



FALCON BMS

Interactive Maps



Ver.: BMS 4.37

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FOREWORD

PURPOSE AND SCOPE

This manual contains information on the Falcon 4 BMS Interactive Maps, which allows a user to locate airports, provides access to airport information (e.g. airport charts, departure charts and approach charts) and a place to conduct flight planning and briefings with mission data, weather information and whiteboard annotations.

In addition, the interactive map allows the user to conduct measurements and access mission computed data from the flight plan.

The Interactive Maps are available to download and can be used as a basis for adding more maps for other theaters or operation.

REQUIREMENTS

To use the Interactive Maps a supported Web Browser is needed on your device. Significant effort has been made to support the Interactive Maps on many platforms and Browsers.

The following is a list of Operating Systems that testing is being done prior to release:

- Windows 10/11
- macOS
- iPadOS
- iOS

Linux is supported but is not an active test platform. Based on the availability of browsers on these platforms the following browsers have been tested:

- Microsoft Edge (Windows only)
- Firefox
- Chrome
- Safari
- Brave
- Opera (macOS)
- Vivaldi (macOS)

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1 FEATURE OVERVIEW

The BMS Interactive Maps online tool is a place to access AIP data and plan and brief your mission. You can overlay Mission Data, weather data and add additional annotations on a whiteboard for additional SA and briefing purposes.

The official location of the Interactive Maps is: <https://maps.falcon-bms.com>

On this page you will find an overview of the features as well as the supported Theaters.

1.1 Supported Theaters

Currently the Interactive Maps are provided for:

- Korea Theater of Operations (KTO)
- Balkans Theater of Operations (BTO)
- Israel Theater of Operations (ITO)

To add Additional theaters, see section about Development.

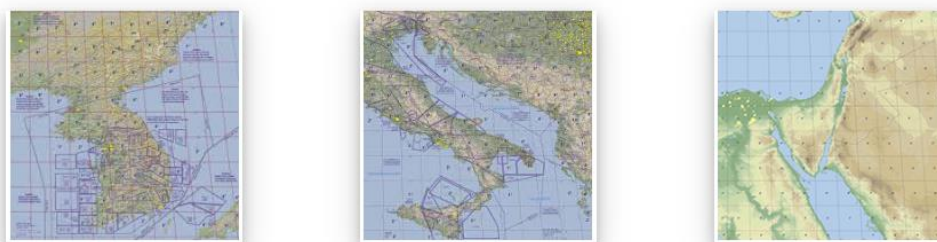


Figure 1 The default provided Theaters of Operation

1.2 Feature Summary

The BMS Interactive Maps can be used on your digital kneeboard or as a desktop browser application for planning, briefing and flight operations. As a Mission Commander you can plan the mission by adding annotations to the mission information from the mission.ini to increase situational awareness (SA), display weather information and discuss the mission during the briefing or as a pilot you can with the Callsign.ini use the Interactive maps to have all your route and mission information in one place and have access to all the airport frequencies and charts.

The Interactive Map in summary provides the following:

- Locate airports and navigation beacons and provide access to their AIP data.
- Ways to pan, zoom and measure track information on the map.
- Import Mission data (.ini) and Weather data (.fmap) to be shown (including METAR)
- Make Whiteboard annotations (bullseye, drawing, text, and Military Symbols).
- Access Flight data (Mission Objectives, Frequencies, fuel consumption, etc.)
- Show Latitude and Longitude for the cursor position on the map.

The weather from an .fmap can be displayed as a weather channel, doppler radar, winds, and pressure charts. The mission data (Objectives, TOS and TAS and duration) can be changed to get a more accurate flight time and fuel consumption estimate and bingo calculation.

Whiteboard annotations can be saved and recalled later during the briefing or can be distributed with the Mission.ini and weather files. The Military Symbolology on the whiteboard is based on MIL-STD-2525D document but only the BMS relevant icons have been provided.

Figure 2 shows an example of the Interactive Map on macOS showing the wind barbs, whiteboard annotations as well as the flight route with mission objectives and calculated Flight information (e.g., distance and fuel). It also shows an airport diagram.

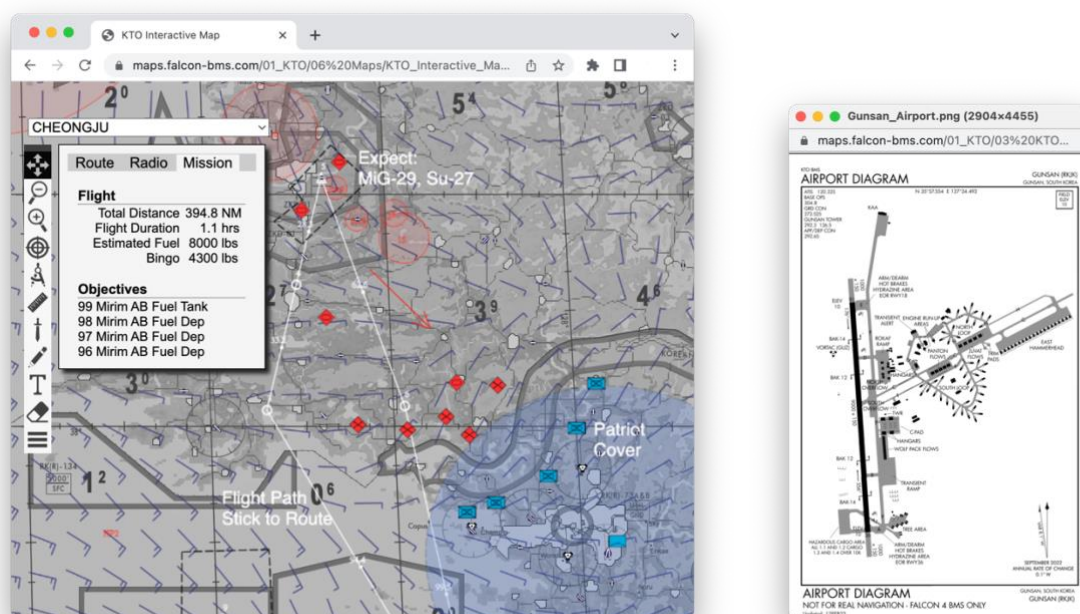


Figure 2 Example Interactive Map Showing Mission, Weather, White Board and Airport Chart.

The sections following will discuss in detail the user interface, operations, and steps to interact with the Interactive Maps on the desktop or tablet and discussed how to add your own additional theaters of operation.

2 BASIC FEATURES

This section describes the basic map features for the interactive map from finding airports to making distance measurements and examining the map.

It also discusses the basic settings menu for managing the visibility of certain layers and the live Connectivity capabilities (e.g. live GFS weather).

2.1 User Interface

The user interface of Interactive Maps has areas:

- The map with the basic map and three annotation layers (i.e., mission, weather, and whiteboard)
- The Airport selection list with major airports and airstrips for the Theater of Operations.
- The Toolbar with the map actions buttons.

The Map area is where hotspots exist to access airport data and where weather and mission route data and pre-planned threats are rendered as well as the top layer which is the whiteboard. The airport selection list is used to find airports on the map and the Toolbar contains buttons providing access to map navigation (panning icon and zoom icons), mission related information (bullseye icon and navigation compass icon), the measure tool (ruler icon) and the whiteboard tools (Sword icon, pencil icon, text icon and eraser icon) and lastly is the settings button for configuration and map settings access.



2.2 Airport Information

The main purpose of the Interactive Maps is to provide easy access to all the airport charts and VORTAC data and most Aeronautical Information Publication (AIP) data for a specific theater in an intuitive manner. The online map helps to identify or locate an airport and once identified provides access to the AIP data for that specific airport.

2.2.1 Finding Airports

There are basically two ways to find an airport:

1. Hover over an airport on the map and use the tooltip hotspots to identify the airport or
2. Use the airport selection box at the top left of the map.

The airport selection box contains a list of the airports and airstrips in the theater grouped by country and type of runway (AFB or Airstrip). Selecting the desired airport from the list will center the map on the desired airport and draw a red circle on the map to locate the airport for you.

2.2.2 Airport Charts

To access the basic AIP data and charts for an airport simply click on any airport on the map (while in panning mode) and a modal dialog will be displayed for the selected airport providing:

- The name and Latitude and Longitude of the Airport with its elevation
- The Available runways
- The TACAN channel information
- The Radio frequencies for the Weather and Air Traffic Control (ATC)
- Below the basic AIP you will find the list of available charts.

INCHEON (RKSI)	
N37°30.460' E127°23.122'	
Elevation: 10 ft	
RWY: 15L/33R-15R/33L-16/34	
TCN: 85X	
ATIS: 128.45	
GND: 266.925	
TWR: 231.8	
APP/DEP: 293.225	
Charts	
Airport Diagram	
APP - ILS RWY 15L (111.9)	
APP - ILS RWY 15R (109.1)	
APP - ILS RWY 33L (109.3)	
APP - ILS RWY 33R (108.9)	
DEP - 15L - 15R	
DEP - 33L - 33R	

All airports include a diagram of the Airport and depending on the runways and facilities at the airport there can be approach and departure charts for both VFR and IFR weather.

2.3 Map Navigation

The map navigation allows you to pan the map and zoom in and out on the map.

2.3.1 Map Panning

The panning action button on the toolbar is the default action and will be set as the default when nothing is selected anymore. The user can either use the scrollbars of the browser or left click and hold and then drag the map up, down, or left and right.

