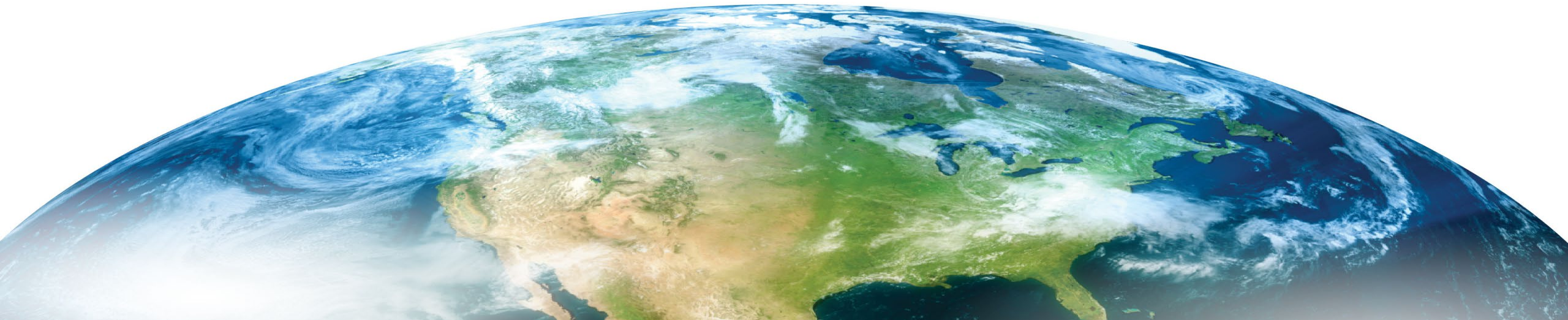




Next**GEN**

Results for the 2022 Summer Experiment on the Experimental Graphical Forecasts for Aviation (GFA)

Presented to: Aviation Weather Center Testbed
By: FAA AWDE Services, ANG-C63
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Topics

- **Introduction and Objectives**
- **User Assessment Approach**
- **Results**
- **Conclusions**
- **Recommendations**



Introduction and Objectives



Introduction

- The National Oceanic and Atmospheric Administration's (NOAA) Aviation Weather Center Testbed (AWT) conducted the 2022 Virtual Summer Experiment May- June 2022.
- AWT combined the capabilities of the Graphical Forecast for Aviation (GFA) and the Helicopter Emergency Management Services (HEMS) tool into the experimental GFA.
- The experimental GFA tool contains a General Aviation (GA) and Low Altitude (LA) mode.
- AWT updated the cross section tool capabilities and added additional overlays and layers.
- Due to the integration and redesign of the tool a User Assessment was needed to determine the overall usability, specifically when compared to the previous stand alone GFA and HEMS tool.
- The Federal Aviation Administration's (FAA) Aviation Weather Demonstration and Evaluation (AWDE) Services team, supported by AWT, conducted virtual interviews to determine the usefulness and suitability of the Experimental GFA.



Participant Summary

# of Participants	User Group	Primary Geographic Region	Flight Hour Range
8	GA Pilot	Southeast US, Midwest US, Eastern US, Southern California, Interior Alaska	3000-5,000
2	Helicopter Pilot	California, Alaska	500-1000
3	Helicopter Dispatcher	Alaska	N/A
1	Part 135 Dispatcher	Alaska Statewide	N/A
1	Part 135 Pilot	Eastern US	2,000
15	Total		



Approach

- Participants were:
 - Provided a link to the GFA expanded coverage experimental GFA website located at <https://beta.aviationweather.gov/gfa>.
 - Asked to use the experimental GFA as a supplemental tool between May 16 and June 30, 2022 to assess the suitability and usability.
 - Provided training materials including a training briefing prepared by AWDE, an experimental GFA video tutorial developed by AWT, and the GFA Help page located at <https://beta.aviationweather.gov/gfa/help>.
- Each virtual interview was conducted with one participant in attendance via Microsoft Teams and consisted of the AWDE Team:
 - Introducing AWT and AWDE team members.
 - Providing an overview of the objectives and procedures of the virtual interview session.
 - Using structured interview questions focused on determining the suitability and usability of experimental GFA tool.
- Participants whose schedule did not allow for a virtual interview submitted feedback via an email.
- AWT team members attended each virtual interview session to provide subject matter expertise (SME) concerning the product.

