MAESTRO plugin for EuroScope

- version 1.1 -

General

EuroScope | power of control

Table of Contents

1   Acknowledgements

This plugin contains code and/or ideas from the following sources:

- JSON parsing uses the JSON for Modern C++ library
- File transfers use the libcurl library

2   Getting started

The MAESTRO plugin emulates an arrival manager, but its functionality is limited compared to the real systems. It can be used to get an overview of inbound flows and delays to one or more airports; however, it will for example **NOT**:

- attempt to optimize the sequence in any way to minimize total delay
- display the same information to all controllers unless a master/slave configuration is used
- provide for dependent or semi-dependent operation when multiple runways are used for arrivals

The calculations are based on the predictions provided by EuroScope, so to get useable results, it is important to keep the aircrafts' data updated. The most common problems are:

- wrong landing runway
    - o the aircraft won't be included in the correct runway's sequence at all
- old direct-to clearance stuck
    - o the aircraft's position in the sequence will be based on the predicted ETA which will be off by hours in the worst case as it assumes the aircraft turns back to that point
- calculated sequence not being followed
    - o the whole sequence behind the affected aircraft is delayed until the sequence is manually corrected or the situation resolves itself as aircraft arrive and are removed from the sequence

If the plugin was provided in a package, all the necessary settings are most likely set already. If not, refer to the Developer Guide for information on how to install and set up the plugin.

3   Windows

The COTS and MAESTRO windows can be moved by dragging them from the title bar. Other windows are non-moveable. Windows are closed by left-clicking the box in the top right corner, and resized by dragging the box in the bottom right corner. Scrollbars can be moved by dragging the bar itself, or by clicking on the background area next to the bar. Left-clicking changes the setting by one unit, right-clicking by 10 units.

The plugin can be configured to two different versions, "old" and "new". The underlying calculations are the same in both ones, and in addition to a couple of minor functionality differences, the two versions differ only in the graphical outlook of the windows and menus.
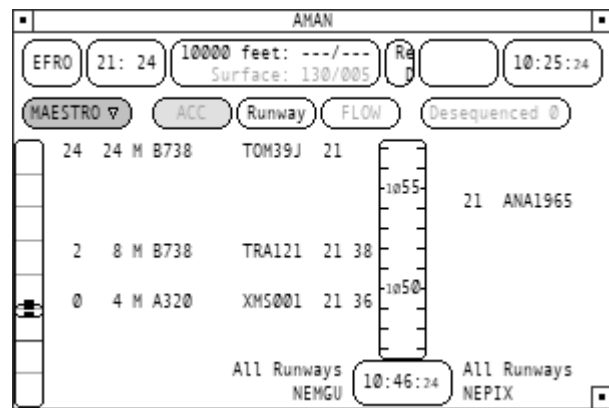
3.1   COTS Window

This window is always visible. Left-clicking on the MAESTRO (AMAN in the "new" version) icon opens the MAESTRO/AMAN Window.

3.2   MAESTRO/AMAN Window
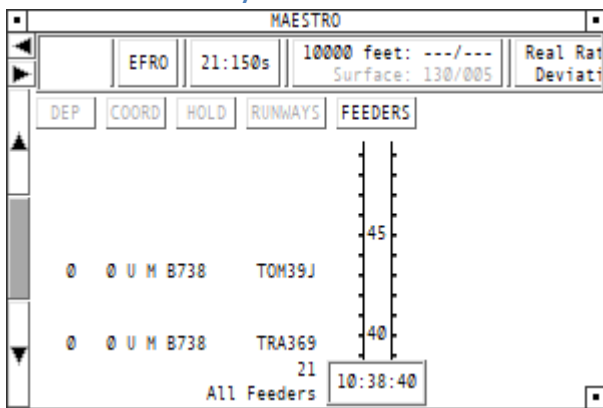
Runways view in [Old version]   Feeders view in [New version]