2.3.2 Map Zoom

The zoom actions allow the user to scale the map without adjusting the browser zoom level (which can also be used to scale the viewport). The magnification (+) will zoom in and provide more map details whereas the magnification (-) will show more terrain with less detail. The most detail is provided at the 1:1 pixel to viewport pixel ratio. The least detail is 0.55 scale of the pixel which is about 50% of the original map size.

To quickly go to max detail hold shift-key and press the zoom in button and to quickly go to least detail hold shift-key and press the zoom out button.

2.3.3 Map Measurements

To measure distances and heading on the map you can use the measure action button (i.e., ruler) on the toolbar. To measure click and hold on your starting point and drag the ruler end point to the target destination. As you drag the ruler the heading and distance for the origin will be rendered in the middle of the ruler. The start anchor point of the ruler is marked with a square. Releasing the mouse button will remove the ruler from the map.

2.4 Configuration Settings

The settings action button (i.e., hamburger icon) will display a modal dialog with settings for the common settings, chart related settings and visibility settings. At the bottom there are three actions buttons (from left to right):

- The whiteboard save button.
- The Whiteboard reset button.
- The page reset button.

2.4.1 Common Settings

Now there is only one generic setting i.e., the unit of measure. This can be set to use the imperial units or the default metric units. Changing the value will influence the display of temperature (Fahrenheit versus Celsius) and pressure data (inches of mercury versus millibar)

Figure 3 Settings Dialog

2.4.2 Chart Settings

The chart settings allow you to influence how the base map is displayed (i.e., default/color or grey scaled for high contrast) select the type of weather chart to display:

- Weather channel
- Wind Barbs
- Pressure Isobars
- Doppler Radar
- Clouds

For more information see the section about weather data.

2.4.3 Visibility Settings

The visibility settings include layer visibility control and an option to show/hide the map coordinates in Lat/Long and in X, Y map coordinates.

2.4.4 Action Buttons

The three action buttons at the bottom of the dialog allow you to save the whiteboard, clear the whiteboard and reset the map (without reloading remote). When the save button is clicked the Interactive Map will save a Whiteboard.png to your downloads folder which can later be restored with a drag and drop (for more details see the whiteboard section).

2.5 Configuring Connections

The Connectivity tab in the Configuration dialog has two sections:

- The Whiteboard Collaboration Connectivity
- The Live Global Forecast System (GFS) connectivity

The Collaboration connectivity allows you to provide connection information for Whiteboard collaboration via a Interactive Maps Node.js server that manages the Whiteboard events between browsers briefing sessions.

The Live GFS connectivity allows you to access live data, download, import and convert a GFS grib2 file into a BMS .fmap weather file. This way create sensible weather for your campaigns and TEs is a breeze.

Figure 4 Connectivity Dialog

2.5.1 Whiteboard Collaboration

In order to have a collaboration session you must connect to an Interactive Map collaboration Node.js server which uses WebSocket API for its connectivity. The setup and configuration of the server will be discussed later. The whiteboard collaboration allows Pilots to coordinate, and plan/brief a mission and each save the collaborative Whiteboard local and have it visible on your digital Interactive Map Kneeboard.

2.5.1.1 Client Connection

To connect to the collaboration server you must provide the connection Address and Port and your session credentials which is Your Callsign or Name and the name of the Session to join. Sessions are unique per server address and can be based on your mission name or a more obscure connection string. Since the session only exists during the briefing no data is stored in the server (it is only a relay switch) with the exception of the session and callsign. When you mistype the session info you will create a new session but when you disconnect or drop the connection the session will be removed if no users are connected.

Once you have provided the connection, session and callsign information simply press the Join button to join or create the session. Once successfully connected the Button text will change to Leave. Any connection failure will be shown with a browser alert.

Once connected you will be able to place C2 Symbols and draw on your local whiteboard and the draw events will be relayed and distributed to your peers in the session. The system uses very simple and tiny messages to inform the peer connections what to do. For example when drawing a line after the originator of the draw action completes the line it will send a message ID and start and end of the line on the whiteboard.

To leave a session simply press the “Leave” button and your connection to the session will be removed.

2.5.1.2 Collaboration Features

During a briefing peers can discuss and place the location of the bullseye, draw freeform, lines, ellipses, text or place symbols and erase and these elements will via the IMCS server show on all the session peer browsers.

The users can also prepare whiteboards and when you drop the Whiteboard.png files they will all be distributed to the peers for viewing and discussion. Like the normal whiteboard stacking while holding shift you can stage your briefing as you would normally do.

In order to be able to discuss and point at things, the collaboration also includes a digital laser pointer. To activate the pointer simply put the toolbar in the move mode (top button on the toolbar) and press the control key on the keyboard. While holding the ctrl key you will see a laser on the whiteboard which will also show on all the peers in the session.

The process for “late” peers to see the current state is simple. Just save the Whiteboard and drag the newly saved .png file onto the Interactive map to resync everyone.

Each peer stays in full control of their Interactive map and can pan and zoom and measure as they like and explore all the features of the interactive map while being in a session.

2.5.1.3 Server Setup and Configuration

The IMCS (Interactive Map Collaboration Server) requires a Node.js capable browser or the installation of Node.js.

Download and install a copy of Node.js for your platform from: <https://nodejs.org>

To install the IMCS download the package from falcon-bms.com and extract the software.

The IMCS uses port 3000 by default to listen for client connections but this can be change by providing the port number at startup.

So the following will launch the IMCS on port 3100:

```
node <path_to_imcs_index_file>/index.js 3100
```

As an MC you can setup your own Node.js server in a few minutes, setup your firewall to have the port passthrough to your Node.js and have your team connect.

Servers on one IP address can accept 65K connections. One server can serve many sessions and so sessions come and go and are determined by the MC as he initially connects and starts the session and is marked as the Commander in the server.

2.5.2 Global Forecasting System

Interactive Maps has the capability to access and download GRIB2 (Gird Binary Version 2) files from the Global Forecasting System server and so providing access to live weather information for your tactical engagements and campaigns. The forecasts are generated 4 times per day and can provide up to 384 hours (i.e. 16 days) of look ahead from the selected time reference as well as some historical forecasts.

2.5.2.1 Downloading GFS Data

To download GFS data in the GRIB2 format simply select the forecast date (latest available date on top), select one of the 4 update time periods and select the forecast hour for which you want the GFS data. See Figure 4 Connectivity Dialog. In the figure the selected date is 20230613, the update cycle time is 0000Z and the Forecast hour is 1. This select a day 13, 0100Z weather forecast valid for 1 hour. Setting the Forecast hour to 5 will give you a day 13 0500Z forecast. If you switch the update cycle to a 1800Z period and forecast hour to 1 then you get a day 13 , 1900Z forecast. So there are multiple ways to get the 1900Z for day 13. You can even start with yesterday and add the extra 24 to the forecast hour to get again a 1900Z for day 13. The closer your date and update cycle to the real time the more accurate is your forecast.

To download press the “Download” button. Depending on your browser it may save the grib2 file right away or it will show a file dialog to save the file to your downloads folder. The Interactive Map systems uses the theater information from the HTML to bound the subregion for which to request weather data.

WARNING: Pressing many times fast (i.e. 50+ hits per second will get you banned from the NOAA GFS system. Initially temporarily but if you continue this behavior your IP will be permanently blacklisted and you can write them and explain why your connection should be reinstated. Be kind and considered or suffer the consequences. GFS terms of use are available and please take a look at their abusive user block [policy](#).

Interactive Maps will only show dates with update cycles that it knows must be there per schedule.

The grib2 file contains several GRIB messages with all the weather data. The GRIB message format is well documented. See [NCEP WMO GRIB2 Documentation](#) for all the details. A GFS create grib2 file is named like: *gfs.t00z.pgrb2.0p25.f001*

It shows that it is gfs data from t00z update cycle containing GRIB version 2 messages with a grid that is 0.25 degrees by 0.25 degrees surface area per data point for the forecast hour 001. Note that there is no date in the name. To get several hours simply increase the forecast hour and click the download button.

2.5.2.2 Importing GFS data

To import and see weather data from the GFS, simply find the file on your local file system and drag the “gfs” file with the GRIB2 messages onto the Interactive map. This is exactly the same as what you do for an .fmap. The Interactive Map fully understands and decodes the requested GRIB2 messages and transcodes them into the BMS .fmap format.

2.5.2.3 Converting GFS to FMAP

Since Falcon BMS works with .fmap files you must convert the GFS data into the .fmap data format. To this simply import the GFS data with drag and drop and after hit the “Save” button on the connection dialog and it will save the GFS data as a .fmap file. The name of the file is based on the Day of the month and time for which the data is valid. So for our example this means day 13, 0100Z so the filename will be: 130100.fmap

Afterwards you can rename them as you want but this allows you to collect and easily keep the 16 days’ worth (384 max hours) of forecasts as .fmap files obviously you can come back daily to build up a month’s worth of weather files for a theater.

2.5.2.4 JavaScript and Browser Limitations

Why download and save the GFS, import with drag and drop and then save to .fmap format. The initial approach was to use the JavaScript fetch API however the GFS system server forbids this on the CGI server. It does this by with: No 'Access-Control-Allow-Origin' header is present on the requested resource. This prevents your local browser from programmatically to access the GFS content. CORS proxies to circumvent these things can be setup but is just adding more dependencies.

