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 for multiple aircraft
- 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
    - the aircraft won't be included in the correct runway's sequence at all
- old direct-to clearance stuck
    - 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
    - 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

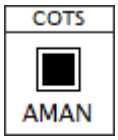
If the plugin was provided in a package, all the necessary settings are most likely set already. If not, refer to the Developer Guide for information on how to install and set up the plugin.

3 Windows

The COTS, MAESTRO and Flight Information Windows and the De-sequenced List 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.

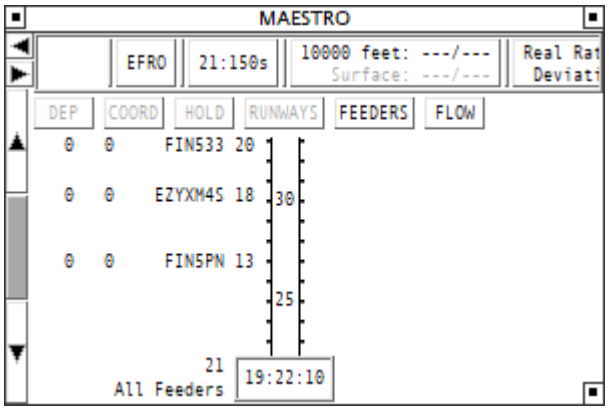
The plugin can be configured to two different versions, “old” and “new” (“new” being the default). The underlying calculations are the same in both ones, and in addition to a couple of minor functionality differences, the two versions differ only in the graphical outlook of the windows and menus.

3.1 COTS Window

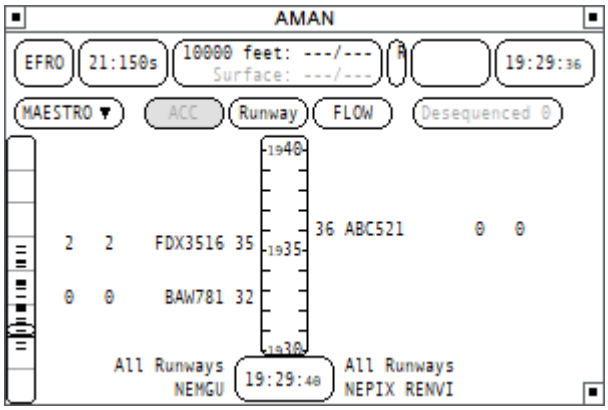


This window is always visible. Left-clicking on the AMAN (MAESTRO in the [Old version]) icon opens the MAESTRO/AMAN Window.

3.2 MAESTRO/AMAN Window



Runways view in [Old version]



ACC 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 the following (items marked with * can be selected on or off):

- [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
- * Number of aircraft already past the feeder fixes (TMA) and the total number of aircraft (TOT)
- [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

Below the toolbar there are buttons to select the desired view:

View	Timelines	A/C position on timeline
RUNWAYS / Runway	One for each active arrival runway	Time over threshold
FLOW	One for each offline-defined feeder fix One for flights not routing via any of the defined feeders	Time over threshold
FEEDERS / ACC	One for each offline-defined feeder fix One for flights not routing via any of the defined feeders	Time over feeder fix

When an airport is selected, one or more time ladders appear. 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).

[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.

The “HOLD” button opens the De-sequenced List.

[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
- [] Tracks Toggles the Tracks tab visibility in the toolbar

The “Desequenced” button displays the number of flights in the De-sequenced List, and opens it.

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.

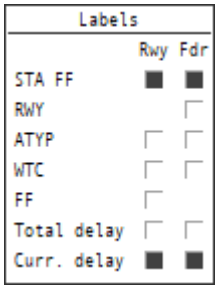
Unstable	The sequence is recalculated on every position update
Stable	A flight becomes stable by default within 20 minutes from the feeder fix, and having been unstable for at least 1 minute. No plugin-initiated changes to the sequence unless an aircraft disconnects or a new flight is added to the sequence. For new flights added, a minimum time to destination is forced, by default 10 minutes.
SuperStable	A stable flight becomes superstable by default within 10 minutes from the feeder fix. No plugin-initiated changes to the sequence unless an aircraft disconnects or a flight is re-inserted to the sequence after a missed approach. For flights re-inserted after a missed approach, a minimum time to destination is forced, by default 10 minutes.
Frozen	A superstable flight becomes frozen by default within 5 minutes from arrival. No plugin-initiated changes to the sequence for any reason other than another frozen flight disconnecting or based on actual order on final approach.
Landed	Flights considered as landed

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:

- STA FF — Scheduled time over the feeder fix
- RWY — Arrival runway
- Callsign — Callsign
- ATYP — Aircraft type
- WTC — Wake turbulence category
- FF — Feeder ID
- Total delay — Total delay in minutes
  (difference between the flight's initial ETA and its scheduled time over the landing threshold)
- Curr. delay — Currently remaining delay in minutes
  (the amount of delaying action still required to reach the landing threshold at the scheduled time)

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:

- Information — Opens the Flight Information Window
- 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 permanently from the sequence
- De-sequence — Moves the flight temporarily from the sequence to the De-sequenced List
- 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).