Results

Q1. What were your initial impressions/thoughts about the experimental GFA interface when you first started looking at it and using it?

- Overall, participants stated a preference for the experimental GFA , over the stand-alone GFA and HEMS tool.
 - The experimental GFA provided all the weather products needed in one tool.
 - To plot a planned route and view the weather conditions along the route is an invaluable capability provided by the experimental GFA.
 - The various options in the Map Options dialog provided the capability to customize the map to display relevant information for flight planning.
- When initially using the site the entire coverage area is not shown, on first use, participants in Alaska were not aware the experimental GFA provided coverage in Alaska.
- One GA Pilot stated the GA Mode uses MSL and the LA Mode uses AGL, the difference in measurements may be confusing to users when toggling between the two modes.
- Using a helicopter icon for the LA Mode may impact the use of the LA Mode because users may not understand the mode is for all low altitude flights not just helicopter flights.
- Products such as WAFS grid, TFM forecasts and tools such as the Terminal Weather Dashboards, were not used by the participants.
- One participant in Alaska stated Anchorage was not included in the Winter Weather Dashboard.
- Participants did not know how to display the legends in the experimental GFA, the icon was difficult to see and users did not realize the icon represented the legends.



Q2. Did you access the experimental GFA product via a computer, mobile device or both? Did you experience any noticeable issues accessing it via one method over another? Have you used the current GFA and/or HEMS on a mobile device? If so, did you find this updated version more mobile friendly?

- All participants used the experimental GFA product on a computer, but stated having a mobile friendly version is useful because weather conditions are assessed up to departure time.
- 4 out of 15 participants used the experimental GFA across multiple platforms:
 - 3 out of 4 participants did not notice any issues when using the tool across different platforms, however, more time would be needed to fully assess the tool and provide adequate feedback.
 - One GA Pilot stated when using a mobile device the cross section tool dialog was small, the information was difficult to read, and the axis values were difficult to see.
- Participants stated if different platforms are used a user account is needed to provide the capability to login and display user preferences across all devices.



Q3. This experimental version of the GFA has a Low Altitude mode integrated as a potential replacement to the HEMS tool. Did you look at/use both modes? If so, was it easy to switch between the GA and LA modes? Were there any issues noted when switching between the two modes? Given your current operations, would you have a preference for one mode over the other? Do you find it beneficial to have both modes accessible via the same webpage?

- 7 out of 15 participants used one mode during the assessment and did not switch to the other mode.
- 8 out of 15 participants viewed both the GA Mode and LA Mode during the assessment.
 - Participants stated when switching modes all preferences, weather products, zoom levels, and location remain consistent which makes toggling between the modes seamless.
 - Participants stated the LA mode provides a 5 hour forecast and the GA mode has a 18 hour forecast, therefore, toggling between the modes may be beneficial for strategic flight planning.
 - Participants stated using different measurements in the modes, AGL and MSL, for altitudes may cause users to misinterpret the altitude information.
 - The helicopter icon for the LA mode deterred GA Pilots from accessing the LA mode because pilots thought the mode was only for helicopter pilots and not a low altitude tool.



Q4. In your daily operations, are there specific weather variables and/or products you use/don't use? Were you able to find those easily on the experimental GFA product?

- Participants indicated there was a learning curve to become familiar with the location of weather products and overlays within the various weather menus.

