Ground Radar plugin for EuroScope

- version 1.4 -

General

EuroScope | power of control

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1 Acknowledgements

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

- Raw radar data aircraft shapes are based on Pierre Ferran's work on his vSMR plugin
- File transfers use the libcurl library

2 Getting started

The Ground Radar plugin has two modes. "Ground" mode is based on the SAAB A3000 A-SMGCS system, and "Tower" mode on the SAAB RDP air situation display. Some settings are required in the used ASR file to determine which mode to use, and to set up some of the necessary parameters.

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.

2.1 Plugin updates

On startup, the plugin will attempt to check for updates. If the check fails or a new version is available, a message box will be presented. In case a mandatory update exists and the latest date to update has already passed, the plugin features will be blocked until it is updated.

When an update is available, the message box will show where to download the current version. The update package contains the plugin dll, the current manual set and the plugin data files that are common to all setups. Replace the existing files with the new ones but do not delete any files unless specifically asked to do so.

3 Global Menu

3.1 Settings menu

- Display… — Opens the Display submenu
- Labels… — Opens the Labels submenu
- Lists… — Opens the Lists submenu (Ground mode only)
- Raw Video… — Opens the Raw Video submenu (Ground mode only)

3.1.1 Display submenu

3.1.1.1 Ground mode

- Pro mode — Toggles the Pro mode on/off
- Tracks
  - Display — Toggles the label, track symbol, history dots and heading line on/off. Can't be set off if Settings->Raw Video…->Raw Video is also off.
  - History — Sets the number of history dots to display (0-19)
  - HDG line — Toggles the heading line on/off
  - AltFilter — Hides tracks above specified height above airport elevation in 100's of feet (1-999)
- APP Window
  - History — Sets the number of history dots to display (0-19)
  - Prediction — Sets the length of the prediction line in minutes (0-99)
  - Scale — Sets the window scale in pixels/nm (1.0-100.0)
  - Rotation — Rotates the view (-360.0 to 360.0 degrees)
  - Extensions — Sets the extended centerlines length in nm (0-999)
  - AltFilter — Hides labels above specified level in 100's of feet (0-999)

The 'Pro mode' setting determines what data will be displayed and how the radar tracks are correlated to flight plans. With the setting off, the airport area will have perfect primary and secondary radar coverage and all the aircraft are shown correctly correlated.

When 'Pro mode' is selected on, the radar coverage depends on the plugin and EuroScope setup, and for the correlation the plugin first checks mode S availability (radar coverage and flight plan equipment suffix). If available, it will be used for correlation. If not, the correlation state as reported by EuroScope (depending on the 'Professional mode' settings in EuroScope's General Settings) will be used.

The heading line is a 10 pixels long line drawn from the position symbol showing the heading of the aircraft.

3.1.1.2 Tower mode

- Tracks
  - History — Sets the number of history dots to display (0-19)
  - Prediction — Sets the length of the prediction line in minutes (0-99)
  - AltFilter Hi — Hides labels above specified level in 100's of feet (-10-999)
  - AltFilter Lo — Hides labels below specified level in 100's of feet (-10-999)

3.1.2 Labels submenu

3.1.2.1 Ground mode

- Ground
  - PosX — Sets the default label position x-offset in pixels (positive right)
  - PosY — Sets the default label position y-offset in pixels (positive down)
  - <FieldName> — Toggles the <FieldName> field on/off
- APP Window
  - PosX — Sets the default label position x-offset in pixels (positive right)
  - PosY — Sets the default label position y-offset in pixels (positive down)
  - <FieldName> — Toggles the <FieldName> field on/off

3.1.2.2 Tower mode

- Tower
  - PosX — Sets the default label position x-offset in pixels (positive right)
  - PosY — Sets the default label position y-offset in pixels (positive down)
  - <FieldName> — Toggles the <FieldName> field on/off