So the select, download, import and save as .fmap is a nice way to work with the browser security model and still get your weather data in a sensible way.

3 Mission Information

The Interactive Map can render mission information from the Mission.ini or Callsign.ini and allows for what if discussions about speeds and time on stations (TOS) for waypoints as well as add waypoint specific information like duration to get a better estimate of the minimum needed fuel for the mission and the duration. Setting accurate waypoint durations gives a relatively accurate mission data estimation.

Without the Mission.ini or Callsign.ini the system will not show the Mission dialog when the user clicks the compass action button. To activate the compass action button the user must drag a Mission or Callsign.ini file onto the Interactive Map. This will trigger the system to parse the .ini file and draw the flight plan and threats.

3.1 Waypoint Route

The interactive map will render the following information on the map:

- The steer points (both Nav and Target) and the flight path between the steer points.
- The Preplanned threats
- The boundary lines (dashed) (e.g., Tanker track, etc.).

When you drop the .ini file the system will calculate the centroid of the route and focus the viewport on it.

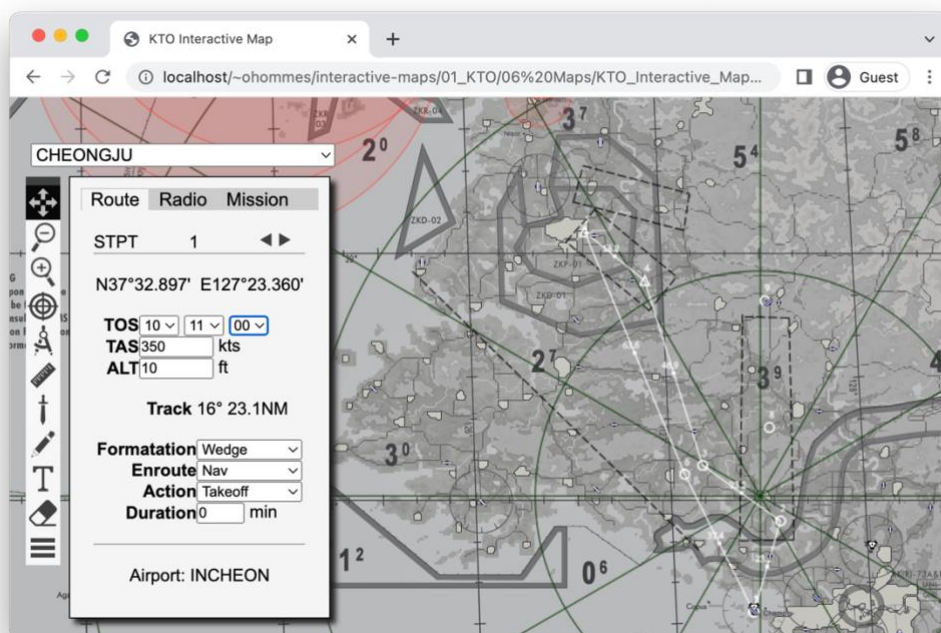


Figure 5 The Steer points, Flight route, Preplanned threats, and Lines

3.2 Waypoint Data

The Waypoint data dialog is shown when the user activates the compass icon on the toolbar. This starts a dialog with three tabs of which the Route Data is tab one. This tab shows the detailed information of that steer point. The user should be aware that the time and Airspeed are not available in the .ini file. This means that sensible defaults are selected, and the user is expected to at least select the Take-off time for STPT 1. The default is 9 am. The default Airspeed is set to 350 kts and is used to calculate the TOS for the remaining Steer-points.

For each steer-point the following details are provided

- Type of steer point (Nav STPT or TGT) with the steer-point number.
- The Latitude and Longitude of the steer-point in degrees and minutes of arc.
- The Time-On-Station (TOS). This data is not present in the .ini file and so the user should set the Take-off time.
- The Airspeed (TAS) in kts.
- The Altitude (usually wrong because the .ini seems to not have the accurate data)
- The Track to fly to the next steer-point (heading and distance in NM)
- The formation to fly.
- The Action for that steer-point (e.g., Take-off, Land, Push, refuel)
- The Duration at or near that steer-point (some defaults set for CAP and refueling.)
- The Steer-point notes.

The notes section contents depend on the action field and can contain Airport and Weather information (takeoff/land), AWACS callsign (Nav) and Tanker Callsign (refuel).

In this dialog the user can change Airspeed and influence the TOS for the next steer-point or set the TOS for that steer-point and affect the Airspeed from the previous steer-point. There is NO locking feature. When changing the duration at steer-point it will obviously impact the TOS of the next steer-point by adding to the computed travel time.

Figure 5 shows the example Route details for Steer-point (STPT) 1.

3.3 Radio Frequencies

Part of the Callsign.ini are the VHF and UHF frequencies (these are not in a Mission.ini). The radio frequencies are displayed on the second tab. The tab shows the 20 UHF and VHF frequencies for the 20 presets. For each preset also the general use abbreviation is provided. These frequencies are used to determine the Callsign of AWACS and the Tanker on tab one. The frequencies are 000.000 when no radio information is available (i.e., Mission.ini).

Route	Radio	Mission
PRESET	UHF	VHF
01 OPS	304.800	138.050
02 GND	273.525	120.225
03 TWR	292.300	126.500
04 DEP	292.650	126.200
05 CHK	290.125	134.250
06 TAC	369.775	133.150
07 APP	292.650	126.500
08 TWR	292.300	126.500
09 GND	273.525	132.875
10 APP	317.425	126.500
11 TWR	305.400	130.200
12 GND	275.800	121.200
13 AAR	249.275	119.500
14 CMN	339.750	119.500
15 FLT1	226.375	141.300
16 FLT2	302.875	142.850
17 FLT3	333.675	141.625
18 FLT4	332.775	143.125
19 FLT5	276.850	35.425
20 LSO	280.500	121.700

3.4 Mission Data

The Mission Data tab provides overall Mission related information for the flight and allows for setting up your flight information to generate a digital kneeboard Mission Briefing and digital kneeboard Weather Briefing.

3.4.1 Computed Flight Information

It computes the total flight distance of the route, Calculates the estimated time needed to complete the route (including loiter time at steer-points (i.e., duration), The minimum estimated fuel needed to complete the planned route and the computed bingo value.

The Bingo fuel is computed based on 1000 lbs. base + VMC/IMC consideration and max distance to Home plate following flight plan home. To get IMC (limits are based on Class C airspace: visibility < 3 km or cloud base < 4000 ft) considered for landing you must first drop an .fmap and then the Callsign.ini. IMC: $(1000 + (400 \mid 800) + \text{Distance to Home plate in NM} * 15)$ lbs.

The VMC pattern use is 400 lbs. and for IMC an additional 400 lbs. is added.

The Mission Data also includes a Playtime value that shows how much time you have once you reach the furthest target/steer-point before you will reach Bingo fuel state. The computation is: $(\text{Total Fuel} - \text{Target Fuel} - \text{Bingo Fuel}) / \text{Fuel Flow per Minute}$. The playtime is the time that you have and can allocate to the durations for each waypoint in the Route tab.

The screenshot shows a software interface with three tabs: 'Route', 'Radio', and 'Mission'. The 'Mission' tab is active. It displays the following information:

- Flight 1**
 - Total Distance: 367.9 NM
 - Flight Duration: 1.2 hrs
 - Estimated Fuel: 7200 lbs
 - Bingo: 4100 lbs
 - Playtime: 23 min
- Package 1**
 - Flight: Mako7 (dropdown menu)
 - Chx: 11/74 (dropdown menu)
 - Fuel: 9000 (input field)
 - 1 (dropdown menu)
 - Y (dropdown menu)
 - lbs (text label)

At the bottom of the 'Package 1' section, there are two small grid icons.

3.4.2 Flight Setup

The flight selection will show information about the selected package, selected Flight and seat#, the Yardstick settings (channel and Band) for the selected flight and the total fuel you plan to take onboard. The selections here will determine the values on the Mission briefing and Weather Briefing reports.

3.4.2.1 Package Selection

You can change the package number to: 1 or 2. Changing the package number will primarily influence the Laser Code assigned to your selected seat. Package 1 will have Laser Codes 15XX and Package 2 will have Laser Codes 16XX where XX depends on the selected Flight and Seat#.

3.4.2.2 Flight Selection

The flight selection allows you to pick the flight in the package and the seat#. If a Callsign.ini has been dropped on the map you will be able to select from 1 of the 5 possible Flight Callsigns in the package; Select the one for which you saved the DTC in Falcon BMS. A Mission.ini file will just show generic Flight1 through Flight5. After picking your assigned

seat it is now possible in the Briefing to show you your full Callsign. For a Mission.ini the Briefing Reports will show the Mission name.

The selection of the Seat# and Flight will determine with the package# the full Laser Code. As an example if you selected Package 1, Flight 2 and Seat 2 you will get the preassigned Laser Code: 1522. The Mission tab screenshot shows Seat 1 picked and Mako7 is Flight 1 (This is also shown as the section header for the computed Flight values).

