

TCAS and Traffic Display_V2

for
Microsoft Flight Simulator X SP1/2



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October 2010

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I Introduction

This gauge version 2 has been developed for the FSX Flight Simulator SP1/2. It should also work with Acceleration. The functionality for the TCAS part is based on general specs for commercial aircraft. It does not provide, in detail, the function for a specific aircraft model. It is a generic gauge, and can be simply added to any aircraft as a standalone popup window.

In addition the gauge provides an AI traffic display in the ranges of 10, 20, and 40 miles. Within this display mode, no TCAS rules are valid, which means all AI aircraft are displayed.

Version 2 changes and improvements

- 1: Full TCAS and traffic display capability is provided even though your aircraft is on the ground. Only the trigger of the alarm/warn sound and the blinking lamp display will be blocked.
- 2: An AI HDG pointer will be displayed. It shows in which direction the AI is moving.
- 3: A bearing pointer has been introduced. It allows the pilot to point to a specific AI.
- 4: The AI additional text info display follows the structure of an ATC text.
- 5: The AI additional text can be selected individually per AI with a mouse click.
- 6: Each AI display contains a ID index number (0 – 20).
- 7: The design of the TCAS and Traffic Display Box has been updated.
- 8: Increased the number of AIs displayed on the screen in display mode.

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CREDIT goes to:

Stefan Schneider for his support on special XML issues and TCAS functionality.
Bob Familton for his review of the documentation and testing for SP1 FSX.
Doug Dawson for his dsd-XML-sound interface in order to generate the sounds.

II General TCAS Functionality

The Traffic Alert and Collision Avoidance System (TCAS) alerts the pilot in case of potential conflicts with other airplanes in the same area. TCAS tracks these other airplanes, if equipped with an Air Traffic Control Radar, or a Beacon System.

TCAS provides two types of collision avoidance alerts, they are:

- Traffic advisory (TA)
- Resolution advisory (RA)

A TA shows the relative position of any AI airplane in FSX.

An RA shows a vertical maneuver to avoid a possible airplane collision.

TCAS I

TCAS I is the system intended for use on small commuter or general aviation airplanes. TCAS I supplies proximity traffic advisories (TA's), but does not produce resolution advisories (RA's).

