMs and NOTAMs with end dates will not be purged after 30 days.

- Pilot Report (PIREP).
- Special Use Airspace (SUA) Status.
- Terminal Aerodrome Forecast (TAF).
- Winds and Temperature Aloft.
- Traffic Information Services-Broadcast (TIS-B).
- Lightning.
- Turbulence.
- Icing.
- Cloud Tops.
- Graphical AIRMET.
- CWA.

8 SAFETY-RELATED DO'S AND DON'TS.

8.1 Do:

1. Establish personal minimums that reflect your level of proficiency.
2. Plan ahead and obtain an outlook briefing.
3. Obtain a standard briefing as close to your departure time as possible.
4. Obtain an abbreviated briefing just before takeoff if your standard briefing is 1 hour or more old or if the weather is questionable.
5. Allow more margin for weather at night. Clouds and the horizon may be difficult or impossible to see on dark nights. Always stay above the highest terrain until a safe landing is assured.
6. Check PIREPs, NOTAMs, AIRMETs, and SIGMETs.
7. Consider VFR flight following (ATC workload permitting).
8. Consider filing a VFR flight plan.

14

9. Have a contingency plan for alternates if unexpected circumstances arise.

10. Be familiar with any applicable disclaimers related to the accuracy of the information provided by the subscribed commercial service.

8.2 Don't:

1. Plan flights that exceed your personal minimums or level of proficiency.

2. Plan flights in or near current or forecast convective activity.

3. Fly in or near thunderstorms. Scattered thunderstorms may be safely circumnavigated, but do not try to fly through or under one or closer than 20 nm) from one.

4. Continue VFR into IMC. Instead, wait it out or turn around if you find en route weather lowering below your personal limits.

5. Forget that areas en route, or even near airports, may be below VFR minimums, even though reporting stations are at or near VFR minimums. Be especially cautious when the temperature and dewpoint spread is 3 °C or less: fog may form.

6. Proceed "on top," hoping to find a hole in the clouds at the other end or hoping to get ATC to talk you down if you get caught on top.

7. Fly into areas of rain when the air temperature is near freezing. Ice can form on the windshield, impairing forward vision, and on the wings, which can decrease aircraft performance, as well as other aircraft control, lifting, and nonlifting surfaces (e.g., propellers, tail surfaces, or intakes).

    Remember: Flight into known icing conditions is prohibited for all aircraft not properly certificated for flight in icing conditions or not properly equipped with ice protection equipment.

8. Hesitate to declare an emergency with ATC whenever the safety of flight is at risk.

9. Plan on using cockpit weather displays as a tactical means of navigating through convective weather.

9 **AC FEEDBACK FORM.** For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.

Robert C. Carty
Deputy Executive Director, Flight Standards Service

15

APPENDIX A. STANDARD BRIEFING ELEMENTS AND RESOURCES

Element	Important Checklist Items	Value to Pilot

1) Adverse Conditions	• Weather Advisories
	• NOTAMs/FICONs
	• PIREPs
	• AIRMETs:
	  o Icing
	  o Turbulence
	  o IFR
	  o Thunderstorms
	• SIGMET:
	  o Convective Activity
	  o Low-Level Wind Shear
		Adverse conditions can be meteorological or aeronautical conditions that are reported or forecast that might influence the pilot to alter the proposed flight (e.g., low-level wind shear, thunderstorms, reported icing, turbulence, frontal zones along the route of flight, and NOTAMs such as airport/runway closures/conditions, air traffic delays, or TFRs).

2) Synopsis	• Frontal System, Location, and Movement • Air Mass • IFR Conditions	Determine when conditions may change based on location, movement, and speed of frontal system. This provides a picture for current and forecast weather conditions and whether VFR flight should be taken.
3) Current Conditions	• Current Weather Reports for Departure, En Route, and Destination • PIREPs	Check the current weather along the route and any PIREPs of actual weather conditions that occurred in flight.