3.2.1   Toolbar

The toolbar below the window title is used to view and adjust a number of settings. From left to right, it includes:

- [Old version] The current operation mode, empty for standalone mode
- The current airport (left-click to open the Setup Window)
- The runway rates (left-click to open the Change Rates Window)
- The 10000ft and surface winds (left-click to open the Change Wind Window)
- The measured actual rates during the past 30 minutes and deviation from set values
- [New version] The current operation mode, empty for standalone mode
- The UTC time when the data was last refreshed

The operation mode shows three lines of data when running in the Master or Slave mode. The top line shows either "MASTER" or "SLAVE", the second line the source of the data (your ID in Master or Slave/Local mode, the source controller's ID in the other Slave modes) and the third line "LOCAL", "WEB" or "WEB+L".

3.2.2 View options

The Runways view displays one timeline for each runway set as active for arrivals. The Feeders view displays one timeline per offline-defined feeder fix plus one for flights not routing via any of the defined feeders. The clocks below the timelines display the reference time for the timelines (current time or a time in the future or past depending on whether the display has been scrolled vertically).

Below the toolbar there are five buttons to select the desired view. Only the "RUNWAYS"/"Runway" and "FEEDERS"/"ACC" options are available. When an airport is selected, one or more time ladders appear, showing the inbound flights at their estimated arrival times.

[Old version]

> The timelines can be scrolled horizontally using the left/right arrow buttons and vertically using the up/down arrow buttons. The middle vertical button is used to reset the timelines to the current time, and is highlighted when the timelines are at the current time.

[New version]

> The timelines can be scrolled vertically using the scrollbar on the left edge of the window. The scroll area displays the current time as a red line, and time lines at 30-minute intervals on either side of it. Inbound flights are shown as thin lines. Clicking the scrollbar resets it to the current time.
>
> The "MAESTRO" button opens a menu with the following options:
>
> - >>> Scrolls the timelines horizontally (right)
> - <<< Scrolls the timelines horizontally (left)
> - [] Winds Toggles the Winds tab visibility in the toolbar
> - [] Rates Toggles the Rates actual/deviation tab visibility in the toolbar

3.2.3 Flight states

The flight labels are color-coded according to their states which are based on the time from the airport and the feeder fix, except for the delay items whose coloring depends on the amount of delay.

- Landed   Flights considered as landed
- Frozen   No plugin-initiated changes to the sequence for any reason other than another frozen flight disconnecting or based on actual order on final approach. By default, within 5 minutes from arrival.
- SuperStable   No plugin-initiated changes to the sequence unless an aircraft disconnects or a flight is re-inserted to the sequence after a missed approach. By default, within 10 minutes from the feeder fix. For flights re-inserted after a missed approach, a minimum time to destination is forced, by default 10 minutes.
- Stable   No plugin-initiated changes to the sequence unless an aircraft disconnects or a new flight is added to the sequence. By default, within 20 minutes from the feeder fix. For new flights added, a minimum time to destination is forced, by default 10 minutes.
- Unstable   The sequence is recalculated on every position update.

3.2.4 Flight labels

The flight labels on the timelines display information about the flights. From the timeline outwards, the following information is available:

- ETA FF   ETA to feeder fix (minutes of UTC time, blank if no feeder or already passed)
- RWY   Arrival runway (Feeder view only)
- Callsign
- ATYP   Aircraft type
- WTC   Wake turbulence category
- FF   Feeder ID (Runway view only)
- Total delay   Total delay in minutes
- Curr. delay   Remaining delay in minutes

The displayed items can be set by left-clicking the clock below the timeline. The Labels menu opens, allowing to change the settings. The Labels menu is closed automatically when the cursor leaves the menu area. The same settings are used for all timelines.
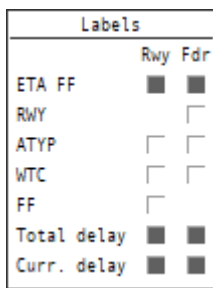
3.2.4.1 Mouse functions