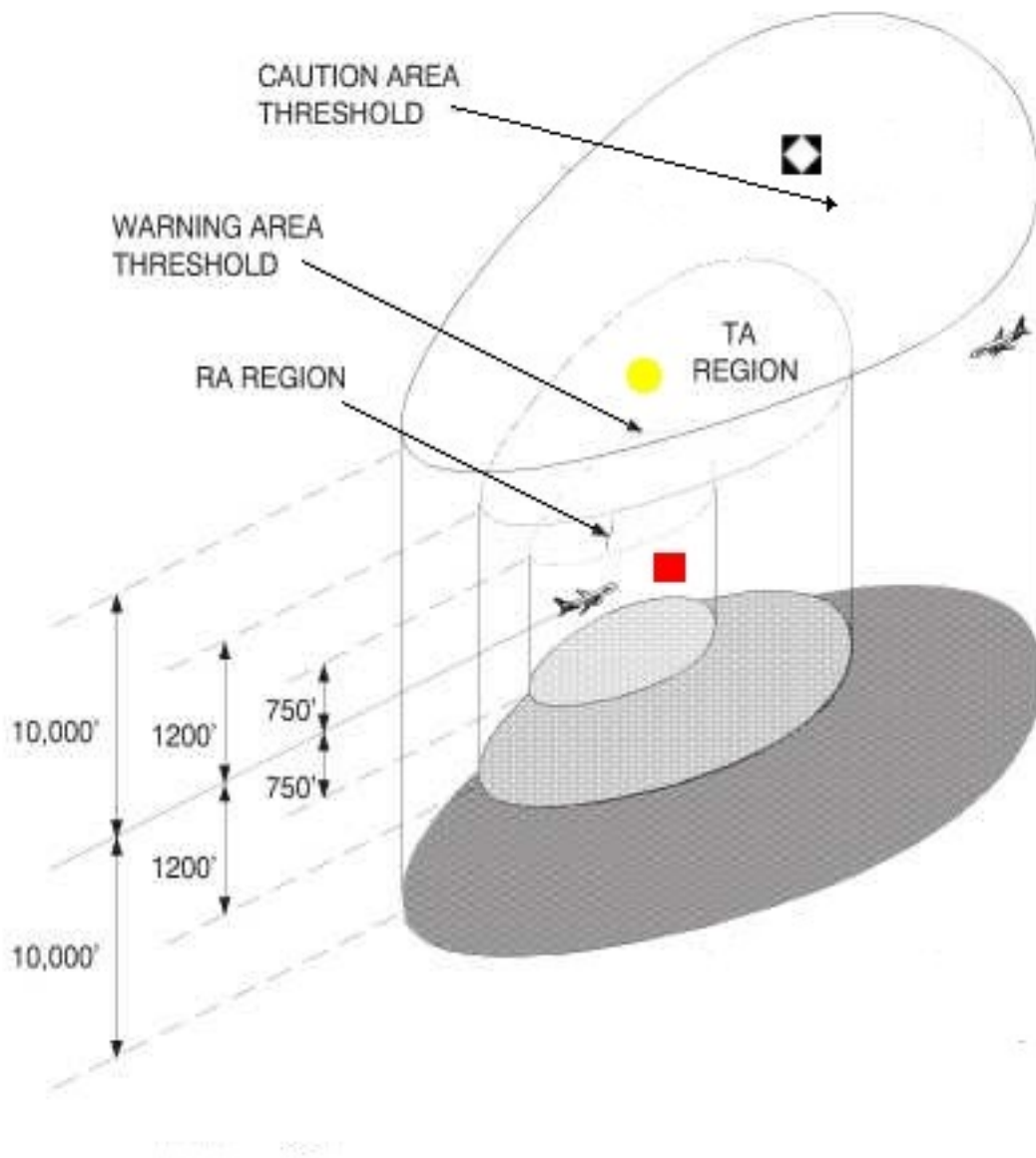
TCAS II

TCAS II is the system installed on all modern airplanes. It supplies both visual and aural advisories to the pilot. Both TA's and RA's are generated by this system. All commercial airlines and some general aviation airplanes will be equipped with this system.

As far as this gauge development for FSX is concerned, it provides the functionality as defined for TCAS I. A potential collision will warn the pilot with a sound and a blinking warning light on the panel. It is up to the pilot to resolve the conflict according to the information displayed by the TCAS gauge.

III Functional Description of Buttons, Modes and Displays

The drawing below show the altitude threshold settings for the TCAS gauge. The distance rings are in the 15 nm range 0-5nm (red), 5-10 nm (yellow), and 10-15 nm (white-filled diamond).



As long as your aircraft is outside of the corridor of the defined distance and altitude in relation to the AI aircraft, you will see no symbols on the screen.

TCAS Displays

Non-Threat Displays

Non-threat or other traffic shows as a white open diamond. These represent AI airplanes with a range > 15 nm or < 20 nm, and no altitude threshold settings.

Proximate Traffic

Proximate traffic shows as a solid, white-filled diamond. These are AI airplanes within a range of > 10 nm and < 15 nm and a $+10,000/-10,000$ feet relative altitude. Proximate traffic is not considered a threat, but only shows to assist the pilot in visually acquiring the AI traffic.

Traffic Advisory (TA) Traffic

TA's show as a solid, yellow-filled circle. These are AI airplanes within a range of > 5 nm and < 10 nm and a $+1,200/-1,200$ feet relative altitude. This gives the pilot time to visually acquire the AI aircraft. A yellow TCAS display light is blinking on the panel along with a warning sound.

Resolution Advisory (RA) Traffic

RA's show as a solid, red square. RA's are issued only when the AI aircraft is within a range of > 0 nm and < 5 nm and a $+750/-750$ feet relative altitude. A red TCAS display light is blinking on the panel along with an alert sound. These AI aircraft require a vertical flight maneuver (Up or Down) to avoid a collision.

Vertical Motion Arrow

An arrow pointing up or down in the same color as the traffic symbol, is placed on the right side of the symbol to show if the AI aircraft is either climbing or descending at a rate greater than 500 feet-per-minute.

