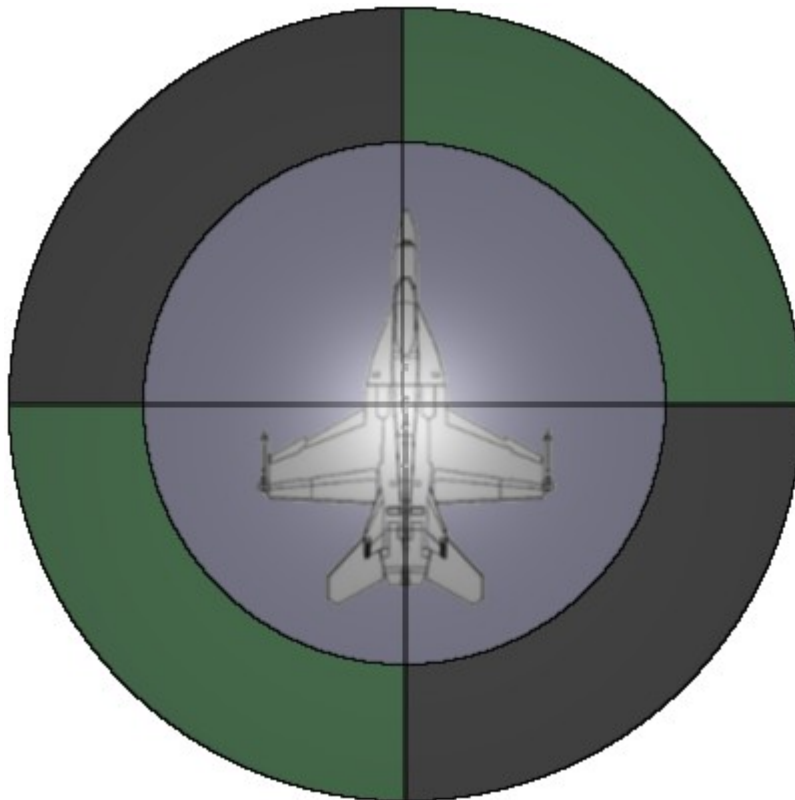


Advanced Radar System (ARS 4) for Microsoft Flight Simulator X SP1/2 Version 1.0



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Table of Contents

I	Introduction
II	Symbols, Buttons, and Switches
	Air Target Display
	Boat/Ship Target Display
III	ARS 4 Operational Instructions for Aircraft
IV	ARS 4 Operational Instructions for Ships/Boats
V	Installation
 Appendix A	
Air to Air Re-Fuel Operation	
 Appendix B	
Virtual Cockpits and other Aircraft Models	

I Introduction

This scenery has been developed for FSX Flight Simulator SP1 or SP2. It has also been tested with Microsoft Acceleration also, but compatibility is not guaranteed by the author.

This new Advanced Radar System (ARS 4) includes significant new features, functions and displays for FSX AI traffic. The new key features are:

- AI traffic display for air targets and boat/ship targets.
- Auto landing on carrier if the carrier is part of the scenery MECOPS.
- Allows switching between air target display and boat target display.
- Provides for air and boat display to optionally insert airport and/or basic terrain display on the screen.
- Different screen presentations for air and boat targets.
- Simplified installation procedure.
- A2A re-fuel function remains the same as in the ARS2 version.
For more information read Appendix A.

For more information on carrier operations read chapter **IV**.

All displays – for air, or boat/ship traffic – can be selected in a range of 5, 10, 20, and 40 miles. An AI aircraft will be represented by a green circle and an associated heading indicator. Each individual air target can be selected by a switch in order to get information about his heading, distance, altitude, speed, the ATC model, and the ATC ID. An arrow symbol indicates whether the air AI is in climb or in decent mode. ARS 4 contains a tracking function, which allows you to follow a selected air target automatically in terms of course, speed, and altitude. In this mode the ARS 4 is coupled with the autopilot of your aircraft. The radar feeds the autopilot with the AI information like heading, speed, and altitude. The tracking mode can be switched on or off.