3.1.3 Lists submenu

- Alerts List
  - Items — Number of flights to display
- ARR List
  - Items — Number of flights to display
  - RWY — Toggles the RWY column on/off
  - TYPE — Toggles the TYPE column on/off
  - WTC — Toggles the WTC column on/off
  - ETA — Toggles the ETA column on/off
  - STAND — Toggles the STAND column on/off
- DEP List
  - Items — Number of flights to display
  - RWY — Toggles the RWY column on/off
  - TYPE — Toggles the TYPE column on/off
  - WTC — Toggles the WTC column on/off
  - EOBT — Toggles the EOBT column on/off
  - STAND — Toggles the STAND column on/off
- Inbound Lists
  - TYPE — Toggles the TYPE column on/off
  - WTC — Toggles the WTC column on/off
  - ETA — Toggles the ETA column on/off
  - STAND — Toggles the STAND column on/off
- Stands List
  - Items — Number of stands to display

3.1.4 Raw Video submenu

- Raw Video — Toggles the raw video display on/off. Can't be set off if Settings->Display…->Tracks->Display is also off.
- Brightness — Adjusts the general brightness of the radar returns (1-100). Note that if the Ground Label is set "off", having a low brightness setting may make it very hard to see the traffic.
- Afterglow — Controls how fast the returns fade (0-100)
- History — Sets the maximum number of history positions (0-10)

3.2 Window menu

- APP Window — Opens the Approach Window
- Alerts List — Opens the Alerts List
- ARR List — Opens the Arrival List
- DEP List — Opens the Departure List
- Inbounds… — Opens an Inbound List (select runway in the list that opens)
- Stands List — Opens the Stands List

The items in the Window menu are active only in the ground mode of the plugin

3.3 Functions menu

- Flight Plan — Opens the Flight plan setting dialog (enter callsign)
- Text notes… — Opens the Text notes submenu
- Maps… — Opens the Maps submenu

3.3.1 Text notes submenu

- Create… — Creates a new text note
- Delete… — Deletes a single text note
- Delete all — Deletes all text notes

It is possible to insert text notes on the radar screen to act as reminders. They will stay fixed at the geographical coordinates they are inserted to, the coordinates defining the center point of the note.

When creating a note, a text entry field opens to enter the note text. When the **[Enter]** key is pressed, the note will be created at the current mouse cursor position.

The notes can be deleted one by one or all of them at the same time. When deleting one by one, the notes are boxed to display their click areas. Clicking on one will delete the note. Pressing the **[Esc]** key or selecting the "Delete…" menu item again will abort the operation.

3.3.2 Maps submenu

The maps submenu displays a list of all map folders found in the maps data file. Left-clicking on a folder name displays the maps in that folder on the right side of the folder list. The selected folder is displayed in reverse video. Each map's display state can be selected on or off. Additionally, those maps that have automatic activation rules defined in the data file can be selected to activate and deactivate automatically. The default state is "Auto" for all maps with that possibility, and "Off" for other maps.

The map list can be undocked from the menu by dragging it, the list then becomes the Maps Window. The active folder must still be selected using the maps submenu.

3.4 LVP status

Left-click to toggle between “NORMAL” and “LVP”. This sets the runway related alert settings accordingly.

3.5 Safety Nets

- APM — Toggle APM alerts on/off
- CVM — Toggle CVM alerts on/off
- ECM — Toggle ECM alerts on/off
- OSM — Toggle OSM alerts on/off
- RIM — Toggle RIM alerts on/off
- RVM — Toggle RVM alerts on/off
- SRM — Toggle SRM alerts on/off

When a safety net is switched off, its button is shown with a yellow background. See the Safety Nets chapter for information on which alerts are connected to which system.

3.6 Developer menu

Left-click on the blue “HITT” label to open the menu

- Reload Settings — Reloads the information in the settings files
- Reload Data Files — Reloads the information in the data files
- Show/Hide Airport Data — Toggles airport related data display on/off

When selected on, the airport data displays the following for development use:

- Airport reference point (green crosshairs and circle), ICAO code and elevation
- Airport area, i.e. airport radius circle around the reference point (green dotted line)
- Runway end and threshold locations (marked with runway id in red color)
- Runway areas (red polygons, LVP versions with dotted lines)
- Runway buffer areas (yellow polygons, LVP versions with dotted lines)
- Runway crossings (red crosses)
- Aircraft stands
    - Occupied and blocked in red
    - Assigned in yellow
    - Free but blocked from automatic assignment in dotted green
    - Free and available for automatic assignment in solid green

4 Track presentation

In both the ground and tower modes, the track symbols and labels are colored according to the flight's status (arrival, departure or overflight/unknown). By default, the arrivals are yellow, departures light blue and overflight/unknown tracks light grey. In the tower mode also the history dots and prediction lines use the same coloring. In the ground mode all history dots use the overflight/unknown color and there is no prediction line available. Hovering the mouse cursor over a label will show all data fields even if not selected on in the settings.