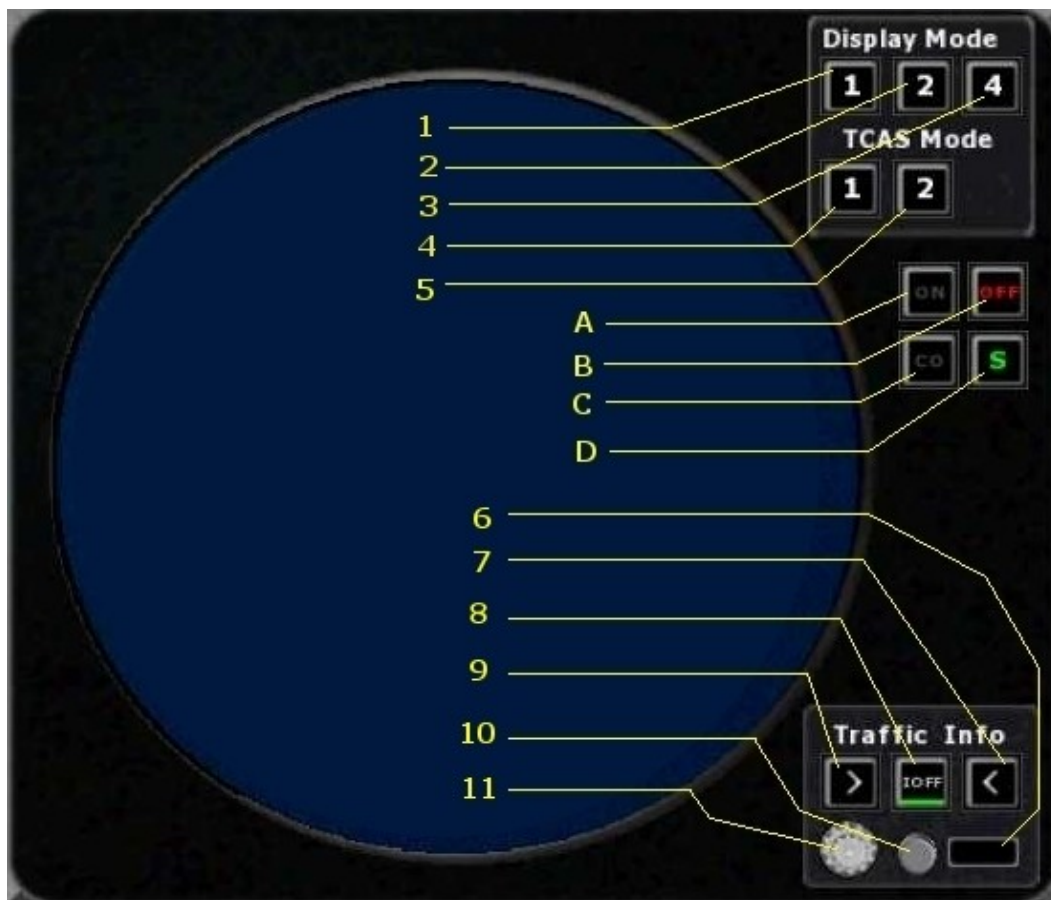
Altitude Readout

The AI relative altitude shows as a decimal number that represents altitude in hundreds of feet and is placed on the right side of the symbol. The color is the same as the traffic symbol. If the AI's relative altitude is above you, the digits appear with a plus sign. If the AI is below you, the digits appear with a minus sign. If the relative altitude is zero the altitude readout is not displayed.

Distance Readout

The AI distance shows as a decimal number that represents the distance in miles and is placed on the top of the symbol. The color is the same as the traffic symbol.

Description of the buttons and control elements of the TCAS panel.



- A) ON click button. Turns TCAS in Mode 20 nm ON.
- B) OFF click button. Turns TCAS OFF. All other click spots are now inactive.
- C) ON/OFF Compass Rose. If ON a compass rose will be displayed on the screen.
- D) ON/OFF warn/alert sound. Per default, the sounds are always ON.

- 1) ON/OFF click button. Turns Display Mode 10 nm ON/OFF.
- 2) ON/OFF click button. Turns Display Mode 20 nm ON/OFF.
- 3) ON/OFF click button. Turns Display Mode 40 nm ON/OFF.
- 4), 5) Click buttons for TCAS Mode with the same function as in Display Mode.
- 6) Display bearing pointer position in degrees relative to your aircraft HDG.
- 7) Decrement AI index. Switches the additional text back to the previous AI.
- 8) ON/OFF for the base text information for all AI's.
- 9) Increment AI index. Switches the additional text to the next AI.
- 10) ON/OFF for the bearing pointer.
- 11) Button with two click spots (Incr./Decr.) to let the bearing pointer rotate.