4) Forecast Conditions	• Forecast Weather:
	  o Departure Forecast
	  o En Route Forecast
	  o Destination Forecast
		A forecast is information that will affect the entire proposed flight and should be reviewed in logical order (i.e., climbout or departure, en route, and descent or destination). The destination forecast includes significant changes expected within 1 hour before and after the ETA.

5) Winds Aloft	• Winds Aloft Forecast • Temperature at Proposed Altitude	A winds aloft forecast provides winds aloft for the proposed altitude using degrees of the compass. Winds should be averaged or interpolated if flying between reported levels. Temperature information is useful to help determine icing levels.
6) Notices to Airmen (NOTAM)	• Departure • En Route • Destination • Alternate Airport(s)	NOTAMs provide information that may have an impact along any part of the route of flight, such as airport and other aeronautical conditions. Other information to check includes TFRs, SUAs, ATC delays, Airport Construction Notices, and Prohibited Areas P-40 (Camp David) and P-56 (Washington, DC) and the SFRA for Washington, DC, if pertinent to the route.

A-1

Source	Description	Adverse 1	Synopsis 2	Current Conditions 3	Forecast Conditions 4	Winds Aloft 5	NOTAMs 6	PIREPs 7	Products
https://1800wxbrief.com	Leidos Flight Service—FAA Contract Vendor	Y	Y	Y	Y	Y	Y	Y	Interactive Maps, Flight Planning and Briefings, winds aloft, Airport Information.
https://aviationweather.gov	NOAA/Government website for aviation weather	Y	Y	Y	Y	Y		Y	AIRMET/SIGMET Map, Graphical AIRMET, GFA Tool, Radar, METARs, TAFs, CWA, PIREPs.
https://weathercams.faa.gov	Alaska, Canada, and Colorado			Y	Y			Y	METARs, TAFs, PIREPs/AIRMETs.
https://www.weather.gov/aawu	AAWU	Y	Y	Y	Y	Y			AIRMET/SIGMET Map, Graphical AIRMET, GFA Tool, Radar, METARs, TAFs, CWA, PIREPs.
https://sua.faa.gov	SUAs						Y		Text List and Graphic Maps for SUAs in ATC Centers, States, Airports.
https://www.spc.noaa.gov/	NOAA Storm Prediction Center	Y	Y						Convective Outlook, Storm Reports, National Radar.
https://www.ncep.noaa.gov/	National Centers for Environmental Prediction (NCEP)	Y	Y	Y	Y	Y			AIRMET/SIGMET Map, Graphical AIRMET, GFA Tool, Radar, METARs, TAFs. Note: Link to https://aviationweather.gov.
https://tfr.faa.gov/tfr2/list.html	TFRs	Y					Y		TFR List, TFR Map, TFR Airports, All NOTAMs. Note: Link to https://sua.faa.gov.
https://www.nhc.noaa.gov/	National Hurricane Center (NHC)	Y	Y				Y		The NHC issues forecasts on tropical weather systems.
https://www.wpc.ncep.noaa.gov/	Weather Prediction Center (WPC)	Y	Y		Y				The WPC provides analysis and forecast products on a national scale, including surface pressure and frontal analyses.
https://www.ssd.noaa.gov/VAAC/vaac.html	Volcanic Ash Advisory Centers (VAAC)	Y	Y						NOAA operates two VAACs, which issue forecasts of ash clouds following a volcanic eruption in their area of responsibility.
https://www.weather.gov/hfo/	NWS Forecast Office Honolulu, Hawaii	Y	Y	Y	Y	Y			Provides all weather products, except NOTAMs and PIREPs, for Hawaii.