3.4.2.3 Yardstick Selection

Part of your Standard Operating Procedures (SOP) of your Wing you will setup your yardstick channel and frequency band (Y-band or X-band). There are 10 possible presets: (11/74, 12/75,...20/83. When loading the Interactive Maps for a first time the presets will match the VHF intra-flight settings; so preset VHF 15 for Flight 1 will have 15/78 selected and Flight 2 (VHF preset 16) will have 16/79. These initial values can be changed to your own Wing SOP settings. To do this choose Flight1 and then set the Yardstick, then Flight2 and set the Yardstick. The yardstick values are maintained in the browser local storage and will stick the next time you launch your browser and go to the Mission tab. So once you have your SOP setup you usually don't need to change and so to get proper flight briefings you only need to select your Flight and Seat before creating the Mission and Weather briefings.

3.4.2.4 Fuel Configuration

To calculate proper fuel remaining for each waypoint on your route and for determining the playtime you need to provide the total fuel you plan to take on. If you desire a specific amount of playtime at the target you can increase the fuel to a level where you have the desired playtime. This means you can fly to the target, operate at the target area for the playtime duration and once the playtime is up you will have about reached the Bingo Fuel status.

3.5 Briefings

Interactive Map provides a Mission Briefing report with the flight package data, airbases with AIP data, flight plan, mission objectives and support assets and a Weather Briefing report with Performance Information (e.g. Density Altitude) and Runway selection, enroute METAR data and winds and temperatures aloft for the route. These briefing reports will show in a new window on your desktop and on your mobile device these will launch as tabs.

3.5.1 Mission Briefing

The Mission briefing contents depends on whether a Mission.ini or Callsign.ini. When a Mission.ini is used you will get some basic package and route information but no support assets will be listed and also no Flight UHF and VHF will be provided since these can only be determined from a Flight specific DTC (i.e. Callsign.ini).

The full briefing has 6 sections:

- Mission Summary
- Package Information
- Airbase Information
- Flight Plan
- Mission Objectives
- Support Assets.

Each of these will be discussed in detail in the proceeding subsections. To show the mission report click the multi-table icon on the mission tab bottom left.

Mission Datacard

about:blank

Mission Briefing

Callsign

Mako71

Times

08:40:00:PIT

08:50:00:UFC

08:54:00:TAXI

09:00:00:T/O

Fuel

7000

5100:4100

Laser Code

1511

Intel

SA-11 SA-10 SA-17 RV

Package

Callsign

UHF

VHF

IDM

TCN

Mako7

226.375

141.300 [15]

XMT 10

11/74Y

Panther2

302.875

142.850 [16]

XMT 20

12/75Y

Cajun6

333.675

141.625 [17]

XMT 30

13/76Y

Gamble5

332.775

143.125 [18]

XMT 40

14/77Y

Lightning4

276.850

35.425 [19]

XMT 50

15/78Y

Airbases

Type

Location

Airport

TCN

GND

TWR

APP

ATIS

DEP

35.97°N 127.42°E

GUNSAN

75X

273.525

292.3

292.65

120.225

ARR

35.97°N 127.42°E

GUNSAN

75X

273.525

292.3

292.65

120.225

ALT

35.12°N 129.14°E

SACHEON

37X

275.8

305.4

317.425

126.625

Flight Plan

STPT

Location

Action

TOS

Hdg.

Dist.

TAS

Mach

Alt.

Fuel

1

35.97°N 127.42°E

Takeoff

09:00:00

51

0.0

350

0.52

10

6800

2

36.13°N 127.68°E

Nav

09:02:37

106

15.3

350

0.52

82

6170

3

35.64°N 129.70°E

Push

09:20:34

175

120.0

350

0.52

352

4600

4

35.44°N 129.71°E

Nav

09:22:36

162

131.9

350

0.52

15

4421

5

35.24°N 129.77°E

Nav

09:24:44

72

144.4

350

0.52

298

4234

6

35.49°N 130.74°E

Grnd_Attack

09:33:06+5

276

193.2

350

0.52

71

3502

7

35.79°N 127.42°E

Split

10:06:12

357

357.1

350

0.52

15

544

8

35.97°N 127.42°E

Land

10:08:04

N/A

367.9

350

0.52

10

382

Objectives

STPT

Location

Target

99

38.10°N 130.14°E

Sokcho AB (RKND) Airbase Ammo Dump

98

38.10°N 130.12°E

Sokcho AB (RKND) Airbase Ammo Dump

Support

STPT

Location

Callsign

Type

UHF

VHF

N/A

N/A

Sentry7

AWACS

290.125 [6]

134.250

9

37.08°N 128.93°E

Copper6

Tanker

249.275 [13]

119.500

Figure 6 Mission Briefing Report

3.5.1.1 Summary Section

The Mission summary contains the Mission Name (Mission.ini) or your Full callsign (Callsign.ini) for your selected flight and seat. Next you will find the 4 computed ground check-in times:

1. PIT (-20 minutes to takeoff)
2. UFC (-10 minutes to takeoff)
3. TAXI (-6 minutes to takeoff) and
4. T/O. (wheels-up / takeoff time)

To get the proper computed times make sure to set the Mission Start time on the route tab.

Next you will find the total fuel loaded and the computed Joker and Bingo fuel values based on the flight plan. The last two elements are the assigned laser codes based on package number, flight and seat# and the known threats.

3.5.1.2 Package Section

The package section contains the information about the possible flights in the package. For a Mission.ini you will see generic Flight tags and no UHF and VHF information. For a Callsign.ini you will see all the 5 possible flights in your package with their UHF and VHF frequencies (with preset) and the IDM and preset TCN for the yardstick. Typically the Flight lead will set the low channel and the wingman the conjugate high channel for the same frequency band. The Element lead and the assigned wingman will either keep the high channel or will switch to the other frequency band. Your mission commander should give you more details.

Why are there 5 flights listed when you might have only 2 flights in your actual package? Because the Callsign.ini created based on your DTC does not list active flights, it is only possible for the Interactive Maps to derive the 5 possible flights and callsigns in the package.

3.5.1.3 Airbases Section

The airbases section on the mission briefing report provides all the frequencies you need for the Departure, Recovery and Alternate airports (TCN, GND, TWR, APP and ATIS). Also the military style for the location (degrees and fraction of degrees only) is used which is accurate to about 6 nautical miles (i.e. 1/100 of 60 NM). So 127.42E degrees is about 127 degrees and 25 minutes of arc. The frequencies here are derived from the chart and so if your DTC has the wrong frequencies for the presets you can always get the AIP values here.

3.5.1.4 Flight Plan Section

The flight plan section provides information per steer-point from take-off to landing. For each steer-point you will get the Action for the that waypoint, the TOS with loiter time (loiter time is shown with +M where M is minutes before leaving the steer-point. The example shows that at steer 6 you arrive at 09:33:06 and leave 5 minutes later: 09:38:06. You can modify the loiter time in the duration field for each steer-point

Next you will find the Heading and Distance to the next waypoint followed by the True Airspeed (TAS) and Mach number. Mach is a function of temperature only but since the temperature drops with altitude it will become higher. The Mission.ini has at times correct altitude values but the Callsign.ini seems to have uncorrelated values. You can modify or correct the altitudes in the Route tab for each steer-point. Without an .fmap file "standard" weather conditions will be used.

3.5.1.5 Objectives Section

The mission objectives are pulled from the precision steer-points 80-90. If you place your objectives/targets elsewhere then these will not be shown. For each target you will get the military location do not use for GPS guidance; always use the preset steer-point number listed in the first column.

3.5.1.6 Support Section

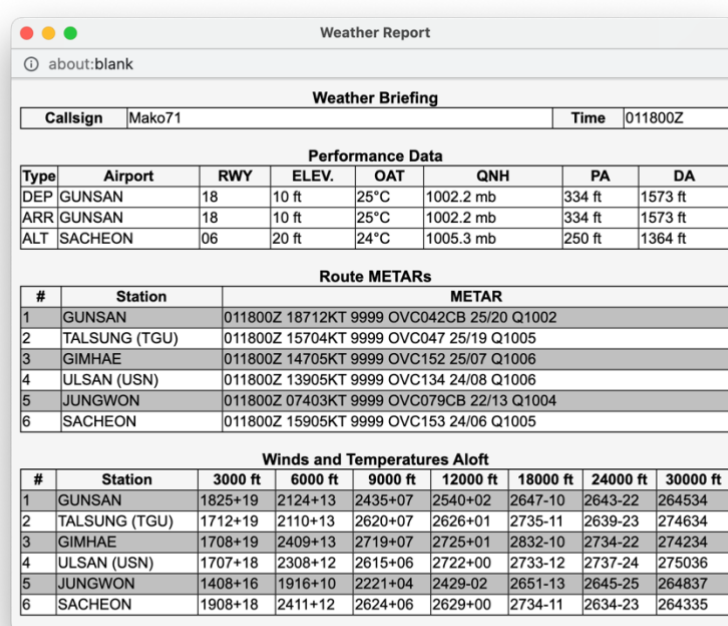
The last section lists the support assets (AWACS and Tanker if any) with their callsign and frequencies to hail them.

3.5.2 Weather Briefing

To get a weather briefing you must have provided a weather .fmap file for a specific day and time. Without it the single table button on the Mission tab will not work. To launch the weather briefing report you must click the single table icon next to the mission briefing button. The weather briefing gives time of report followed by the performance data, route weather METARs and winds with temperatures aloft. Each of these will be discussed next.