The track labels displayed here are the default sets.

4.1 Ground mode

4.1.1 Track symbol

- ○ Primary track
- □ Secondary (mode A or S) or combined track

Right-clicking on the track symbol toggles the heading line

4.1.2 Uncorrelated track label

- ALRT Safety net alert indicator
- CALLSIGN Transponded SSR code ("----" for primary only tracks)

4.1.3 Correlated track label

Departure

Arrival

Overflight/unknown

- ALRT Safety net alert indicator
- ASSR_E Assigned SSR code if different from the transponded code
- COMM "t" if text only, "r" if voice receive only
- CALLSIGN Callsign
- DRWY Departure runway identifier, automatically displayed when either:
  - there is more than one active departure runway, or
  - SRM is enabled and the assigned runway is not an active departure runway
- DEP Assigned heading or SID designator
- STAND Assigned arrival stand
  - Highlighted after a change until acknowledged
- ATYP Aircraft type
- WTC Wake turbulence category
- RMK Scratchpad contents

4.2 Tower mode

4.2.1 Track symbol

- ○ Primary track
- ⊔ Uncorrelated secondary or combined track
- ◇ Correlated secondary track
- ◈ Correlated combined track

4.2.2 Uncorrelated track label

- CALLSIGN — Transponded SSR code
- AFL+VS — Actual flight level and an arrow to indicate climb or descent. At or below the transition altitude the displayed value is the altitude in hundreds of feet, prefixed by “A”.
- GS — Groundspeed in knots (rounded to nearest 10 knots)

4.2.3 Correlated track label

- CALLSIGN — Callsign
- COMM — “t” if text only, “r” if voice receive only
- AFL+VS — Actual flight level and an arrow to indicate climb or descent. At or below the transition altitude the displayed value is the altitude in hundreds of feet, prefixed by “A”.
- GS — Groundspeed in knots (rounded to nearest 10 knots)

4.3 Label field mouse functions

The following mouse functions are available (left-click unless specified):

- CALLSIGN	Open Callsign menu	
- DEP	Left-click:	Open SID setup popup list
	Right-click:	Open assigned heading popup list
- STAND	New assignment:	Acknowledge it
	Otherwise:	Open Stand menu
- RMK	Edit scratch pad string	

4.3.1 Callsign menu

The Callsign menu for correlated tracks contains the following (unavailable ones shown with grey text):

- <Ground state>	Displays current ground state, opens the Ground state menu
- Assume	Assumes the track
- Trans <ID>	Transfers the track to the indicated controller
- Man Tfr	Opens a menu to manually transfer the track to any controller
- Free	Drops the track
- FPL	Opens the EuroScope Flight plan setting dialog
- Stand	Opens the Stand assignment menu
- Uncorrelate	Uncorrelates the flight plan from the radar track

For uncorrelated tracks, the menu only contains one item:

- Correlate	Correlate the radar track with a flight plan (enter the callsign)

4.3.1.1 Ground state menu

The Ground state menu includes the default ground states as well as three custom ones:

- ON FREQ	Sets the custom “On Freq” state
- DEICE	Sets the custom “De-Ice” state
- START UP	Sets the default or custom “Start-Up” state depending on EuroScope version
- PUSH	Sets the default “Push” state
- TAXI	Sets the default “Taxi” state
- LINE UP	Sets the custom “Line Up” state
- TAKE OFF	Sets the default “Depa” state
- (empty)	Clears the ground state

For compatibility reasons, the custom states set the following default states:

- On Freq	“Push” if any default state had already been set
- De-Ice	“Taxi” if the previous default state was already “Depa”
- Line Up	“Taxi”
- (empty)	“Push” if any default state had already been set

4.3.2 Stand assignment menu

The Stand assignment menu is used for various tasks related to arrival stand assignment. It will not open if another controller is tracking the aircraft. The menu contains the following options:

- Auto — Assigns a new arrival stand automatically
- Manual — Opens the Manual stand assignment menu
- Publish — Communicates the current stand assignment to other controllers
- Clear — Clears the stand assignment

In addition to the manual “publish” method to communicate stand assignments, an assignment is automatically communicated to all controllers in range when the assignment is made, and also to the next controller when the track is transferred (the information is stored in the flight strip).