Source	Description	Adverse 1	Synopsis 2	Current Conditions 3	Forecast Conditions 4	Winds Aloft 5	NOTAMs 6	PIREPs 7	Products
https://www.swpc.noaa.gov/	Space Weather Prediction Center (SWPC)	Y	Y						The SWPC provides alerts, watches, warnings and forecasts for space weather events (e.g., solar storms) affecting or expected to affect Earth's environment.
https://notams.aim.faa.gov/notam search/	Federal NOTAM System (FNS)	Y					Y		Provides airport and runway closures and all other NOTAMs.
https://tfr.faa.gov/tfr2/list.html	TFRs						Y		
https://www.faa.gov/air_traffic/publications/notices/	Published NOTAMs (the Notices to Airmen Publication (NTAP) was discontinued effective June 18, 2020)						Y		
https://www.fly.faa.gov/flyfaa/usmap.jsp	Air Traffic Control System Command Center (ATCSCC)						Y		ATC delays and/or flow control advisories.
https://www.faa.gov/mobile/	FAA Mobile						Y		ATC delays and/or flow control advisories.
https://www.fly.faa.gov/ais/jsp/ais.jsp Note: Users must subscribe to this service.	Aviation Information System (AIS)						Y		ATC delays and/or flow control advisories.
https://sua.faa.gov/sua/siteFrame.app	Published SUAs						Y		Additional information on SUAs not included in NOTAMs.
https://www.faa.gov/air_traffic/flight_info/aeronav/Aero_Data/Apt_Constr_Notices/	FAA Airport Construction Notices	Y					Y		Visual depictions of airport construction NOTAMs on the affected airport diagram. Note: The Federal NOTAM System (FNS) will automate the publication of Airport Construction Notices. At that time, the Airport Construction Notices web page will be disabled and users will be redirected to the FNS NOTAM Search web page.

Source	Description	Adverse	Synopsis	Current Conditions	Forecast Conditions	Winds Aloft	NOTAMs	PIREPs	Products
		1	2	3	4	5	6	7	Products
https://www.faa.gov/airports/runway_safety/videos/	FAA From the Flight Deck Videos						Y		Additional information on airport hot spots and other safety concerns.
https://sapt.faa.gov/default.php	Service Availability Prediction Tool (SAPT)						Y		Provides availability of ADS-B, ADS-B Deviation Authorization Pre-Flight Tool (ADAPT), and RAIM.

APPENDIX B. SAMPLE PREFLIGHT CHECKLIST

B.1   **Outlook Briefing Elements (more than 6 hours until departure).** Check for reported or forecast meteorological or aeronautical conditions that might influence or alter the proposed flight.

☐   Weather advisories (SIGMET, AIRMET, convective SIGMETs, CWAs, and Aviation Watch Notification Messages)
☐   Synopsis (type, location, and movement of weather systems and/or air masses)
☐   En route and destination forecast (alternate if needed)
☐   NOTAMs (e.g., airport/runway closures, air traffic delays, and TFRs)

B.2   **Standard Briefing Elements.**

☐   Adverse conditions (e.g., weather advisories, low-level wind shear, thunderstorms, icing, and frontal zones)
☐   Synopsis
☐   Current weather
☐   En route, destination, and alternate forecasts
☐   Winds aloft
☐   NOTAMs, TFRs, and PIREPs
☐   P40 (Camp David) and P56 (Washington DC); Washington, DC SFRA (if applicable)
☐   ATC delays

B.3   **Abbreviated Briefing Elements (update on changes, up to 2 hours prior to flight).**

☐   Check updates to adverse conditions (reported or forecast) along the route of flight
☐   Check for any changes in meteorological and aeronautical conditions

B.4   **Non-Weather-Related Checklist Items.**

☐   IMSAFE
☐   PAVE
☐   Personal minimums
☐   Fuel requirements
☐   Alternate airports
☐   Traffic delays
☐   Takeoff and landing distance information for airports
☐   Aircraft performance items (e.g., airport elevation, runway slope and conditions, and Weight and Balance)
☐   RAIM check

B-1

Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the General Aviation and Commercial Division (AFS-800) at 9-AFS-800-Correspondence@faa.gov or the Flight Standards Directives Management Officer at 9-AWA-AFB-120-Directives@faa.gov.

Subject: AC 91-92, Pilot's Guide to a Preflight Briefing

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____   Date: _____