Weather		Products		Tools	
Observations	X	SIGMET	X	Terminal Weather Dashboard	
C&V	X	G-AIRMET	X	Winter Weather Dashboard	X
Clouds	X	CWA		Aviation Forecast Discussion	X
Precipitation	X	WAFS grids		Decision Support imagery	
Thunderstorms		TAF map	X	DATA API	
Winds	X	METAR data	X	Archive View	
Turbulence	X	TAF data	X	Status	X
Icing	X	TFM Forecasts		Submit a PIREP	X

X indicates a product/overlay participants specifically stated was used. Lack of an X does not mean the product/overlay is not needed only not identified during the interview.



Q5. The “Weather” and “Product” drop down menus allow you to select various weather overlays for the GFA map. Was the specific information you were looking for easy to find under these two menus? When you selected a specific weather variable and/or product, was it easy to figure out how to configure what was displayed? Was there any thing different you noticed between the Experimental GFA and the Stand alone GFA.

- Participants stated when compared to the stand-alone GFA, there is a learning curve to find specific weather products on the experimental GFA, however, after using the product, the organization of the information in the experimental GFA became intuitive.
- One Helicopter Pilot stated when zooming into the LA mode map the weather information becomes pixelated and does not provide adequate information for decision making.
- One Helicopter Pilot and one GA Pilot stated the cloud information was not adequate and did not provide the details needed for decision making:
 - Altitude and cloud coverage information was not easy to see.
 - The cloud information was cluttered, the text was difficult to read, and some text was overlaid on-top of other text.



Q6. The experimental GFA interface has a compact toolbar in the upper right. Did you find the toolbar easy to use and the graphics intuitive to what each tool does? Why or why not? Are there any specific capabilities missing from the toolbar that you would like to see added?

- Participants did not have any concerns/issues with the graphics used on the toolbar and stated the toolbar was easy to use.
- Select Active Layer Dialog: When making a selection on the options the dialog automatically closes not providing the capability to select more than one option at a time.
- Configure Map Options Dialog: Participants that actively used and assessed the Map Options Dialog stated the information was easy to use, navigate, and provided all the necessary information for flight planning.
- Flight Path and Cross Section Dialog
 - The stand-alone GFA tool provides the Flight Path tool to enter and display a route, in the experimental GFA participants were not aware the cross section tool is the flight path tool and were not aware the route was displayed after selecting the “Go” button, in addition the dialog does not disappear so the user can see the route displayed on the map.
 - The dialog can’t be moved to see information displayed on the map.
 - The route was not spaced in the cross section dialog.
 - Participant's stated the need to select and view more than on weather variable to assess conditions along a route.
 - The axes in the cross section were not labeled which made the information difficult to interpret.
 - Participants had difficulty determining locations along a route impacted by weather conditions because the tool does not provide scaling information to determine the where the weather occurs along a route.



Q7. Did you find it easy to navigate the experimental GFA interface? (ie. the zoom capability, time slider, altitude slider) (GA vs LA mode?) Were you able to locate where/how to display the legend if needed? Was the Zoom function easy to use between modes and products?

- Participants stated the experimental GFA interface was easy to use, including the zoom capability, time, and altitude slider.
 - Participants stated the preference for the time slider on the experimental GFA over the stand-alone GFA because the time slider was larger which made the slider easier to use and see.
 - The altitude slider was easy to use, however, participants had to consistently recall which weather products did and did not have the altitude slider capability.
 - When zooming into specific locations the resolution was not adequate causing the weather information to become pixelated and difficult to interpret.
- Legends:
 - 5 out of 15 participants could not find the icon to display the legends.
 - The icon used to display the legends was difficult to find and participants were not aware the icon represented the display/hide legend capability.
 - Participants stated the legends provided information that was not selected and displayed on the map.



Q8. Overall, was it easy to know what weather information was being displayed and the valid time? (i.e. is it a forecast product or an observation?) (GA vs LA mode?)

- Participants stated determining which weather product displayed was easy.
- The valid time was easy to determine for the weather product displayed.
- Participants stated determining if the weather information provided a forecast or an observation was easy.
- Participants stated the time slider provided the capability to easily select and display historical and forecast information.
- Participants stated the “Now” button provided the capability to easily display the current time.