3.5.2.1 Performance Section

The performance section gives information needed to Take-off and landings. Based on the Wind direction you get the selected Runway and elevation for the Runway as well as the additional values of the Outside Air Temperature and Pressure information to calculate the Pressure Altitude (PA) and Density Altitude (DA) which significantly will impact your aircraft performance. With low pressure and high temperatures the aircraft will behave as if it is already several 1000 feet above MSL.



Weather Briefing							
Callsign		Mako71		Time		011800Z	
Performance Data							
Type	Airport	RWY	ELEV.	OAT	QNH	PA	DA
DEP	GUNSAN	18	10 ft	25°C	1002.2 mb	334 ft	1573 ft
ARR	GUNSAN	18	10 ft	25°C	1002.2 mb	334 ft	1573 ft
ALT	SACHEON	06	20 ft	24°C	1005.3 mb	250 ft	1364 ft

Route METARs	
#	Station
1	GUNSAN
2	TALSUNG (TGU)
3	GIMHAE
4	ULSAN (USN)
5	JUNGWON
6	SACHEON

Winds and Temperatures Aloft							
#	Station	3000 ft	6000 ft	9000 ft	12000 ft	18000 ft	24000 ft
1	GUNSAN	1825+19	2124+13	2435+07	2540+02	2647-10	2643-22
2	TALSUNG (TGU)	1712+19	2110+13	2620+07	2626+01	2735-11	2639-23
3	GIMHAE	1708+19	2409+13	2719+07	2725+01	2832-10	2734-22
4	ULSAN (USN)	1707+18	2308+12	2615+06	2722+00	2733-12	2737-24
5	JUNGWON	1408+16	1916+10	2221+04	2429-02	2651-13	2645-25
6	SACHEON	1908+18	2411+12	2624+06	2629+00	2734-11	2634-23

Figure 7 Mission Weather Report

3.5.2.2 Route METAR Section

This section finds the closest weather stations along the planned route/waypoints. The weather stations are listed in the order of your flight plan and also includes the METAR for your alternate airport. For more information on the METAR format you can search online.

3.5.2.3 Winds and Temperatures Aloft Section

This section shows the winds aloft for the selected weather stations along your route or near waypoints. The information is formatted like so DDffTT: Wind Direction (DD), Wind Speed (ff), and Temperature (TT). The temperature is in Celsius only and the sign is NEVER provided about 24000 ft since they will always be negative (This is the standard for the Winds and Temps aloft reports). Examples of live data can be found at: aviationweather.gov

Use this data to see if you can adjust your route and conserve fuel or when you might encounter icing in poor or inclement weather. In the example you might get icing in the clouds above 12000 ft.

3.5.3 Briefings on Kneeboard

The briefing reports will nicely show up on your digital kneeboard like iPad, iPhone or Android tablets when you have the Interactive Maps launched. Each Briefing report will open as a tab on your mobile device and so you will be able to have the Interactive Map, these briefing reports and airport charts directly accessible (after dropping your weather.fmap and Callsign.ini)

If you want/need to have access to these in your VR cockpit then you will for now have to make window captures using the keyboard shortcuts for your specific platform and save them to the appropriate file for the in BMS cockpit kneeboard.

Future releases of Interactive Maps may provide save options for each briefing with the correct scaling and file name for the BMS kneeboard.

4 Weather Information

This section explains the weather information that is available in the Interactive maps based on an .fmap files or grib2 files with weather information. The .fmap or grib2 file contains information about weather type, pressure, temperatures, winds, clouds, precipitation, and visibility. This information is read when you drop .fmap or grib2 file on the interactive map and rendered on the map to provide weather awareness for your mission.

The weather information is rendered on the map with a particular focus, or you can get a Meteorological Terminal Aerodrome Report (METAR) for each airport on the map.

To get a .fmap file you can use Weather Commander or use F4Wx to download actual weather data or you can use Interactives Map live GFS connection. Creating your own and having consistent weather data is complex with lots of dependencies isn't recommended.

The next sections detail the available weather information.

4.1 Weather Channel

The weather channel look is a rendering of the BMS weather type with temperatures. It will look like a basic weather channel display with sun or clouds and temperature. However, some notes need to be taken. The icons represent the BMS Weather type and not clouds coverage (for cloud coverage you should use the METAR and clouds rendering on the map).

BMS has 4 weather types:

1. Sunny (Sunny icon)
2. Fair (Sunny with Cloud icon)
3. Poor (Cloud icon)
4. Inclement (Rain or Snow icon)

To render this weather chart, select the temperature chart type on the settings dialog.

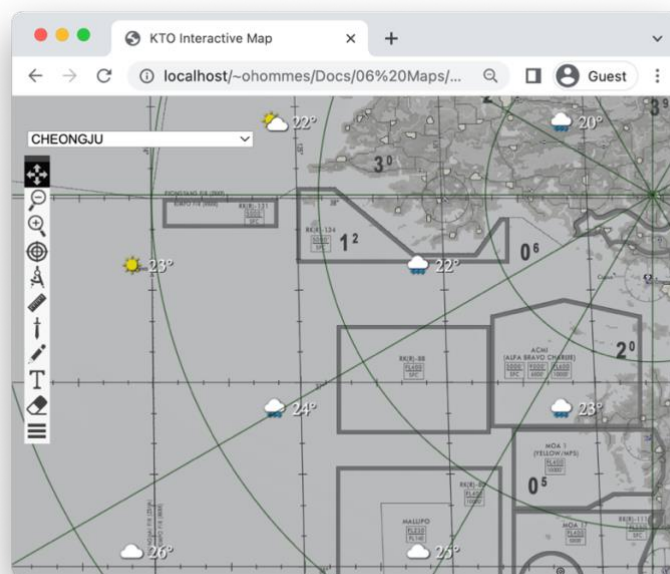


Figure 8 The Weather Channel Look

4.2 Winds

The Winds chart type will be rendered when you select Winds on the settings dialog for chart type. The Winds chart will render the wind direction and speeds using so called wind barbs. The show direction and strength for a selected altitude. BMS supports 10 wind altitudes. The winds can help plan your route for fuel efficiency and speed as well as provide crucial information on how to make your attack run and make use of the wind. Don't fall short when tossing/dropping into the wind.

The Interactive map renders the staff (wind direction) and barbs or flags (to indicate the strength). The strength is rounded to the nearest 5 knots. A half barb is 5 knots, a full barb is 10 knots, and a flag represents 50 knots. Add all the barbs and you get the expected wind speed.

Typically, higher altitudes have higher wind velocities. Select your planned attack or cruise altitude and see what the winds are doing at the planned altitude.

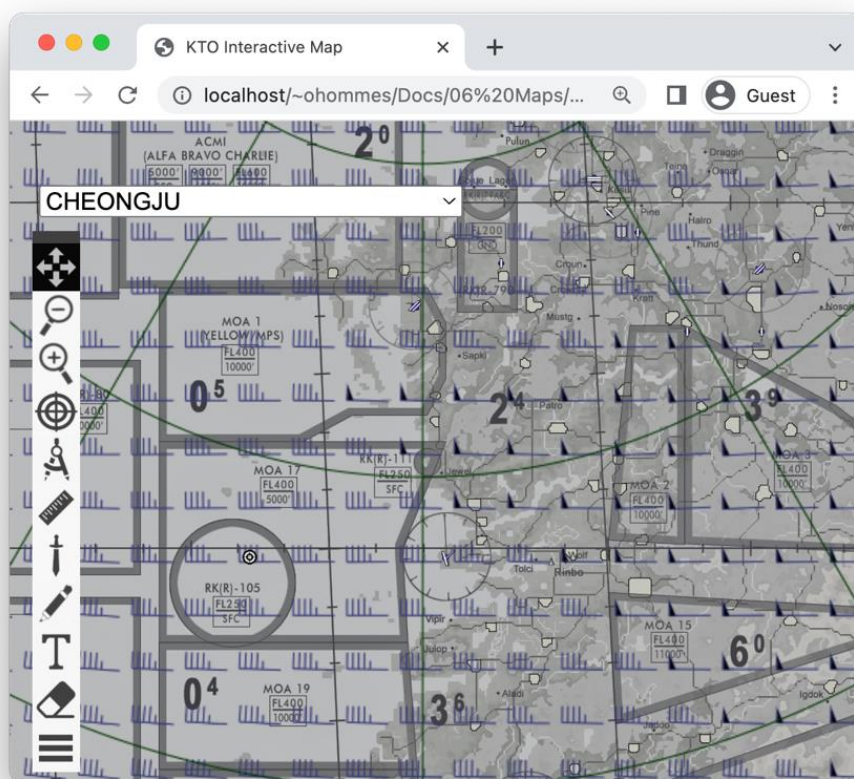


Figure 9 The Winds chart showing the wind barbs.

4.3 Isobar

The Isobar chart provides information about the pressure systems in the area of operations. Use this to determine thunder cells and possible cumulonimbus (up to 30000 feet) and possible showers. You can use this to see if you need a possible alternate or need to anticipate an IFR recovery. Expect thunder cells in areas below 1000 mbar with high humidity. Also check the METAR for the airport to complete the full weather picture for your take-offs and landings.

The chart renders lines between points of the same atmospheric pressure at a given time and the unit of measure can be switch to inches of mercury by choosing the Imperial units.

The term isobar comes from the Greek words isos (equal) and baros (weight).