Attention: All click spots are blocked as long as the TCAS and Traffic Display Mode is OFF!

IV View Examples

If you are in Display Mode and you switch ON the 40 nm view, you may see the following screen:



In Display Mode you will always see an AI symbol as a White Open Diamond. The symbol on the lower right tells you the AI is 22.5 miles away from you, it is 14,900 feet (+14.9) above your altitude and the vertical motion arrow tells you the AI is in climb mode. The little yellow pointer indicates the HDG of the AI. The 4 on the left side of the symbol is the AI Index ID. It is the 4th AI out of 20. A max of 20 AI's are displayed on a screen in Display Mode. 339 is the speed above ground. The symbol on the upper position tells you, the AI is in decent mode.

The following screen shows additional information on the AI. This is, if you click/scroll on the (11) button. You can step through all displayed AI's in order to turn on this additional information. For example:



Paci: Is a 4 letter ATC Airline Name . **5752 :** Is the ATC Flight NBR
B738 : Is the ATC Model. **D-ATUK:** Is the ATC Tail NBR
59 : Is the altitude (here 5,600 feet), **328 :** Is the speed.
EDDH, UTAA : Is the flightplan. Flying from EDDH to UTAA
The motion arrow indicates that the aircraft is in climb mode.

In this case you will see the additional info text on one of the AI symbols in a red color, in the TCAS-Alert mode. In addition a blinking text display “TRAFFIC TRAFFIC “.



The following display is an example if you are in TCAS Mode for an AI which is in a TA area (yellow):



Again, to see this display, you must have TCAS Mode selected. The AI is 5.1 miles away, in a climb, and 300 feet above your altitude. This display will also trigger a warning sound and turns on a yellow flashing light on the panel. The 1 is the AI Index ID. 262 is the speed above ground.

The following display with the basic info is another example if you are in TCAS Mode and the AI is in a RA area (red) :



Again, to see this display, you must have TCAS Mode selected. The AI is 1.7 miles away, in climb, and 300 feet above your altitude. This display will also trigger an alert sound and turns on a red flashing light on the panel.

In the example below the bearing pointer has been turned on and points to the AI.



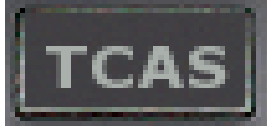
The display below indicates that the bearing pointer selected is 13 degrees and the green color on button (10) indicates that the pointer is ON.



In Display Mode the max number of AI's being displayed on the screen is 20. Always the 20 closest AI's, in terms of the distance relative to your own position, are displayed. Be aware, that the Display Mode is just an extra function for this TCAS gauge in order to provide a overview for the PC pilot of the overall traffic situation.

TCAS Panel Light.

On your aircraft panel you will see a TCAS Warn/Alert light.
The light looks like this:



TCAS has no collision situation discovered.



This display indicates a TA situation. A warn sound is turned on, and the light flashes.



This display indicates an RA situation. An alert sound is turned on, and the light flashes.

In all yellow/red situations you should immediately open your TCAS screen and check out what actions are appropriate.

Installation

If you have Version 1 installed, just delete all the relevant files of this version.

The installation is a very simple copy and paste approach. The installation described here, shall be for the standard MS B737-800. If you are installing it in another aircraft follow the same procedure. Alter the Window number and gauge numbers to suit the panel.cfg numbering system to suit your selected aircraft. The location of the gauges will have to be changed to suit your panel. The first two numbers after the gauge name determine the horizontal and vertical position of the gauge on the 2d panel.

- 1: Copy the folder TCAS into the main Gauges folder of FSX.
- 2: Copy the TCAS_V2.CAB file into the panel folder of the aircraft.
- 3: Insert a new window entry into the section of the panel.cfg.

[Window Titles]

window10=TCAS // new entry

- 4: Insert now the new window into the panel.cfg.

----- **TCAS Window** -----

[Window10]

Background_color=0,0,0

size_mm=450,400

window_size_ratio=1

position=0

visible=0

Ident=1025

//Don't change this !!

window_size= 0.303,0.345

//small

//window_size= 0.4363,0.496

//large

window_pos= 0.060, 0.060

gauge00=TCAS_V2!TCAS_V2, 0,0,0,0

With this entry the pop up window is configured in the panel.cfg.