3.2.4.1.1 Callsign menu

Left-clicking on a flight label opens a menu with the following options:

- Informations   not implemented
- Recompute   Recomputes the flight's data
- Change Runway >   Opens the EuroScope menu to set the arrival runway
- Insert Overshoot >   not implemented
- Insert Slot >   Opens the slot submenu
- Change ETA_FF   not implemented
- Remove   Removes the flight from the sequence
- Holding   not implemented
- Coordination   not implemented

The "Recompute" option recalculates all the flight's data and its position in the sequence. This may become necessary when the flight is no longer in the unstable state (so its position in the sequence is fixed) and can no longer meet its calculated time profile, starting to delay all the flights behind it in the sequence.

The "Insert Slot >" option opens a submenu where a slot relative to the selected flight can be set in minutes before or after the flight. Both can be set at the same time. The slot moves with the flight. To adjust or delete these slots, open the menu again (a value of 0 minutes removes the slot).

The "Remove" option can be used to manually remove a disconnected flight from the sequence before it is automatically removed after 10 minutes. If a flight that is still online is removed from the sequence, it will be automatically added again (in case of diversion, the destination of a flight must be changed to remove it from the sequence).

3.2.4.1.2   Timeline menu
Left-clicking a timeline opens a menu with the following options:

- Insert Overshoot   not implemented
- Insert/Modify Slot   Opens the Slot Modification Window (only available in the Runways view)
- Insert Flight   Allows to type in a callsign already in the sequence to move into that position

3.2.4.1.3   Manually adjusting the sequence
To swap the positions of two flights in the calculated sequence, first left-double-click on the label of one of the flights. The flight label becomes boxed. Then left-click on the second flight's label to swap the flights. A confirmation window will then be presented allowing to confirm or cancel the swap operation. A flight still in unstable state cannot be swapped.

To move a flight to another position in the sequence, drag the label. While dragging, a horizontal line is drawn across the window to mark the place where the flight would be moved to. When the mouse button is released, a confirmation window appears asking to either confirm or cancel the move operation. The flight will not be moved to that exact time, but to the place in sequence containing the selected time. Another way to move a flight is to use the menu that opens by left-clicking on a position in a timeline. A flight still in unstable state cannot be moved.

 Note: It is possible to change a flight's position in the sequence forward so much that it can't reach the feeder fix so early. It will then be scheduled at the feeder fix as early as possible but the sequence will not be changed and this may cause delays for flights in the sequence behind it. Because of this, flights should not be moved forward by more than their current delay value.

3.2.5 Setup Window
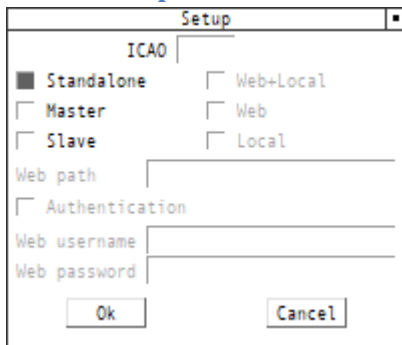
The airport identifier is entered into the box just below the window title. It is required for all modes other than Slave/Local.

The option buttons are used to set the operation mode:

- **Standalone mode**   **The plugin calculates its own data**
- **Master mode**   **The plugin calculates its own data, and shares it as follows:**
  - Web   Data is uploaded to given network location to be used by other plugins
  - Local   Data is saved to the local computer to be used by other EuroScope instances
  - Web+Local   Both of the above
- **Slave mode**   **The plugin gets its data from a location depending on the settings:**
  - Web   Data is downloaded from the given network location
  - Local   Data is read from window messages or a file on the local computer
  - Web+Local   Data is downloaded from the network, and then saved to the local computer to be used by other EuroScope instances (the plugin operates as a slave relative to the network data but as a master relative to local data)

The local data is by default transmitted using window messages, but it can also be set up to be saved to a file named "**MAESTRO_sequence_data.json**" in the same folder as the plugin dll. In this case, the plugin should be placed in a folder where the user has write access.