An air fuel gauge is also included in the package , which allows performing an air re-fuel procedure for your aircraft. An air refueling can be done from each AI aircraft if you have decided to use it as your tanker. The decision will be done via a select function on the ARS4 panel and in addition via a dedicated activation on the A2A fuel window.

A boat/ship target will be represented with a cyan square and an associated heading indicator. Information for boat targets can be displayed per switch to get the information about heading, distance, and speed.

Note: All descriptions below, regarding carrier operations, are related to a existing scenery, where a carrier is .This documentation does not explain on how to develop a scenery nor on how to generate a traffic.bgl for boats. The description explains the operation based on a existing scenery which can be made available via AVSIM by downloading the file **mecops.zip**. This scenery includes the ARS4 gauge also. If no carriers are being considered at all, the gauge can be used for normal AI air and AI boats traffic. In this case just ignore all descriptions regarding carrier operations.

Be aware, that boats traffic will be displayed only, if the FSX AI traffic engine is generating this traffic, and if your traffic slider settings in FSX are set accordingly (e.g. a minimum of 30% is a good value) .

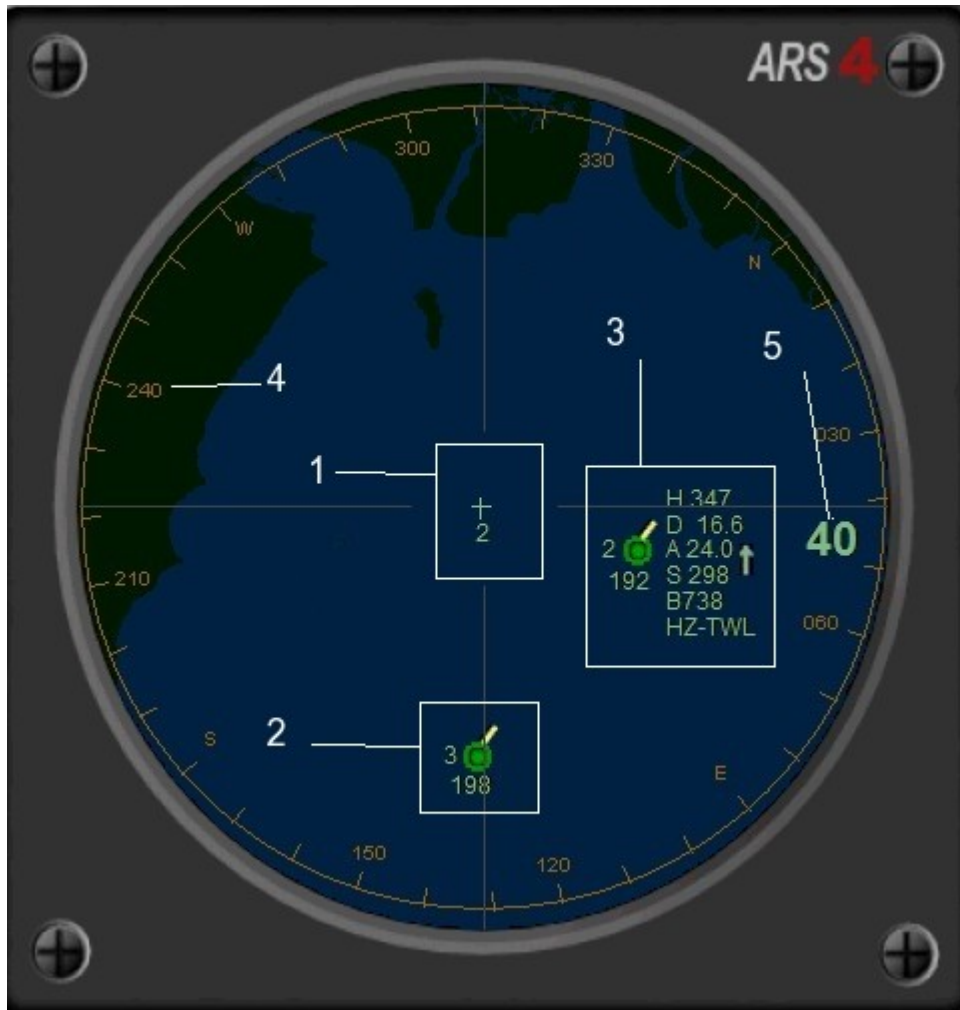
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This gauge is distributed as free-ware. All rights are reserved and no part of this package may be duplicated or distributed without the expressed and written consent of the author. Use this gauge at your own risk. The author cannot be held responsible for any damages, directly or indirectly, caused by the use of this free-ware.