Q9. In addition to the experimental GFA interface, AWC has also done a complete redesign of their website which is currently in experimental mode. You can access some of these pages with the updated look via the “Tools” menu on the GFA. Did you find having access to these various pages via the GFA interface useful? Was it intuitive what the “Tools” menu included? Or were you expecting something else?

- The Terminal Weather Dashboards and WAFS forecast were not needed by the participants.
- One GA Pilot in Alaska stated Anchorage was not included in the Winter Weather Dashboard.
- Participants stated the capability to submit a PIREP from the tool was useful.
- Participants suggested the following improvements:
 - Add Decision Support Graphics such as prognosis charts for the Alaska region.
- Participants stated the font in the Aviation Forecast Discussion was small and difficult to read, there is no capability to increase the size of the text or zoom-in to make the text larger (see the Figure below).



Q10. If you happened to look at the other pages with the updated look (experimental AviationWeather.gov) do you have any feedback/suggestions to provide?

- 6 out of 15 participants accessed the other pages located within the experimental GFA tool.
- The participants that accessed the page stated the look and feel of the other pages was consistent with the GFA tool and easy to use.



Q11. Do you have any suggested changes to the experimental GFA?

- Provide the capability to create a user account which will apply preferences on any device once logged-in.
- When viewing airports under observations, provide a color coding or graphical feature indicating flight category, i.e. VFR or IFR for a quick glance view.
- The Select Layer dialog box automatically closes after selecting one overlay:
 - The Select Layer dialog should remain open to allow users to select more than one overlay.
 - The Select Layer dialog should either have a close button or an “x” icon to manually close the dialog.
- The Cross Section tool should include a legend and scale to clearly determine the location and severity of the weather along a route.
- All dialogs including the legends should be movable to not cover critical weather information displayed on the map.
- Allow for feature that will allow users to drag the route along a curved path to the actual flight plan instead of a straight line point to point or requiring the pilot to enter latitude and longitude.



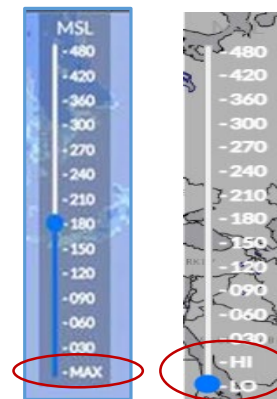
Q11 continued. Do you have any suggested changes to the experimental GFA?

- When initially opening the experimental GFA site, the entire coverage area should be displayed to ensure all users are aware of the entire coverage area.
- Pilots stated the need to include Temporary Flight Restrictions (TFR) as an overlay.
- Provide an overlay to display region boundaries in Alaska (similar to the AAWU website): Statewide, Southcentral, Southwest, Bering, Southeast, Central.
- Pilots stated a need to have a smoke forecast.



Human Factors Issues*

- In GA mode the altitude slider displays MAX and HI at the bottom, see figure below. Recommend moving MAX to the top of the slider.
- When selecting a specific altitude, 180 MSL in the figure below, the entire range from Max-180 MSL is filled in with the line. Recommend using only the circle as a button to select and display the altitude and remove the line below the circle. The line gives an indication the display will show all altitudes from 180 MSL and below.
- When viewing Turbulence the altitude slider has “HI” and “LO” as options, it’s not intuitively clear what will be displayed if either values are chosen given the placement on the slider.

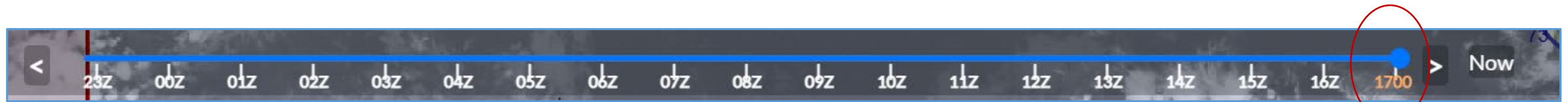


GA Mode

*Note: The Human Factor issues were noted by Human Factors experts when reviewing the site and pertain to Human Factors Standards and Guidelines.