A flight removed from the sequence using the "Remove" option can only be re-inserted using the Timeline menu's "Insert Flight" option (see below).

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 to be inserted/moved into that position

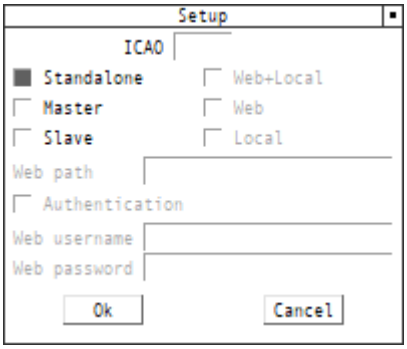
3.2.4.1.3 Manually adjusting the sequence

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.

3.3 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 users
  - Local Data is sent using local plugin-to-plugin communication or saved to a file
  - 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 received using plugin-to-plugin communication or read from a file
  - 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 plugin-to-plugin communication, 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. The plugin automatically appends the airport ICAO code to the file name in web use, so more than one airport can be hosted on the same web path.

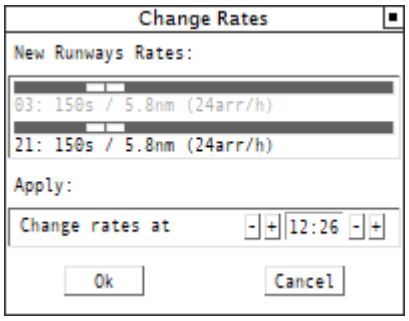
Example:
The master mode user uploads the data to an FTP server path he has access to, setting the necessary credentials and "ftp://www.somesite.com/maestro/" as the path. Knowing that the uploaded file can be accessed at "http://www.somesite.com/someusername/maestro/" he then communicates this path (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 sequence less than 10 minutes old for that airport already exists. If so, it uses that sequence 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.

3.4 Change Rates Window

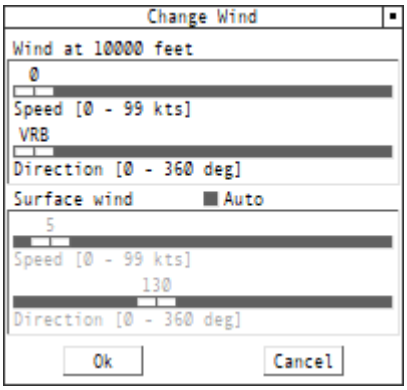


The Change Rates Window is used to set the arrival rates in seconds. The displayed distance between arrivals is calculated using the entered surface wind and an offline defined average approach speed.

By default the change takes place immediately, but it can be delayed by specifying the change time using the “+” and “-” buttons. Only one delayed rates change can exist at a time, entering a second one before the first change takes place will cancel the first change.

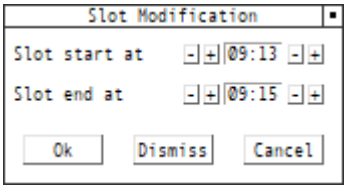
Clicking “Ok” saves the new rates. “Cancel” clears any currently edited or saved delayed rates change.

3.5 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.

3.6 Slot Modification Window



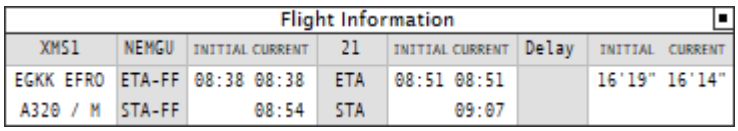
The Slot Modification Window is used to add, delete and edit slots fixed in time. During a slot no arriving aircraft will be calculated to land. Closing the window or clicking “Cancel” will abort the operation. “Dismiss” will remove the edited slot and “Ok” will apply the changes to the edited slot or 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.

3.7 Flight Information Window

The Flight Information Window displays flight related data.

[Old version]

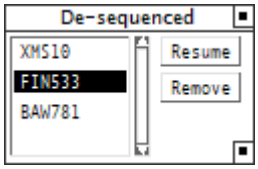
[New version]



The boxes contain:

Callsign	Feeder fix	INITIAL	CURRENT	Arrival runway	INITIAL	CURRENT	Delay	INITIAL	CURRENT
Origin Destination	ETA-FF	Initial ETA FF	Current ETA FF	ETA	Initial ETA	Current ETA		Total delay	Currently remaining delay
Type / WTC	STA-FF		Scheduled time at fix (STA FF)	STA		Scheduled time at rwy (STA)			

3.8 De-sequenced List



The De-sequenced List contains flights temporarily removed from the sequence. They are presented in the same order as they were entered into the list. Left-clicking one or more callsigns highlights them. The “Resume” and “Remove” buttons can then be used to either re-enter the highlighted aircraft back into the sequence or remove them from it permanently.

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.