- 5: Next you have to insert an entry for the click icon to call/activate the window.
This is the entry in the [Window00] section:

gauge37=TCAS_V2!TCAS_Switch, 585,445,25,25

Check the gauge sequence number not being in conflict with existing numbers in your panel.cfg. This is the icon:



6 : Next insert the gauge entry for the TCAS Warn/Alert display.

```
gauge38=TCAS_V2!TCAS_Alert_12, 214,480,50,25
```

Check the gauge sequence number not being in conflict with existing numbers in your panel.cfg. This is the display symbol :



7 : Next insert the gauge entry for two gauges which provide the functionality for the sound and the traffic info.

```
gauge39=TCAS_V2!TrafficInfo_V2, 0,0,0,0  
gauge40=TCAS/Sound3!dsd_xml_sound3, 0,0,,, ./gauges/TCAS/Sound.ini
```

Again, check the gauge sequence number not being in conflict with existing numbers in your panel.cfg.

If you open the TCAS window you can move it and change the size the way you want easily with the mouse.

If you see this FSX warning message (it's in German, because I have the German Windows):



Click Accept/OK. This is just the sound.dll from Doug Dawson.

Finally copy the TCAS_Doc_V2 folder into a folder of your choice.

That's it.

VI Test your TCAS

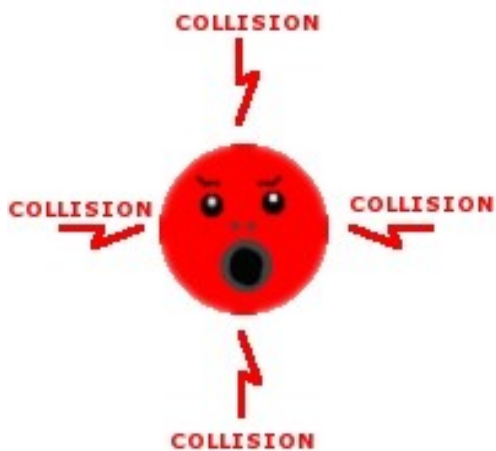
Just to see whether your TCAS works do this:

- 1: Start FSX
- 2: Set your traffic slider to 100 % just to generate a lot of traffic.
- 3: Select a busy airport with time and date accordingly.
- 4: Start "FLY NOW!"
- 5: You will be sitting now on a RWY.
- 6: Go in Slew Mode.
- 7: Move your aircraft off the RWY and on a position where you can watch the RWY's. You can stay on the ground.
- 8: Open your TCAS window.
- 9: Switch TCAS ON.
- 10: Select the 40 nm Display Mode and you should see a lot of traffic.
- 11: You can now speed up the simulation by selecting 4X (not more !!)
- 12: Watch the AI until you see an AI take off.
- 13: Select the sim speed back to normal, and watch the AI that takes off.
- 14: Select TCAS Mode 20 nm.
- 15: As soon as the AI is in the air, you must see the flashing red TCAS display on your panel but not hear a sound.
- 16: Go in Slew Mode and move your aircraft off the ground, and now you should hear the sound and your display is still in red with the flashing text.

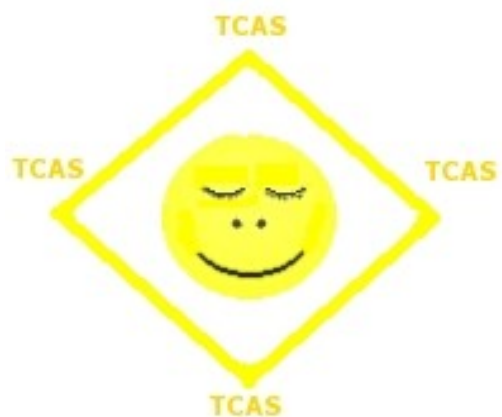
As soon as the AI is 750 feet over the relative altitude of your plane the alert sound and the red display turns off.

Stay in slew mode, and follow the AI by controlling your distance and flight level according to the specs of the TCAS gauge. So, you can easily generate the yellow TA situation (AI > 5 nm and within > -1,200 and <+1,200 feet) and any other display as well.

If you loose the display in TCAS Mode for some reason, just select the Display Mode in order to see where your AI traffic is.



No risk, no fun ??



I love my TCAS