Credit goes out to : Bob Familton for his review of the documentation and testing the gauge for FSX ACC and to Wayne Knowles for a final documentation review.

II Symbols, Buttons, and Switches

Air Target Display



- 1: The center of the screen. The number indicates the relative AI ID number.
- 2: The AI symbol. The little yellow dash is the HDG pointer for the AI. The 198 is the unique target ID, the 3 is the sequence number.
- 3: The associated information for this AI. H=Heading in degrees, Distance in nm, A=Altitude in ft., S=Speed in kts. B738 is the ATC model, HZ-TWL the ATC ID.
A white arrow indicates that the the AI is in climb mode.
- 4: Compass Rose
- 5: Selected range number

Boat/Ship Target Display



The target symbols are in cyan color and the symbol is a square. The associated target information is H=Heading in degrees, D=Distance in nm and S=Speed in kts.
The compass rose can be activated by a switch as well.

ARS 4 Panel for Air Targets



The ARS panel can be switched ON/OFF by clicking on the center of the screen.

The range control.



The display range can be controlled by clicking on the left/right side of the knob.

Mode and Display Select.



AIR button selects AIR or Boat panel.
T selects a basic terrain view ON/OFF.
A selects airport symbols display ON/OFF.

Power ON/OFF.



Turns all ARS functions ON/OFF. If the switch is in the OFF position, all click buttons/switches are inactive.

Select.



With the < > buttons you can step through the displayed targets. On each selected target ARS will display the AI traffic information. You can step forward and backward. Turning ON the **IOFF** button will cause the traffic information to be displayed for all targets. Press the **ID** button in order to display the relative and the unique AI ID. The unique AI ID is the selection criteria for you in case of automatic tracking a target.

AI Tracking.



Auto tracking requires you to select the AI you want to track. Press **SEL**. In the little window the selected AI number will be displayed in orange.

The green number always displays the number related to the AI's you step through.

With the **CPL** button you couple the ARS with your autopilot. **ATR** turns on the auto tracking regarding heading and altitude. The **ASP** button turns on the function to follow the AI with a controlled speed in order to catch up to the selected target AI.

Compass.



The compass button turns the compass rose ON/OFF

Rings.



The rings button turns the rings on the radar display ON/OFF

Bearing Control



Turns the bearing pointer on the radar display ON by clicking the **ON/OFF** button for the bearing pointer. The position, in degrees will be displayed on the little window below the rotating knob. With the mouse wheel you can rotate the pointer by using the click spots on the left/right side of the knob.



The click spot for the A2A window to display. (see Appendix A also)

The ARS 4 Panel for Boat/Ship Targets



This panel will be shown if the **AIR** button is pressed on the AIR panel. It will now be shown as Ship.

The range control.

Same as for the AIR panel..

Power ON/OFF.

Same as for the AIR panel..

Carrier Select.



Carrier select buttons. If you have the MECOPS scenery installed, you can select the CVN68 (**C1**) or the CVN69 (**C2**) carrier. If no carriers/scenery is installed, you will get a MSG "No carriers available". If a carrier is available, a magenta info will be shown in the center of the screen, which indicates the distance, the bearing and the carrier name. Distance and bearing are relative to your position, regardless where you are in the world.

Carrier Auto Landing



Auto landing requires you to select the carrier you want to land on. Press **C1** or **C2** . With the **SEL** button you select this carrier for a landing approach. With the **CPL** switch you prepare the radar for auto landing.

The **ATR** button turns on the auto tracking regarding the HDG. The **ALT** button turns on the function to follow the glide slope to the carrier. For more information you must read the MECOPS documentation.

Compass.

Same as for the AIR panel.

Rings.

Same as for the AIR panel.

Bearing Control

Same as for the AIR panel.