Additional Human Factors Issues*

- The time slider displays the current time in orange font in Observations, however, the same color coding is not used in the Forecast.



Observations



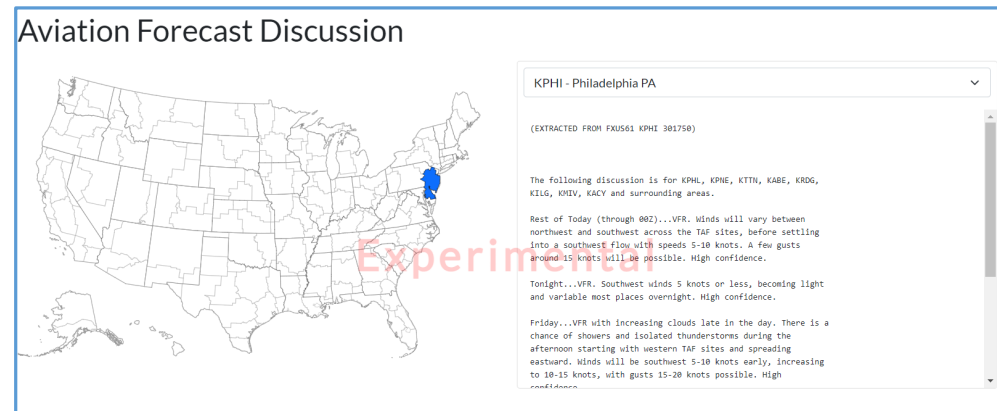
Forecast

- Recommend using the same orange font for Observations and Forecasts for the current time.
- Recommend using orange font on the “Now” button to correlate the button with the current time on the slider. This is particularly important for Observations since the “Now” button is not close to the current time on the slider.

*Note: The Human Factor issues were noted by Human Factors experts when reviewing the site and pertain to Human Factors Standards and Guidelines.

Human Factors Issues*

- The text on the Aviation Forecast Discussion was small and difficult to read, there is no capability to increase the size of the text or zoom-in to make the text larger (see the Figure below).
 - Human Factors guidelines recommend providing a user-selectable font size adjustment or using a Sans serif typeface for small text.



*Note: The Human Factor issues were noted by Human Factors experts when reviewing the site and pertain to Human Factors Standards and Guidelines.

Conclusions and Recommendations



Objective 1: Determine the usability of the Experimental GFA

- Overall, participants stated due to the redesign, there is a learning curve to identify all capabilities and determine the location of the weather products and associated information.
- Once familiar with the experimental GFA participants stated:
 - Weather information was easy to find to support flight planning.
 - The overlay information was easy to view on the map display.
 - Knowing which weather product is being displayed was easy.
 - The zoom capability was adequate to support decision making.
 - There were no issues found when using the tool across different platforms, however, more time would be needed and additional platforms used to fully assess the tool.
- Participants found toggling between the GA and LA mode intuitive as the menu structures and weather products were similar and all preferences remained consistent.
- When a dialog is open the weather information on the map is covered and there is no capability to move and/or minimize the dialog to view the map display. This includes:
 - All legends
 - Select Active Layers dialog
 - Map Options
 - Cross Section Tool
- Participants did not know how to display the legends in the experimental GFA, the icon was difficult to see and users did not realize the icon represented the legends.



Objective 1 Cont.: Determine the usability of the Experimental GFA

- The legends contained information not relevant to the weather products and/or information being displayed.
- When making a selection in the Select Active Layers dialog the dialog automatically closes not providing the capability to select more than one option at a time.
- When using the Cross Section Tool to enter a route, participants were not aware or given feedback the route was displayed when selecting the “Go” button.
- The example to enter a route, in the Cross Section tool, does not clearly notify users all letters need to be capitalized and dots need to be used in the route.
- The GA and LA mode use different altitude measurements, MSL and AGL, the difference in measurements may cause confusion to users when toggling between the modes.
- In GA mode when viewing the Icing and Wind forecast products, the altitude slider displays MAX at the bottom which is not intuitive because MAX is listed below the lowest value.
- When selecting a specific altitude, the slider bar indicates all values at and below the selected value will be displayed, when only the selected altitude is displayed.