4.3.2.1 Manual stand assignment menu

This menu lists the stands at the airport for manual assignment. Stands that are occupied, blocked or already assigned are displayed in grey color. The “[---]” item allows to manually type in the stand designator.

5 Windows

5.1 Approach Window

The Approach Window displays traffic around the airport (traffic on the ground at the airport is hidden). The window displays the runway centerlines, and optionally extended centerlines.

To move the window, drag it from the title bar. To close it, click on the [X] button in the top right corner. To resize, drag the box in the bottom right corner.

To pan the view, drag somewhere on the display area. The panning is limited so that the airport reference point must stay within the display area.

Left-clicking on the "xnm" text label (or dragging it up) zooms the display in, right-clicking (or dragging down) zooms it out. The available zoom range is 1-100 pixels/nm, the initial value being 10 pixels/nm. Each click increases or decreases the scale by 25%.

The arrow below the scale, shown if the display has been rotated, points to true north.

Hovering the mouse cursor over a label will display all data fields even if not selected on in the settings.

For the mouse functions in labels, refer to Label field mouse functions

5.1.1 Uncorrelated track label

ALRT
CALLSIGN
AFL+VS GS

- ALRT — Safety net alert indicator
- CALLSIGN — Transponded SSR code
- AFL+VS — Actual flight level and an arrow to indicate climb or descent. At or below the transition altitude the displayed value is the altitude in hundreds of feet, prefixed by "A".
- GS — Groundspeed in knots

5.1.2 Correlated track label

Departure	Arrival	Overflight/unknown
ALRT ASSR_E COMM CALLSIGN DRWY DEP AFL+VS GS ATYP WTC RMK	ALRT ASSR_E COMM CALLSIGN STAND AFL+VS GS ATYP WTC RMK	ALRT ASSR_E COMM CALLSIGN AFL+VS GS ATYP WTC RMK

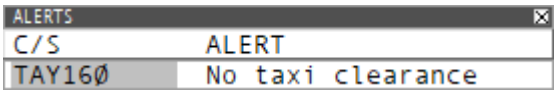
- ALRT — Safety net alert indicator
- ASSR_E — Assigned SSR code if different from the transponded code
- COMM — "t" if text only, "r" if voice receive only
- CALLSIGN — Callsign
- DRWY — Departure runway identifier, automatically displayed when either:
  - there is more than one active departure runway, or
  - the assigned runway is not an active departure runway
- DEP — Assigned heading or SID designator
- STAND — Assigned arrival stand
  - Highlighted after a change until acknowledged
- ATYP — Aircraft type
- WTC — Wake turbulence category
- RMK — Scratchpad contents

6 Lists

To move the lists, drag from the title bar. To close them, click on the [X] button in the top right corner.

When a scrollbar is displayed, the displayed items can be scrolled one at a time by using the “up” and “down” triangle buttons above and below the scrollbar, by dragging the scrollbar or by clicking the scrollbar area above or below the scrollbar itself (left-clicking scrolls by the number of items displayed, right-clicking moves the scrollbar to the clicked position).

6.1 Alerts List

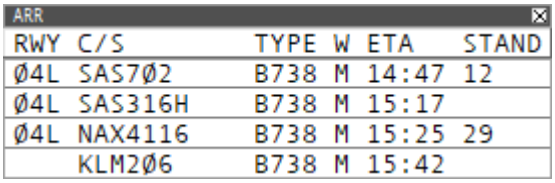


The Alerts List displays the active alerts and informations provided by the safety nets. The list is sorted to display the alerts first, sorted according to the callsign, and then the informations.

- C/S Callsign
- ALERT Alert or information type

It is possible to cancel APM “Area penetration” and RVM “Restriction” alerts for a stationary track by left-clicking the callsign in the Alerts List. The alerts will be automatically activated again when the track starts moving.