Click spots



A click on the center of the screen turns the ARS4 panel on. Each button/knob has a click spot. The click spots for the toggle switches are on the upper/lower position of the switch. In order to move the bearing pointer on the screen, use the click spots (mouse wheel) on the left/right side of the bearing knob.

III ARS 4 Operational Instructions for Aircraft

With a click on the ARS icon the ARS4 screen will show up. By default the air target screen and the basic terrain display will be active.



With a click on the center of the screen the ARS panel will disappear. By default the power switch is OFF. All buttons/click spots are inactive. If you turn on the PWR switch, the screen will be shown with the 5 nm range as default.

If nothing is on the screen, no AIs may be in the range of 5 nm around your position. Select 10, 20, or 40 nm to check for any AI targets.

At a different time, and different situation, you may see a number of targets if you turn on the 40 nm range (see above).

To get more information about the individual AI's just step through the symbols by clicking on the ➤ button. On each of the symbols you will get the following information:



The meaning of the different information has been explained above already.

With the ◀ button you step backwards, and if you reach zero no related information will be displayed any more.

A click on the IOFF button will turn on/off the information for all targets on the screen.

Clicking on the **Rings** button will turn on the range rings, and a click on the **Bearing** knob will show the orange bearing pointer. Using the mouse wheel will allow you to rotate the pointer around the center of the screen. The little window below indicates the position in degrees of the pointer.



Auto Tracking Aircraft Targets

Attention !! If you activate auto tracking you must be aware:

1) Your aircraft will try to catch up to the AI. The speed control will add an initial speed of 200 kts if the AI is at a distance > 10 nm and < 40 nm.

The speed will be degraded step by step the closer your aircraft will come to the AI. So, if you try to track an AI B737 and you are sitting as well in a B737 the radar will set the speed in your autopilot to the AI speed plus 200 kt. This may result into an overspeed condition. In this case it is better to control the speed manually. For this kind of auto tracking, you just should sit in a military jet which is able to follow this kind of command.

2) The auto track function of the ARS will feed your autopilot with the max of 9,900 ft/min vertical speed, if the AI you want to follow is much higher/lower in terms of altitude compared with your aircraft. Depending on the model you are sitting in, this may result into a problem. Again, if you are not using a military jet you should better control your aircraft manually until you are coming closer to the altitude of the selected AI aircraft before switching auto tracking on.

The ARS 4 gauge works only, if the ARS4 window is activated and shown on your pane !!! If you switch to a outside view, the gauge is not in function !!!!!!!!!!! If you want to view the refueling you can go to the Menu and select an outside view and undock the window and place it in a suitable position.

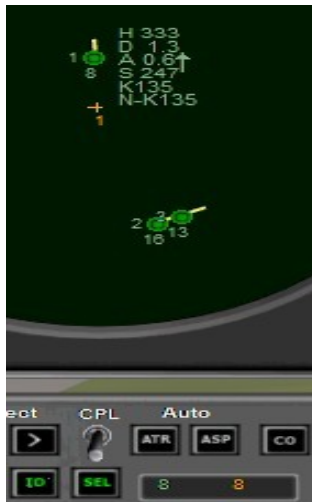
Let's take an example in which you want to follow an AI K135 air tanker with the ATC-Code N-K135.

The tanker is flying a route from Airport A to Airport B and he starts on Airport A at the time 13:00 PM. You are starting at Airport A as well, however about 3 minutes later. You want to meet the K135 somewhere on his route. So, take off at airport A, turn on your radar, select 40 miles, click the button **IOFF** to get all info from all targets on the screen. You are watching for the ATC-Code N-K135 which is your target aircraft. In case the K135 shows up on the screen you see this information for it:



Two things are important to notice. The little number 8 below the green dot is the unique number associated with this aircraft.

OK, next turn off the IOFF and select your tanker with the > < buttons. The little number on the left of the green symbol is the sequence number which increases/decreases the number of click steps selected by the > < buttons. In the case above it is just the 1 which means one click on this > button.



Next, click the **SEL** button. In the little window on the control panel you see what you have selected. It shows the number 8.