Objective 1 Cont.: Determine the usability of the Experimental GFA

- Recommend using the orange font for the “current time” on the time slider for both observations and forecasts including the font on the “Now” button.
- When initially using the site the entire coverage area is not shown, on first use, participants in Alaska were not aware the experimental GFA provided coverage in Alaska.
- The weather information display is pixelated when zoomed-in, this occurs when using the default basemap (light gray), the pixelation makes the weather information difficult to use for decision making.
- Using a helicopter icon for the LA Mode may impact the use of the LA Mode because users may not understand the mode is for all low altitude flights not just helicopter flights.
- The cloud information was not easy to use for decision making:
 - Specific altitude and cloud coverage information was not easy to see.
 - The icons and text were cluttered on the screen and has no filter capability.
 - The text was difficult to read due to the color, size, and the text being overlaid on-top of each other.




Objective 2: Determine the suitability of the experimental GFA

- Once familiar with the new design and functionality, participants stated a preference for the experimental GFA over the stand-alone GFA and HEMS tool to aid in flight planning.
 - When switching modes all preferences, weather products, zoom levels, and location remain consistent which makes toggling between the modes seamless.
 - The experimental GFA provided all the weather products needed in one tool.
 - The various options in the Map Options dialog provided the capability to customize the map to display relevant information for flight planning.
 - Participants stated the LA mode provides a 5 hour forecast and the GA mode has a 18 hour forecast, therefore, toggling between the modes may be beneficial for strategic flight planning.
- The Cross Section Tool was an added improvement to the experimental GFA, but the capability needs improvements to better support decision making:
 - The route was not spaced in the cross section dialog.
 - The capability to select and view more than one weather variable to assess conditions along a route is needed.
 - The axes in the cross section were not labeled which made the information difficult to interpret.
 - Participants had difficulty determining locations along a route impacted by weather conditions because....
 - The tool does not provide specific location information on where the weather occurs along a route.
- To better accommodate using the experimental GFA across multiple platforms a user account is needed to provide the capability to login and display user preferences across all devices.
- The addition of a smoke forecast is needed to support decision making.



Recommendations

- Provide the capability to move and/or minimize all legends and dialog boxes.
 - In the Cross Section Tool recommend to provide:
 - User feedback the route displays after selecting the “Go” button by minimizing or moving the dialog to display the route on the map.
 - The capability to choose more than one weather variable at one time.
 - A route example above the text box with directions specifying all letters need to be capitalized and dots need to be used in the route.
 - Provide the capability to select more than one overlay at a time in the Select Active Layers dialog and provide the capability to manually close the dialog by adding a “x” in the upper right hand corner.
 - Increase the visibility of the “Display Legend” icon by enlarging the icon and/or changing the icon to a button that has text that toggles from “Display Legend” to “Hide Legend.”
 - The GA and LA mode use different altitude measurements recommend either making the measurement (MSL and/or AGL) more noticeable by changing the font color and increasing the font size.
 - The altitude slider:
 - Place MAX and HI at the top of the slider.
 - When a specific altitude is selected, recommend removing the line that gives an indication the selected altitude and all the values below will be displayed.
 - Recommend providing the capability to create a user account to save preferences that can applied across different platforms once logged-in.
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Recommendations

- Recommend legends should only provide information regarding the weather products being displayed.
- When initially opening the experimental GFA recommend displaying the entire coverage area.
- To increase the usability and suitability of the cloud information recommend providing the capability to filter by altitude and cloud coverage type.
- Recommend adding a smoke forecast to support decision making processes.