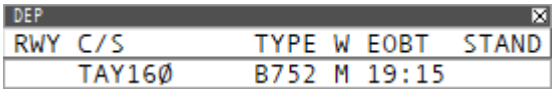
6.2 Arrival List



The Arrival List displays flights inbound to the airport, estimated to arrive within the next 60 minutes. The list is sorted according the estimated time of arrival, with the first to arrive on top.

- RWY Arrival runway (selectable field)
- C/S Callsign
- TYPE Type (selectable field)
- W Wake turbulence category (selectable field)
- ETA Estimated time of arrival (hh:mm) (selectable field)
- STAND Assigned arrival stand (selectable field)

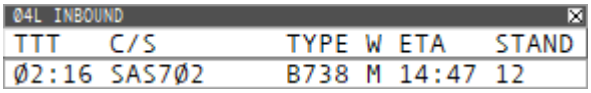
6.3 Departure List



The Departure List displays flights departing from the airport. The list is sorted alphabetically on C/S.

- RWY Departure runway (selectable field)
- C/S Callsign
- TYPE Type (selectable field)
- W Wake turbulence category (selectable field)
- EOBT Estimated off-block time (hh:mm) (selectable field)
- STAND Departure stand (selectable field)

6.4 Inbound Lists



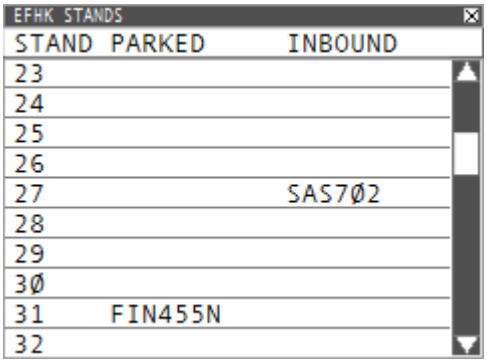
The Inbound List displays a list of aircraft approaching that runway. The aircraft are added to the list when they are established on the extended centerline (less than 0.6nm cross track error and ground track within 10 degrees of the runway heading), are less than 30nm from the threshold and at an altitude not more than 5000ft above the airport elevation.

When an aircraft is on final to a runway other than the one it is supposed to land on, it will be added to the list when it is a bit closer to the threshold, when the plugin code assumes that it will land on the runway regardless of the runway assignment (less than 0.3nm cross track error, ground track within 10 degrees of the runway heading and less than 4nm from the runway threshold).

The list is sorted according to distance from the threshold, with the closest aircraft at the top.

- TTT Time to threshold (mm:ss) assuming current groundspeed
- C/S Callsign
- TYPE Type (selectable field)
- W Wake turbulence category (selectable field)
- ETA Estimated time of arrival (hh:mm) (selectable field)
- STAND Assigned arrival stand (selectable field)

6.5 Stands List



The Stands List shows an overview of the stand allocation status at the airport. It also allows to manually assign arrival stands, mark stands as occupied by a specific aircraft, or to block stands from automatic allocation. Blocked stands are displayed with grey text if automatically blocked, red text if manually blocked.

In addition to the Settings menu, the number of displayed stands can be adjusted by dragging the “down” triangle button below the scrollbar when it’s visible.

- STAND — Left-click to toggle manually blocked status
- PARKED — Left-click to open a menu to mark the stand occupied by an aircraft, or to clear the information when it exists
- INBOUND — Left-click to open a menu to manually assign the stand for an aircraft

Stands defined as an area (capable of parking multiple aircraft) will display the number of aircraft parked and assigned to park there in the “PARKED” and “INBOUND” columns. It is not possible to manually set an area stand as occupied by an aircraft.

The “Parked” menu shows all aircraft within 5nm of the airport reference point, and the “Inbound” menu all aircraft arriving at that airport regardless of distance to the airport. When assigning a stand, it may take a couple of seconds until it shows in the window as the stand assignments are refreshed every 5 seconds within the plugin.