From now on this AI, which is your AI K135, is permanently selected/displayed regardless what other buttons are shown. So, you may turn off all the other information and put your focus on N-K135. Watch the HDG, ALT, SPD and distance of your selected aircraft. Follow the AI K135 until the AI has reached the cruise altitude.



Go now to your autopilot and set HDG hold, ALT hold, and SPD hold to ON, but leave the AP master switch still in OFF position. Turn on the **CPL** switch on your radar panel, turn on the **ATR** and the **ASP** button. You are now connected to your AP. You will see the numbers are changing on the AP. Turn the autopilot master switch ON and the **radar controls your aircraft from now on via the autopilot**. Your aircraft follows the selected aircraft.

Your aircraft will be accelerated under control of the radar in speed depending on the current distance to the selected AI. The altitude is controlled too. If you want to stop the speed acceleration, just turn off the **ASP** button on the radar panel or turn off the SPD hold function on the autopilot. In this case it is up to you to control the speed of your aircraft. You can always turn off the individual tracking functions by switching off the autopilot, or set the **ATR** button to off.

IV ARS 4 Operational Instructions Ships/Boats

With a click on the ARS icon on the panel the ARS4 screen will show up. By default the air target screen and the basic terrain display will be active.

With a click on the center of the screen the ARS4 panel will disappear.

Per default the power switch is OFF. All buttons/click spots are inactive.

If you turn on the PWR switch, the screen will be shown with the 5 nm range as a default.

Click now on the **Ship** button and the ship/boat screen will be displayed along with the control panel for boat traffic.

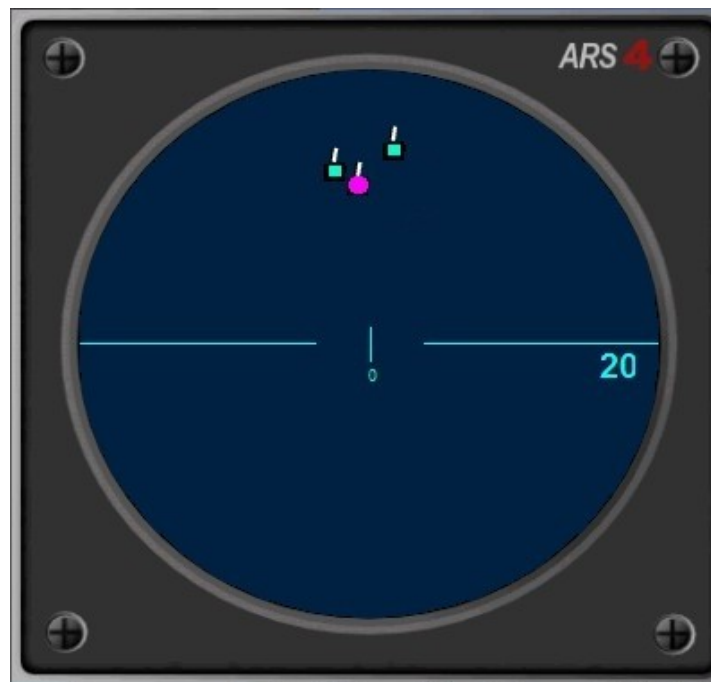
If nothing is on the screen, no boat traffic may be in the range of 5 nm around your position. Select 10, 20, or 40 nm to check for any AI boat targets.

The boat traffic display is very simple. It shows the symbols only with the HDG pointer. If the **IOFF** button is pressed, additional info associated with the target symbol will be shown. This is the HDG, the distance, and the speed of the boat target. If the boat is in sleep mode the speed is zero.



Carrier Operation/Identification

The ARS4 gauge has been tested and developed based on the two great carrier models USS Nimitz & USS Eisenhower from Javier Fernandez. To identify the carrier on the screen it will be represented as a magenta dot with a white little HDG pointer.



Note: The scenery **mecops.zip** is required to see a carrier.

After you have selected the carrier via the control panel (C1,C2 button) and you are looking for a landing, the following auto landing screen will be displayed:



- 1: Normal boat symbol.
- 2: Carrier symbol.
- 3: RWY HDG information and distance .
- 4: Runway heading pointer.
- 5: Localizer pointer.
- 6: Glide slope pointer.
- 7: LOC deviation readout.

