FSX/P3D Generic GCA
Classic Approach Pattern Control and Ground Controlled Approach

Ground Controlled Approach or GCA was a revolutionary invention whose beginnings go back to the 1940's. It enabled controllers to 'talk-down' airplanes in difficult weather conditions. In order to simulate GCA in FSX/P3D the present application accesses two powerful gauges: Karol Chlebowski's AILA (Airborne Instrument Landing Approach), adapted by permission of the author, and Doug Dawson's sound DLL gauge. AILA provides guidance to *any* runway defined in FSX/P3D, and Doug Dawson's sound module allows the inclusion of verbal callouts. For more details on AILA and a historical account of GCA check out folder DOCS of the download zip.

Quick Checklist

APC: Approach Pattern Control

1. Set up AILA from approx. 20 miles out.
2. AILA > "NRST" for airport, runway, and runway end.
3. Check terrain obstructions.
4. Call APC.
5. Proceed until handed over to PAR.

PAR: Precision Approach

1. For PAR used without previous APC set up AILA as above.
2. Follow instructions and take over when able.

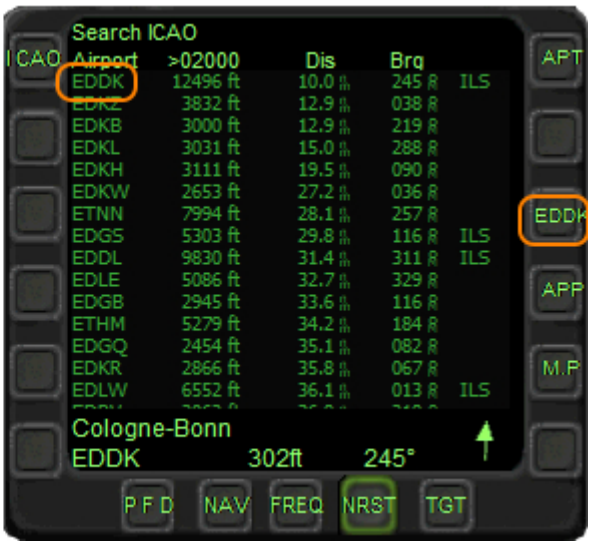
1. APC: Approach Pattern Control

Consider the following scenario. In FSX/P3D I am flying towards EDDK, my home airport. I am at an altitude of 5,000 feet and about 20 miles out. At this point, I pause the sim by going into SLEW mode. This gives me time to select a runway and set up a glideslope intercept from which to start my final descent. The GCA functions can be called up in a small 2D panel window which allows access to the AILA gauge and at the same time opens a tiny custom Autopilot.

Depending on where you have specified this panel to be (see readme), you can call it up either by a Shift-n combination, or via the menu bar by going to Views > Instrument Panel > GCA (in FSX) or Vehicle > Instrument Panel > GCA (in the newer P3D versions). What you get is this:

The AILA box is on top, the Autopilot is below. If initially the AILA box remains opaque, you may have to turn on the ship's battery.

The next steps need to be treated in some detail. The AILA panel allows me to select destination airport and runway as follows.