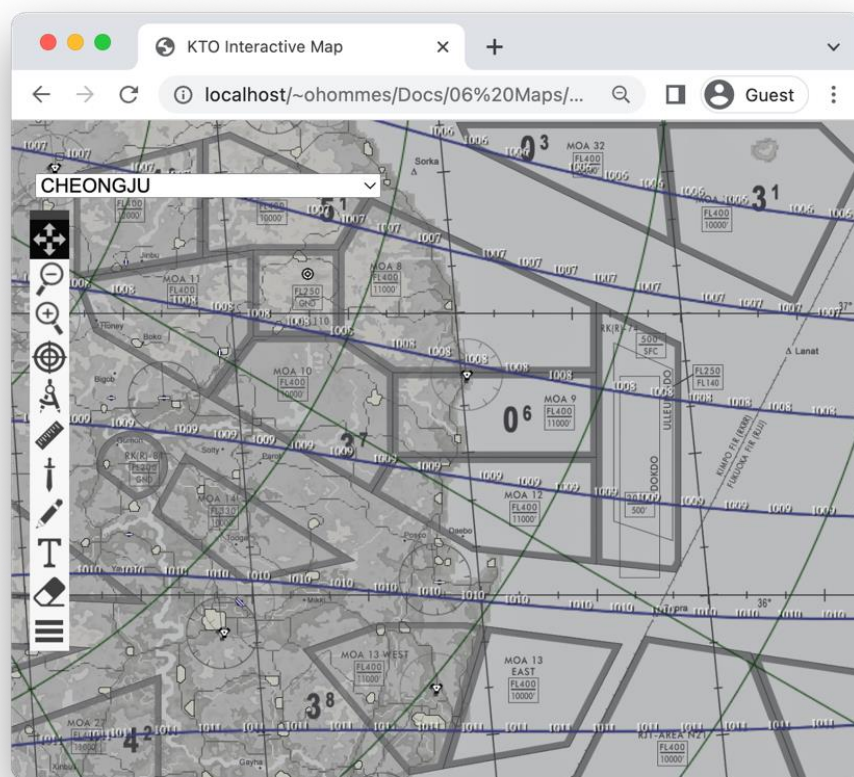


Figure 10 The isobars and weather look like no storm cells in this area.

4.4 Doppler Radar

The Doppler RADAR shows the areas on the map where rain has been detected of a certain intensity and in range of the doppler RADAR. Fog and light rain may not register on the doppler return. Expect rain showers in the detected areas. For Rain to show the BMS weather type must be inclement. Probably not a good time to use laser guided weapons when Heavy rain and clouds are expected in the Area of Operations.

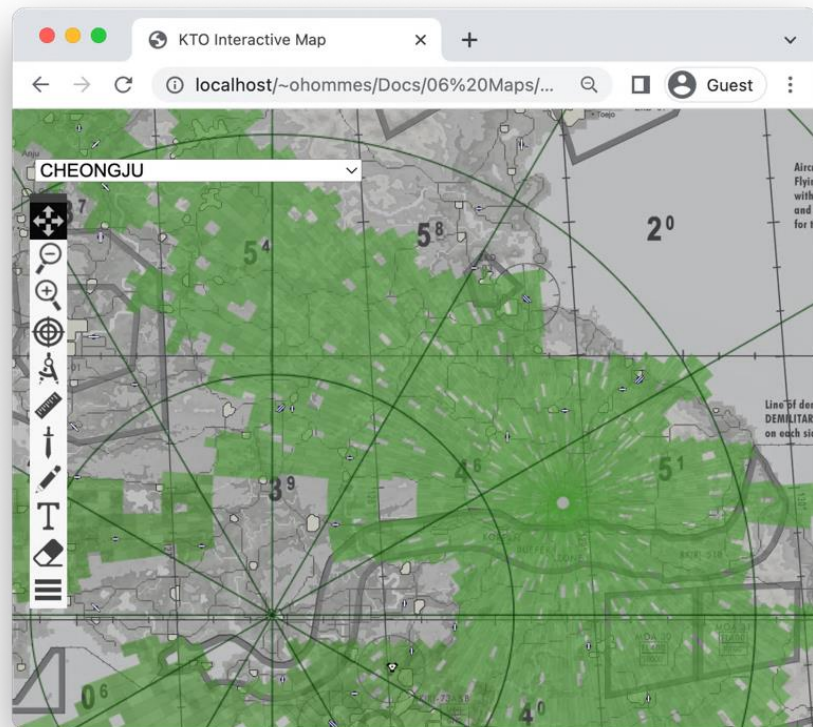


Figure 11 The Doppler Radar showing areas of precipitation.

The clouds weather chart renders areas where clouds are detected based on the cloud coverage. The reflectivity is based on the cloud coverage. The clouds are rendered in the cell and then a gaussian blur (this takes a lot of CPU) is added for cloud effects.

Clouds are not areas of precipitation, for that you must use the Doppler RADAR. For clouds to show on the map the cloud coverage must be scattered, broken, or overcast.

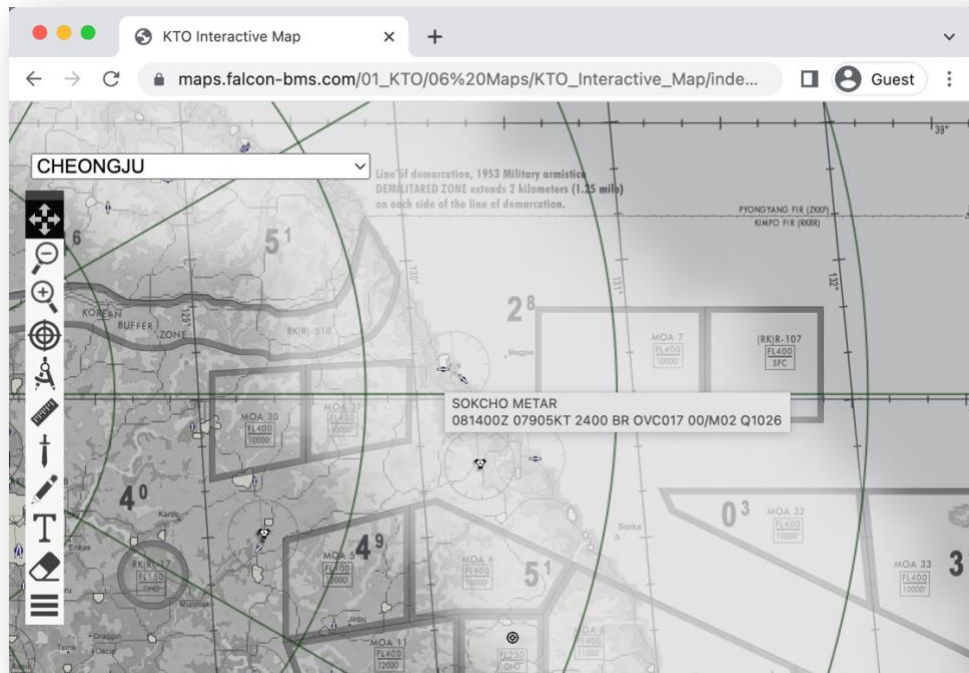


Figure 12 The cloud coverage and METAR report

4.6 METAR

The Meteorological Aerodrome Report (METAR) is created based on a lot of information in the .fmap or grib2 file. Based on your Unit of Measure setting in the Settings Dialog you will either get the European or American METAR. They differ in visibility (i.e. Statue Miles versus meters) and pressure data (inches of mercury Hg versus hPa aka millibars).

The METARs are determined for all the airports on the map and visible as a tooltip for the airport or in the mission route notes. The report starts with the station names (Normally the station identifier but Interactive maps shows the full station name) and type of report (i.e., METAR) then followed with:

- Time of Report (Day and Zulu Time)
- Wind Direction and strength
- Visibility (in European 9999 means greater than 10 km)
- Weather (Like showers, rain, haze, or fog etc.)
- Sky condition (cloud coverage and cloud base)
- Temperature and Dewpoint
- Altimeter Setting
- Remarks (Not displayed but could be automated rain sensor)

When the Temperature and Dewpoint (High humidity and temperatures are “low” then expect some icing as you get into the clouds.

On tablets/mobile devices (e.g., iOS and iPadOS) The METAR is only available for the take-off and landing airports as part of the Mission route information since these platforms do not support tooltips.

To understand the METAR format there are many sources online or decoder pages to help understand the coded notation.

5 Whiteboard

The whiteboard feature is a layer that, allows you to annotate the map for mission (de)briefings. With the Mission Layer and Weather Layer you can discuss the mission plan, route, and weather but with the Whiteboard you can add additional annotations to enhance the OOB and situational awareness.

When the whiteboard doesn't show anything, or lines disappear after drawing; you probably have the Whiteboard layer hidden in the Settings dialog.

The Whiteboard User Interface (UI) has 4 options:

- Symbology (Armory icon)
- Pencil
- Text
- Eraser

Each of these are discussed in detail in the following subsections.

5.1 C2 Symbols

The Symbols dialog gets shown when the user clicks the armory icon (sword). This brings up a dialog where the user can select a symbol icon "stamp". After the dialog is dismissed (click sword again) you can use the selected symbol stamp to place/drag command and control units to their location on the whiteboard.

The Command and Control Symbols are based on the [MIL-STD-2525D](#). A subset of this standard set of icons has been implemented so a Mission designer can show the SA, or you can use this to discuss Mission Building before creating a tactical mission.