Once more, the mecops scenery is required to see a carrier.
The scenery is available via AVSIM by downloading the file **mecops.zip**

V Installation

The installation is a copy and paste approach.

- 1: Copy the ARS4.cab file into the panel folder of your aircraft.
- 2: Insert 2 new window entries into the section of the panel.cfg.

[Window Titles]
Windowxx= ARS4 Radar
Windowzz= Airfuel

Note: The xx and zz numbers are the next numbers in sequence.

- 3: Insert the new windows into the panel.cfg.

```
//-----ARS_4-----  
  
[Windowxx]  
Background_color=0,0,0  
size_mm=405,485 //Don't change this !  
window_size_ratio=1  
visible=0  
ident=1125 //Don't change this !  
window_pos= 0.01, 0.015  
  
gauge00=ARS4!ARS_4, 0,0,400,400 //default  
gauge01=ARS4!ARS_4_Panel, 0,400,400,80  
  
//-----Airfuel ARS_4-----
```

```
[Windowzz]  
Background_color=0,0,0  
size_mm=190,240 //Don't change this !  
window_size_ratio=1  
visible=0  
ident=1130 //Don't change this !  
window_pos= 0.02, 0.633 //default  
  
gauge00=ARS4!Airfuel24, 0,0,0,0
```

Note: The xx and zz numbers are the next numbers in sequence and should correspond to the above window numbers.

In order to position the gauge exactly into your panel the way you want, adjust the size parameter on the gauge entry and the position parameter on the window pos entry accordingly.

4: Next insert the click icon into your main window for the ARS gauge. By clicking on this icon the ARS window will be opened.



Insert an entry in your panel.cfg in the Window 00 section like this:

gaugexx=ARS4!ARS_switch, yy,zz,20,20

yy and zz are the position parameter for the Icon symbol to define the position on your main panel. The xx value is the next number gauge line in sequence with the last numbered gauge line above it.

5: Next insert the following entry into your main window 00 too. This gauge provides the traffic FSX information for the radar gauge.

gaugexx=ARS4!TrafficInfo_AI4, 1,1,1,1
gaugexx=ARS4!CarrierCtl_Gulf, 1,1,1,1 //See Note

Note: The ARS4!CarrierCtl_Gulf entry is required only, if the MECOPS scenery is installed. **The xx numbers are the next numbers in sequence in window00.**

Thats it !!

Appendix A

Air to Air Refuel Operations

The Auto Tracking function supports a successful air to air re-fuel operation. The following should be considered for all A2A operations.

- You must have **NO WIND** at your altitude where you want to perform the auto re-fuel. Any windy weather will make it very difficult to perform an A2A operation.

- The flight level of your selected tanker should be around 10,000 feet. If you are trying to track an AI flight lets say at 30, 000 feet, you will experience an instability in keeping the exact flight parameters (altitude/heading/speed). So, the higher the flight level is, the more critical is an A2A re-fuel operation.

The ARS4 includes a dedicated control window in order to perform an air re-fuel operation.

The control window will be opened by clicking on the AA click spot on the ARS4 air control panel.

In principle, every AI aircraft can be used as a tanker for your aircraft. It is up to you to select a tanker of your choice out of the AI targets.

Normally you will have a dedicated aircraft e.g. a Boeing K135 as a tanker flying from A to B.

You can make any aircraft to be seen by the A2A control window as a K135 tanker by making the following entry in the aircraft.cfg :

atc_id=N-K135 or

atc_id=N-K136

The control window is sensitive for these two atc_id definitions and will display the distance and the bearing of this aircraft beyond the range of the ARS4 radar of 40 nm. You may see distances up to 100 nm from your position to the tanker you are looking for. The window looks like this:



You can now very easily find your tanker by just following the bearing information, and turning on your radar display as soon as the distance is below 40 nm.

As soon as you see the tanker on your radar, select it and the A2A control window will switch to this display:



Now you can use the auto tracking function in order to follow it.