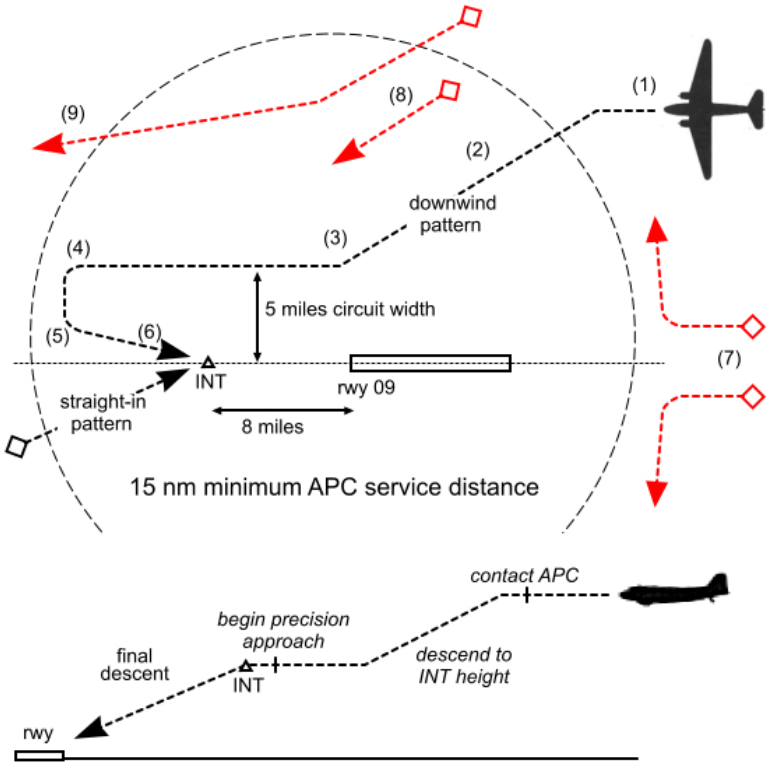


Click NRST ("nearest airports") in the bottom line, to get a list of close-by airports. If my target airport is not yet listed, I can use the "ICAO" button, which allows me to type in letters. After having picked my airport from the list, I click the button now showing EDDK to proceed to the runway menu and after that the central approach page:

Here I pick the runway I want, opting for 07-25. Clicking "APP" opens AILA's Approach page. On this page, I must make sure that the runway end shown is the one I want (careful here, easy to get it wrong by leaving the default end selected). Clicking "RWY" top left toggles the ends. Here, the 244 end is the one I need. Clicking the general area of the airport name presents a data sheet containing, among other things, wind velocity and direction, which might clearly be relevant to your runway selection.

With airport and runway selected, I am ready to un-slew my plane. I give her a moment to get re-established in straight and level flight, ensure that she is pointed in the very general direction of the destination airport and at least 15 miles away from it. If okay, I can click APC for Approach Pattern Control. The Controller (Alice) will identify herself and your plane (she knows if you are Air Force, Navy or Marine if you have specified it in atc-airline) and inform you of the eight-mile intercept altitude. If I want Alice's instructions to be executed directly, I turn on the custom Autopilot's Hdg and Alt locks. Depending on where I am, my approach will either be straight-in or a fairly long downwind pattern extending to around 13 miles. APC decides on the type of approach according to my entry point. The two main patterns are shown below; note that the tracks/entry points marked red will generate error messages.

Approach Pattern Control (APC)



1. This is Approach Pattern Control. Standby for vectors to eight-mile intercept runway 09. When clear of obstacles descend and maintain X feet intercept height. Turn left, heading [intercept].

2. Fly heading [intercept heading].

3. [at 6.0 nm from centerline] Turn right heading 270 [reciprocal runway heading].

4. [at 12 nm distance to runway] Turn left 90 degrees heading [toward centerline].

5. [at 1.5 nm from centerline] Turn left heading [toward intercept].

6. Standby for Final Controller.

7. For wider downwind circuit turn right/left ninety degrees for two and a half minutes. Re-contact APC when done.

8. Approach Control is not available at your current distance from the airport. Minimum distance is 15 miles.

9. Radar contact lost, service terminating.

Once APC is activated, an eight-mile intercept is set up and AILA and the AP will show additional data such as intercept altitude, distances, etc. Almost all of the AP's data cells are mouse areas, and most parameters can be set manually if desired or necessary – check out the tooltips for more detail.

As APC guides me to the intercept, I mainly have to monitor speed, altitude, and vertical speed. When on a downwind pattern as sketched in the above diagram you should check if stages 3, 4, and 5 are executed as expected.

Note: APC's initial warning *When clear of obstacles descend to intercept height* is of particular importance. The approach gauges have zero knowledge of possible terrain obstructions. It is therefore entirely up to the user to make sure that the pattern is a viable one. This can partly be done by selecting appropriate intermediate altitudes, or by opting for a different runway, a different entry point, or even a different glide slope (an AILA function). Internet resources such as SkyVector.com and EuroControl provide approach plates for most runways with ILS/VOR/GPS approaches which include 25 mile minimum safe altitude (MSA) information and other useful details.

For instance, suppose you insist on asking APC for vectors to runway 09 at Gibraltar AB. Here is a map view of the downwind pattern that APC will generate without the slightest hesitation.

You better find out how high those mountains are, and whether it is possible to avoid them by tweaking the altitude of the intercept. Of course, choosing the seaward runway end (27) would be much more sensible in any case.