7 Safety Nets

In the ground mode of the plugin, the following potentially unsafe situations are highlighted by presenting an alert indication in the track label. If more than one alert is active simultaneously, the first one in the below order is shown. The alerts are also shown in the Alerts List, and by coloring the callsign item appropriately in other lists. The safety nets can be toggled on/off using the buttons on the Global Menu bar. The button that controls each alert is shown boxed before the alert name in the list below.

7.1 Runway Monitoring and Conflict Alerting (RMCA)

RMCA displays conflicts between aircraft on a runway or on approach. In addition to monitoring single runways, it also looks for conflicts on crossing runways. Whether the conflict is shown as an alert or information depends on its severity (closure rate, time to threshold etc.)

CONFLICT — RIM RMCA conflict alert

CONFLICT — RIM RMCA conflict information

7.2 Conformance Monitoring Alerts for Controllers (CMAC)

CMAC provides alerts when aircraft deviate or potentially deviate from clearances or normal procedures.

NO TOF CLR — CVM No take-off clearance alert

Departing aircraft above 20kts ground speed on runway without "DEPA" state

RWY INCURSION — RIM Runway Incursion Monitoring alert

Departing aircraft on:
- its departure runway with a ground state other than "LINE UP" or "DEPA"
- another runway with a ground state other than "TAXI"
- any runway with a ground state other than "TAXI", "LINE UP" or "DEPA" when no departure runway has been set

HIJACK
COMFAIL
EMERG — ECM Emergency Code Monitoring alert

Displayed for squawks 7500, 7600 and 7700 within 30nm of the airport

RWY CLOSED — APM Runway closed alert

Aircraft on a closed runway

RWY TYPE — RVM Runway type alert

Aircraft on a runway not suitable for it

TWY TYPE — RVM Taxiway type alert

Aircraft on a taxiway not suitable for it

APM — APM Area Penetration Monitoring alert

Aircraft inside an area prohibited for all traffic

RESTRICTION — RVM Restriction Violation Monitoring alert

Aircraft inside an area prohibited for it

TWY CLOSED

APM Taxiway closed alert

Aircraft on a closed taxiway

HIGH SPEED

CVM High speed alert

Aircraft moving very fast (over 55kts ground speed) outside a runway

STATIONARY RPA

CVM Stationary within the runway protected area alert

Arriving aircraft stopped inside a runway protected area

RWY CLOSED

APM Runway closed information

Aircraft assigned a closed runway

RWY TYPE

RVM Runway type information

Aircraft assigned a runway not suitable for it

NO CONTACT

CVM No contact information

Arriving aircraft still in "transfer in" state, less than 120sec/4nm to threshold

TRANSFER?

CVM No transfer information

Departing aircraft still assumed and outside a defined volume
(height above airport elevation, distance from reference point)
(applicable only when logged in as GND or TWR)

HIGH SPEED

CVM High speed information

Aircraft moving fast (40-55kts ground speed) outside a runway

NO TAXI CLR

CVM No taxi clearance information

Departing aircraft moving forward with ground state "none", "ON FREQ", "DEICE" or "START UP", or over 10kts ground speed with ground state "PUSH"

NO PUSH CLR

CVM No pushback clearance information

Departing aircraft moving backward with ground state "none", "ON FREQ", "DEICE" or "START UP"

STAND

OSM Occupied Stand Monitoring alert

Arriving aircraft whose stand is currently occupied
(This alert is only displayed on the track label)

DRWY

SRM SID/Runway Monitoring alert

Departing aircraft assigned a departure runway that is not active for departures and there is at least one active departure runway
(DRWY item in track label shown with a red background)
(This alert is only displayed on the track label)

8 Tag items and functions

The plugin includes a number of tag items and functions to use in EuroScope flight lists or track labels.

8.1 Tag items

Arrival stand	Displays the assigned arrival stand. Colored with ES color “Emergency” if the stand is occupied or blocked, “Information” if the assignment has changed.
Departure stand	Displays the departure stand (only as long as the aircraft is still there)
Ground state	Displays the aircraft’s ground state using the plugin’s custom texts for them, including the plugin specific ground states. The displayed text for each state is adjustable using the plugin settings.

8.2 Tag functions

Open Ground state menu	Opens the Ground state menu
Open Stand menu	Opens the Stand assignment menu. When the aircraft has a changed stand assignment, instead of opening the menu, this tag function clears the “Information” color.