If you have not defined in your aircraft.cfg one of these two entries (**atc_id=N-K135** or **atc_id=N-K136**) it is up to you, to select a aircraft of your choice as your tanker, by selecting the corresponding aircraft.

For a precise approach of your air tanker always watch the dedicated A2A control window.

For a successful A2A re-fuel procedure do this:

- 1: Select an AI tanker of your choice out of the air targets on the radar screen. A K135 model should be the preferred aircraft.
- 2: Turn on the auto tracking mode in order to follow the tanker in terms of altitude, heading and speed.
- 3: If you are close at about 5 nm you should turn on (if not already open) your A2A control window. Check the AI flight data on the little green screen.
- 4: Turn on the A2A ARM function on the A2A control window by clicking on the horizontal bar next to the ARM label on the frame of the box. A blinking MSG "Airfuel ARMED" will be displayed.
- 5: Keep auto track mode on and it will maneuver your aircraft towards the tanker until less than 1 nm in distance and two pointers will be shown. The pointers indicate the distance and the altitude relative to the selected AI. The yellow dot indicates the distance and the HDG direction, the green bar indicates the altitude. If both pointers are in the white box the re-fuel parameters are meet and the refuel will be performed (see left pic.).



On the right pic you see that the the yellow square is outside the white rectangle. The distance is to far. The green altitude pointer is in range so, you need to speed up to get closer to your tanker, until both pointers are in the white box.

In case you are far out of range for HDG, distance and altitude the pointers are not shown. The distance pointer will show up if you are less than 1 nm in range of the AI. The altitude pointer will show up if you are within an approx. 100 ft range.

Note: For a successful A2A re-fuel you must achieve to get your aircraft within this parameters close to your selected AI tanker:

Distance relative to the AI: < 0.05 nm

Altitude: max. 100 feet below the AI and max. 10 feet above the flight level of the AI.

6: The best way to maneuver your aircraft within that range is to turn off the auto track function if you are at about 0.5 nm close to your AI and your altitude corresponds to the AI. You may keep the speed control in order to come closer to your tanker. At this stage you can control the HDG more precisely with your stick. Now watch the two pointers. If you are within the range of the parameters above, the air fuel will be performed within less than a second.

The thick light green bar at the left lower part of the window will indicate the completed re-fuel. The new total fuel capacity will be shown which is always the max. capability of the aircraft.

Appendix B

Virtual Cockpits and other Aircraft Models

General: A full supported auto landing approach using the ARS4 will work only if the auto pilot of the aircraft uses the standard FSX A/P functionality.

Virtual Cockpit F-18A FSX ACC:

Below is the panel.cfg for the standard FSX ACC F-18A if the VC will be used (the new entries that need to be made are shown in blue):

```
// FA-18
// Copyright (c) 1999-2005 Microsoft Corporation. All rights reserved.
```

```
[Window Titles]
Window00=Main panel
Window02=GPS
Window03=Minipanel
Window04=ARS4 Radar
Window05=Airfuel
```

```
VIEW_FORWARD_DIR=-1.000, 0.000, 0.000
```

```
//-----
```

```
[Window00]
Background_color=0,0,0
size_mm=456,378
position=4
visible=1
ident=MAIN_PANEL
alpha_blend=0.95
window_size=0.6,0.65
window_pos=0.2,0.3
```

```
gauge00=fa-18!hud_2d, 0, 0, 456, 378, 4
```

```
//----- ARS4 -----
```

```
gauge31=ARS4!TrafficInfo_AI4, 1,1,1,1
gauge32=ARS4!CarrierCtl_Gulf, 1,1,1,1
```

```
//-----
```

```
[Window02]
Background_color=0,0,0
size_mm=456,378
position=8
visible=0
ident=GPS_PANEL
window_size= 0.500
no_luminous=1
```

```
gauge00=fs9gps!gps_500, 0,0
```

```
//-----
[Window03]
Background_color=0,0,0
size_mm=456,378
position=4
visible=1
ident=MINIPANEL
alpha_blend=0.95
window_size=0.6,0.65
window_pos=0.2,0.3

gauge00=fa-18!hud_2d, 0, 0, 456, 378, 4

//-----ARS_4 -----

[Window04]
Background_color=0,0,0
size_mm=405,485
window_size_ratio=1
nomenu=0
visible=0
ident=1125                                //Don't change this !

window_pos= 0.0, 0.015
window_size= 0.345,0.560

gauge00=ARS4!ARS_4,                                0,0,400,400
gauge01=ARS4!ARS_4_Panel,                                0,400,400,80

//-----Airfuel ARS4-----

[Window05]
Background_color=0,0,0
size_mm=190,240                                //Don't change this !
window_size_ratio=1
visible=0
nomenu=0
ident=1130                                //Don't change this !
window_pos= 0.02, 0.633                                //default

gauge00=ARS4!Airfuel24,                                0,0,0,0

//-----
```

```
[Vcockpit01]
Background_color=0,0,0
size_mm=1024,1024

visible=1
pixel_size=1024,1024
texture=$F18_A_GAUGE1

;1 = left DDI
;2 = right DDI
;3 = center DDI

gauge00=fa-18!MFD, 450,4,440,440, 1
gauge01=fa-18!MFD, 4, 452, 440, 440, 2
gauge02=fa-18!MFD, 4,4,440,440, 3
gauge03=fa-18!MFD, 578, 579, 440, 440, 4 NOSCANNING
gauge04=fa-18!UFC_WINDOW, 4, 898, 193, 58, 1
gauge05=fa-18!UFC_WINDOW, 204, 898, 193, 58, 2
gauge06=fa-18!UFC_WINDOW, 4, 960, 193, 58, 3
gauge07=fa-18!UFC_WINDOW, 204, 960, 193, 58, 4
gauge08=fa-18!UFC_WINDOW, 450, 446, 193, 58, 5
gauge09=fa-18!UFC_SCRATCHPAD, 648, 448, 264, 57
gauge10=fa-18!UFC_COM, 400, 899, 47, 58, 1
gauge11=fa-18!UFC_COM, 400, 961, 47, 58, 2

//----- ARS4 -----

gauge12=ARS4!TrafficInfo_AI4, 1,1,1,1
gauge13=ARS4!CarrierCtl_Gulf, 1,1,1,1

//-----ARS_4 -----

[Window04]
Background_color=0,0,0
size_mm=405,485
window_size_ratio=1
nomenu=0
visible=0
ident=1125 //Don't change this !

window_pos= 0.0, 0.015
window_size= 0.345,0.560

gauge00=ARS4!ARS_4, 0,0,400,400
gauge01=ARS4!ARS_4_Panel, 0,400,400,80

//-----Airfuel ARS4-----

[Window05]
Background_color=0,0,0
size_mm=190,240 //Don't change this !
window_size_ratio=1
visible=0
nomenu=0
ident=1130 //Don't change this !
window_pos= 0.02, 0.633 //default

gauge00=ARS4!Airfuel24, 0,0,0,0
```

If you have the great F/A-18E/F Superbug from Vertical Reality just insert the following entries in the 2D part and also into the VC part of the panel.cfg.:

[window00?

//----- ARS4 -----

gauge31=ARS4!TrafficInfo_AI4, 1,1,1,1
gauge32=ARS4!CarrierCtl_Gulf, 1,1,1,1

//-----ARS_4 -----

[Window01]

Background_color=0,0,0

size_mm=405,485

window_size_ratio=1

visible=0

ident=1125

//Don't change this !

window_pos= 0.0, 0.015

window_size= 0.345,0.560

gauge00=ARS4!ARS_4, 0,0,400,400
gauge01=ARS4!ARS_4_Panel, 0,400,400,80

//-----Airfuel ARS4-----

[Window02]

Background_color=0,0,0

size_mm=190,240

//Don't change this !

window_size_ratio=1

visible=0

ident=1130

//Don't change this !

window_pos= 0.02, 0.633

//default

gauge00=ARS4!Airfuel24, 0,0,0,0

Note: If the VRS F-18 will be used in connection with the ARS4 auto landing, only the ARS4 Altitude Hold functionality is supported. Same is valid for the air to air re-fueling procedure if ARS4 auto tracking is selected.

You must use the FSX command bar to open the ARS4 window in all cases where the VC is being used !!