The dialog allows the user to select from the icon sets based on the Symbol Standard Identity (Friend or Hostile) and the Symbol Set (Land, Sea, or Air). Based on these Symbol Set selections the Symbol Entity can be selected. The Entity is the combination of entity, entity type and entity subtype from the standard. The Sector 1 and 2 modifications are not yet implemented.

Based on the Entity selection the system will generate the Symbol Identification Code (SIDC) and is able to pick the icon associated with that code. To draw this icon on the map, dismiss the dialog by clicking on the armory button. Then click and hold a place the icon on the Whiteboard. When you release the mouse button the icon will be committed to the whiteboard, and you can only remove it with the eraser.

C2 Symbols

Symbol Set

Identity

Type


Identification

Entity

Sector 1

Sector 2

Symbol Identification Code

 10061000161211000000

[MIL-STD-2525D](#)

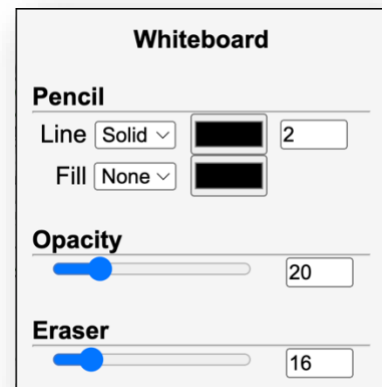
5.2 Pencil Drawing

The next option for working on the whiteboard is the pencil drawing tool. When the user clicks the action button (pencil icon) the system will present a style dialog from where the user can set the style parameters.

5.2.1 Style Control

The user can select the line style (solid, dashed or dotted), the line color using the browser's specific color selection tool and the line width. The User can also specify the fill option for ellipses and the color of fill. The opacity sets the percentage of opaqueness for the fill object.

Besides the pencil control there is also the eraser size setting which allows you to define a larger eraser to erase sections of the whiteboard.



5.2.2 Drawing Actions

The user can draw in 3 modes in the style selected on the Pencil Control Dialog.

1. Free form
2. Lines
3. Ellipses

To draw free form simply activate the pencil and start drawing on the whiteboard in the preset style. To draw lines in the active style, hold the shift-key and click and hold on the map and drag the line to the endpoint. To finish the line, release the mouse click. To create ellipses, hold the Ctrl-key (i.e., Command-key on macOS), click and hold to set the center of the ellipses and drag until the ellipses is the desired size and form. To finalize the ellipses, release the mouse button. Figure 1. Shows some examples.

5.3 Text Annotations

Text annotations are always added in white (for now). To start adding simply activate the text action button in the toolbar and click anywhere on the map to start writing.

The text tool allows the user to enter multi-line text on the whiteboard. The text will be committed to the whiteboard once you click somewhere else on the map. Once committed the text is immutable and can only be erased using the eraser tool.

5.4 Eraser

The eraser tool can be activated by selecting the eraser action icon on the toolbar. The size of the eraser can be controlled from the pencil control dialog. The size of the eraser does not adjust to the zoom level (it stays the size of the viewport pixels). A larger eraser obviously allows you to erase bigger areas at a time. There is no “Undo” function so be careful with erasing.

5.5 Image File

The Interactive Map allows you to retain your annotation work or prepare for a mission briefing.

5.5.1 Saving

The white board can be saved to a Whiteboard.png file in your browser designated Downloads area. The file contains all the data from the whiteboard in the compressed .PNG format.

5.5.2 Loading

To recall a saved whiteboard file, you can simply drag and drop the whiteboard.png onto the Interactive map. Which will replace any existing data unless the shift-key is pressed.

5.5.3 Stacking

Stacking is the process of preparing multiple whiteboard.png or any other image file and pressing shift-key while dragging and dropping a single Whiteboard.png file. The Shift-key will make sure that any previous .png files will not be cleared and so you can stack multiple Whiteboard files together during your briefing.

This allows you to build up your briefing with several whiteboard layers. One could be your wings logo, another could be hostile entities only followed by friendly entities or you could create Whiteboard layers for land versus sea versus air. This way you can structure your briefing and focus the discussion in stages.

6 Miscellaneous

This chapter documents additional information about using the Interactive Maps on either different browsers or platforms that might be helpful for a user. The software and UI design have been designed to fit both Desktop and mobile devices with one single code base and UI design. The goal was to use as little real-estate on the screen.

6.1 Digital Kneeboards

The Interactive Maps can be used on Digital Kneeboards that provide a “recent” browser version. In this section mainly iOS and iPadOS are documented due to the availability of these mobile devices for testing.

6.1.1 iPads

Opening the Interactive Maps on an iPad is done by selecting the desired Theater of Operations from the maps.falcon-bms.com website. This will display the same UI and map as on the desktop.

6.1.1.1 Limitations

However, there are some limitations today:

1. No measurement support.
2. No METAR for all airports since tooltips are not supported.
3. Not Whiteboard drawing and erasing supported (yet)
4. Bullseye placement is possible but requires a long press followed by short placement touch. It is annoying and it would be better if the STPT 25 had the bullseye information.
5. iOS, iPadOS and MacBooks do not support the `CanvasRenderingContext2D.filter blur()` function in JavaScript and so the cloud layers will not have this effect.

6.1.1.2 Drag and Drop

Drag and drop is also supported on the iPad for .fmap, Callsign.ini and Whiteboard.png. First make sure you have you iCloud Drive mounted on your PC or MacBook and save or copy your desired files to be opened on your mobile device. Also make sure you have you iCloud Drive mounted and available in the “Files” application.

To accomplish this once you have the Interactive Map open for your Theater, select the triple dot menu at the top of the browser and select the split-screen option (middle option) and then as the right application start your “Files” application and navigate to the iCloud Drive folder containing your .fmap or .ini or Whiteboard file (Your view should look like the inset picture above). Press and hold the file you want to drag and drop. Once you can move it



around drag it on top the map, hold it there for one or two counts and release the file by not touching the screen. The map will now render the data on the map. If you don't see anything, then either the drop failed, or you have the layer hidden for that file type (for a hidden layer you need to re-enable the layer in the settings menu).

6.1.2 iPhones

Opening the Interactive Maps on an iPhone is the same as for the iPad and has the same limitations as the iPadOS. However, the drag and drop works slightly differently.

First again make sure you have the iCloud Drive available on your PC or MacBook as well as in the Files Application on your phone. Then:

1. Place the files you want to drop into a folder in the iCloud Drive.
2. Next go to your iPhone and with the desired Theater Map open and visible on your iPhone swipe up.
3. Start the Files application and navigate to the folder on the iCloud Drive with the files you want to drop.
4. Next Press and hold the file you want to drop (with your index finger) and try to drag it around. If it doesn't move keep pressing and you might get a context popup menu but just ignore that and keep the press hold.
5. Once you can move the file hold your finger pressed on the file and with your thumb swipe up and select your browser app (Might be useful to put your desired browser in the launch bar at the bottom). DO NOT release the file while doing this with your index finger.
6. Once you see the Interactive Maps again place to file on the map give it a 1 count and release and now the file will be rendered on the map.

If nothing is visible, then either the drop failed, or you have the layer specifically for your file hidden.

6.2 Local Map Access

The maps can be downloaded as a zip file and extracted into the Maps folder of the respective Theater. So, the KTO_Interactive_Map.zip file needs its contents extracted in the 06 Maps folder. This enables you to open the index.html directly and have just local access.

The Interactive Map creates file names and accesses symbology resources. When you open the index.html for the theater it will have a document root that has file:// in the access path. For generated filenames like the C2 Symbology icons you will with local file access violate the CORS access policy. This issue does not play when the files are all served from a webserver from falcon-bms.com or your own webserver.

However, if you don't care for the C2 Symbology (MIL-STD-2525D) then you don't need to do anything. You just can't place the symbols. But there is a way to by-pass this policy when you start your browser and open the index.html file with a directive to: *"allow file access from files"*.

Here is the example for starting Chrome on a MacBook with this directive (MS Edge also has similar or identical options; Please consult your favorite supported browser for the actual flag):

```
/Applications/Google\ Chrome.app/Contents/MacOS/Google\ Chrome --flag-switches-begin --allow-file-access-from-files --flag-switches-end
```

6.3 Browser Notes

Not all browsers are equal in performance or capabilities. All effort is made to test and make sure all features on the macOS, Windows and Linux are working for the browsers listed in the list of Prerequisites.

6.3.1 Safari

Safari on all platforms (iOS, iPadOS and macOS) do not support the filter blur() when all other browsers do. So, all clouds will look like squares since the blur effect to add the cloud haze isn't supported.

6.3.2 Brave Browser

The Brave browser fully supports all features, but some may have disabled the Hardware Acceleration to fix a blurry font issue. When this is the case the rendering of the clouds will take an eternity due to lack of GPU usage. So, you need to re-enable this and then fix the font issue the proper way. This means on PC with Nvidia card you need to disable the FXAA for Brave.

6.3.3 Firefox

The Firefox browser fully supports all features but is the only browser which does not properly set focus and bring to the front the Mission or Weather briefing windows if they are already on screen and behind another window. Just show all the Firefox open windows and switch to the briefing windows. All other browsers properly push the opened briefing window to the front if it was already on screen.