Warning: Do not store any data in a file with this name in the same folder as the plugin. The plugin will overwrite the file without any warning!

The web path (just path, no file name) is used to set the network location for uploading or downloading data. FTP, FTPS, HTTP and HTTPS protocols are supported. When the server requires authentication, the "Authentication" button must be selected and the username and password must be set.

Example:
The master mode user uploads the data to an FTP server path he has access to, setting the necessary credentials and "ftp://www.somesite.com/maestro/" as the path. Knowing that the uploaded file can be accessed at "http://www.somesite.com/someusername/maestro/" he then communicates this path (and any credentials required for download access) to be set by all the slave controllers.

"Ok" applies the changes and closes the window. It is grayed out until all necessary fields (ICAO and the necessary web settings) are filled with data. "Cancel" or closing the window discard any changes and the window is closed.

When the "Ok" button is clicked with the Master mode selected, the plugin checks if a local or web file less than 10 minutes old for that airport exists (local checked first). If so, it uses the sequence from that file as a starting point. This is to recover a previous sequence after a crash or a change from slave to master mode.

In Slave mode, data older than 10 minutes will not be used, and if three consecutive download attempts fail to give more recent data, the plugin reverts to Standalone mode.

3.2.6 Change Rates Window
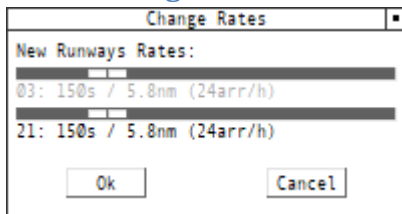
The Change Rates Window is used to set the arrival rates in seconds. The displayed distance between arrivals is calculated using the entered surface wind and an offline defined average approach speed (140kts by default). Closing the window or clicking "Cancel" aborts the change. Clicking "Ok" immediately applies the new rates.

3.2.7 Change Wind Window
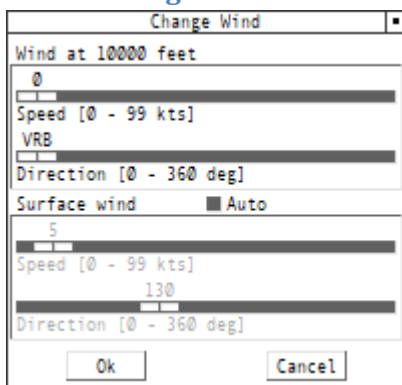
The Change Wind Window is used to set the displayed winds. The 10000ft wind is not used for any calculations, it's there for display purposes only. The surface wind is used to convert the selected rate to a distance value which is then used for wake turbulence separation. When enabled, the "Auto" option for the Surface wind sets the surface wind value automatically if a METAR has been received for the airport.

3.2.8 Slot Modification Window
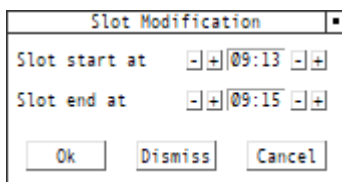
The Slot Modification Window is used to add, delete and edit slots fixed in time. During a slot no arriving aircraft will be calculated to land. Closing the window or clicking "Cancel" will abort the operation. "Dismiss" will remove the edited slot and "Ok" will apply the changes to the edited slot or create a new slot. Slots will appear as a bar on the timeline, and clicking on a slot will open the Slot Modification Window to edit or dismiss it.

4   Tag items

Current delay

Displays the current delay value in minutes.
The "(unselected track)" version is meant to be used on tagging levels other than *detailed*.

Dummy item – correlated detailed tag

Does not display anything. Must be present in all *correlated detailed* tags of the used tag family if the setting "Label_Highlight_Type" is set to display a box around the label of the track with a detailed tag open.