6.3.4 Vivaldi

Vivaldi supports all features but doesn't want to open two so called blank local HTML pages for the both briefings. As long as you only choose Mission or Weather it is fine but when trying to show both it will only launch 1 and if you keep clicking it will after a few clicks crash hard. Seems Vivaldi has a bug.

7 Development

7.1 Adding Theaters

Currently the default set of maps are created for the KTO, ITO and Balkans. Adding another theater and share with the community is easy. The Interactive Map has taken all steps to have all the theater specifics in two files:

- index.html
- resources/map_airbases.png (this is the airport overlay for the theater)

All other files you will find in the resources folder and are generic for all maps. So, the discussion to add a new map will only involve the index.html file.

7.1.1 HTML Overview

The index.html for each theater has the following sections:

1. The head section (with title JavaScript and style references)
2. The Range/Airport/VORTAC Information from the theater AIP
3. Fixed Menus and Popup Dialog definitions
4. The Main UI Layout section with Toolbar
5. The image map with tooltip, airport click actions and special map data.

The next sections will discuss each of these sections in detail and what you can or should do in these sections for your own map. The basic HTML and required tags are not explained for a webpage and it is assumed you are familiar with this. This means that you can take the KTO example index.html and follow along with the discussions and see what you need to modify/add.

7.1.2 The Head Section

This section contains the page title which you must update to reflect the name of your theater. It also includes linkage to the .css style sheet and JavaScript resources. The `<head>...</head>` section can be copied verbatim and is the same for all theaters. Only the title should be updated.

```
<head>
<title>KTO Interactive Map</title>
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet" href="resources/map_style.css">
<script type="text/javascript" src="resources/map_math.js"></script>
<script type="text/javascript" src="resources/map_conrec.js"></script>
<script type="text/javascript" src="resources/map_mission.js"></script>
<script type="text/javascript" src="resources/map_weather.js"></script>
<script type="text/javascript" src="resources/map_files.js"></script>
<script type="text/javascript" src="resources/map_draw.js"></script>
<script type="text/javascript" src="resources/map_radio.js"></script>
<script type="text/javascript" src="resources/map_symbology.js"></script>
<script type="text/javascript" src="resources/map_actions.js"></script>
</head>
<body>
```

7.1.3 The Airport Section

Each airport section has three subsections:

1. The Airport division Identification
2. The Airport AIP data
3. The Airport Chart data

This section is a long list of detailed Range/Airport/VORTAC information from the AIP. The `<pre>` tag is used to minimize HTML tag usage to improve readability. The data for a range and VORTAC is usually less than for an airport and so for the discussion only the airport information for each airport in this section is discussed. You can consult the KTO interactive map for the details of the ranges and VORTACs that must be provided.

Here is an example airport (GUNSAN) which will serve as the template to be followed for each airport:

```
<div id="GUNSAN" class="modal"><div class="modal-content">
<center><b>GUNSAN (RKJK)</b></center></div><pre>
N356deg57.554' E127deg24.492'
Elevation: 10 ft
RWY: 18/36
TCN: 75X
ATIS: 120.225
GND: 273.525
TWR: 292.300
APP/DEP: 292.65

<b>Charts</b><hr><a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_Airport.png" onclick="return chart(this)">Airport Diagram</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_Airport_EOR.png" onclick="return chart(this)">EOR-Procedure Chart</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_Visual.png" onclick="return chart(this)">APP - Visual 18/36</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_ILS_18.png" onclick="return chart(this)">APP - ILS RWY 18 (110.3)</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_ILS_36.png" onclick="return chart(this)">APP - ILS RWY 36 (110.3)</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_RDR_18.png" onclick="return chart(this)">APP - RDR RWY 18</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_RDR_36.png" onclick="return chart(this)">APP - RDR RWY 36</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_DEP_Aladi1.png" onclick="return chart(this)">DEP - ALADI 1</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_DEP_Coyote3.png" onclick="return chart(this)">DEP - COYOTE 3</a>
<a href="../../../03 KTO Charts/01 South Korea/Gunsan/Gunsan_DEP_Patro.png" onclick="return chart(this)">DEP - PATRO</a>
</pre></div></div>
```

7.1.3.1 Airport Identification Information

For each airport the id must be unique. This is needed to launch the popup with the airport division (<div>) information that you provide here. It is advisable to not add special characters in the id name. Also don't change the div attributes and their values.

7.1.3.2 Airport AIP Information

Next you should update/provide the AIP data for the airport this includes its name and ICAO identification (do not change or modify the html tags shown just provide the data as is shown in the example), the latitude and longitude (notice how the degree symbol is to be provided), the Elevation, Runway information, TACAN , ATIS VHF and frequency of each control agency for the airport (OPS, GND, TWR and APP/DEP).

7.1.3.3 Airport Chart Information

The last part is the chart information subsection. This is where you provide links to the actual charts delivered with BMS. Its starts with the preamble of the section name Charts and the <a>... sections for each chart.

Each chart needs the "href=" providing the location of the chart image, the onclick action information (the same for every entry) and the chart short description. Typically, each airport has an Airport Diagram and additionally it can have: End of Runway (EOR), Approach (APP) and Departure (DEP) charts. Create uniform descriptions as are shown above.

7.1.4 Fixed Menus and Dialog Section

This section is completely the same for all theater interactive maps and SHALL be copied verbatim to keep the dialogs and tabs in the UI working. Below is the list of dialog definitions to aid in reading this section but you should not make any modifications and just copy all of it:

- The C2 Symbol Identification dialog
- The Whiteboard Style settings dialog
- The Interactive Settings dialog.
- The Route and Mission information dialog and tabs (Route, Radio, and Mission)
- The Text Entry area

7.1.5 Main UI Layout Section

The main UI layout section contains the elements of the main UI:

- The basic Background Map
- The Airport Overlay image (this is unique for the theater)
- The Toolbar definition

In the main UI you must provide the location of the theater unique map as an 4096x4096 image. Next you must provide the location of the airport overlay image 4096x4096.

If you don't have an airport overlay image file and the airports are part of the chart already, they provide a blank and transparent image here.

The rest of this section with the toolbar icons and actions SHALL NOT be modified. You can if you want style your own toolbar icons, but it is better to have a uniform look and feel across theater maps.

7.1.6 Image Map Section

The image map section contains information about the latitude and longitude of the left bottom corner of the map, airport hot-spot and grouping data, the map legend area definition, and the default location of the bullseye. All of these must be provided.

```
<!-- All Map Coordinates based on 4096x4096 Javascript scales to 3840.
    You must set the map datum in degrees for the map south west corner for Lat/Long calculations-->
<map name="Map" id="imgMap" data-map-datum="33.84375,123">
<!-- South Korea -->
<area shape="circle" coords="1996,2776,17" href="javascript:void(0);" alt="South Korea" title="CHEONGJU" onclick="return popup('CHEONGJU');"/>
<area shape="circle" coords="1336,3147,17" href="javascript:void(0);" alt="South Korea" title="CHIK-DO" onclick="return popup('CHIK-DO');"/>
<area shape="circle" coords="2499,3150,17" href="javascript:void(0);" alt="South Korea" title="DAEGU" onclick="return popup('DAEGU');"/>
<area shape="circle" coords="2642,2339,17" href="javascript:void(0);" alt="South Korea" title="GANGNEUNG" onclick="return popup('GANGNEUNG');"/>
<area shape="circle" coords="2617,3482,17" href="javascript:void(0);" alt="South Korea" title="GIMHAE" onclick="return popup('GIMHAE');"/>
<area shape="circle" coords="1663,2422,17" href="javascript:void(0);" alt="South Korea" title="GIMPO" onclick="return popup('GIMPO');"/>
<area shape="circle" coords="1589,3151,17" href="javascript:void(0);" alt="South Korea" title="GUNSAN" onclick="return popup('GUNSAN');"/>
```

7.1.6.1 The Map Datum

The map data is required to be updated to get correct calculated Latitude and Longitude values when you unhide the coordinates updates in settings. Not providing this or the wrong values results in the incorrect calculated Latitude/Longitude values.

Update the data-map-datum= element with the Latitude and Longitude in degrees (See image above). The data can be pulled from the terrain files.

7.1.6.2 The Airport Hotspots

For each airport you must provide the airport hotspot data:

- The location on the map (use the map x, y coordinates provided by Interactive Maps)
- Set the Alternate which is used for grouping the airports.
- Set the title which is used in the tooltip info and METAR.
- Provide the popup action with the id of the airport information.

The airport X, Y location can be found by first starting with little map hotspots and launch the index.html page and use the Interactive Maps coordinates (use unhide in the settings dialog) to find each of your airport's X, Y location on the map. Leave the circle click size as 17 pixels.

7.1.6.3 The Map Legend

To not draw over the legend you must create the legend mask information. The JavaScript will find this using the alt= name. You must provide the top left and bottom right coordinates.

```
<!-- Special Map areas and Coordinates based on 4096x4096-->
<!-- Map Legend Area -->
<area shape="rect" coords="0,3580,735,4096" alt="Legend">
<!-- Set Default Bullseye coordinates -->
<area shape="circle" coords="1562,2237,1" alt="Bullseye">
</map>
```

7.1.6.4 The Bullseye

Finally (since the Mission.ini and Callsign.ini leave the STPT 25 information empty) you must provide the default Bullseye location to be used for drawing the initial bullseye location. The location is in X, Y map coordinates.