Anyway, if all goes well, APC will eventually position me close to the intercept at the correct altitude - 2900 for EDDK - at which point it will hand me over to PAR, the Precision Approach Radar, for a fine-tuned talkdown.

2. PAR: Precision Approach

PAR can be used with or without prior use of APC. For using PAR on its own you first need to set up the four AILA pages as described above, selecting airport, runway, and runway end. You also need to make sure that you are on a viable straight-in approach (PAR is not suited for intricate approach patterns) and also that you are at a suitable height for intercepting the glideslope. If, on the other hand, PAR is called up via the normal APC handover process, heading and height should be more or less adequate already. Because PAR usually sets in a few miles before the intercept has been reached, it will maintain current altitude until it meets the glideslope.

During the talkdown the AP panel displays some additional bits of information. Here is what it shows - or should show (see note below) - as I pass the seven-miles-from-the-runway mark.

ALT lock has been set to 0 (we are descending until the AP is turned off). The “vs:gs” cell tells us that the vertical speed currently set is -9 * 100 = -900, and that we are on a 3.00 degree glideslope, which is perfect. Our offset from the centerline line is 304 feet, which is pretty good, too, considering that we are still 7.0 miles from the runway, 1.1 miles past the intercept. We have been told to check our wheels down and locked, and the panel indicates that we have set flaps 25 and our wheels are down (“25!”). Rate of descent will be corrected automatically when PAR is in default mode, but it is useful to understand what is going on - and at a later stage you will actively adjust the parameters yourself (see “realism challenges” below). For instance, when the PAR Controller tells you that you are “below the glidepath”, or “well below the glidepath”, the gs value will tell you roughly how much and by implication suggest a suitable trim/vspeed correction (see the “Flying Tips” below).

The rest of the PAR talkdown is pretty straightforward with continuous instructions mainly on headings, centerline offset, glidepath, and distance from the runway. Naturally, speed, gear, and flaps remain your responsibility. At 0.6 miles to go PAR asks you to “take over visually” when you have the runway in sight, and at this point it will turn OFF the Autopilot (feel free to turn it off earlier using the ‘Z’ key). PAR will officially terminate with the call “over the runway.”

Flying Tips

The GCA gauges will behave a bit different in every aircraft because each aircraft operates and behaves differently. One of our beta testers wandered around the sky and thought it was a problem with the GCA, but it turned out to be his lack of familiarity with the aircraft he was testing and particularly its autopilot. Indeed, different planes have different ways of actuating their autopilot, so it may happen that the custom AP doesn't properly link to it. In this case, try to shut the AP off/on using 'Z' and there is a good chance that it will 'catch'.

To align on the glideslope you can use AILA’s ILS crosshairs and watch the current glideslope figures. The AP also monitors the current glideslope ("gs") and the vertical speed (“vs”), which is posted to ALT lock in auto mode. In non-auto flight you can trim her down to maintain a gs angle of around 3.0 and you should come out well aligned on the slope.

If you have turned all 2D panels off you must fly by the seat of your pants. I use the following rules of thumb.

glidepath call	**action**
on glidepath	trim down to around -700 feet per minute
above glidepath	trim down for -900 fpm
well above glidepath	trim down for -1300 fpm
(well) below glidepath	stay level or climb +200 fpm

The rate of descent figures given here are based on an average approach speed of around 150 KIAS.

While glidepath alignment is fairly easy to handle, the course callouts are a bit more difficult to interpret. Unfortunately, the PAR Controller will give no trend calls such as “slightly left of centerline and correcting” as a real PAR controller would. However, the 2D panels do provide fairly exact data on how many feet you are off left or right of the centerline, and watching the “ctr” figure decrease or increase you can also see whether you are correcting or not. With the 2D's turned off, the following rules of thumb apply:

course call	**action/information**
on centerline	fly runway heading (use the exact heading listed in AILA gauge (plus wind correction, if necessary), not the runway number)

turn l/r 3 degrees	you are 80-180 feet off centerline
turn l/r 5 degrees	180-600 feet off
turn l/r 10 degrees	more than 600 feet off

3. Realism Challenges

Most of the processes described above are executed in semi-automatic fashion using the sim's default Autopilot functions and requiring little or no hands-on interaction (except for things like speed, gear, and flaps). This isn't, of course, what it was like in real life. Therefore, after having done a few practice runs in fair weather and become thoroughly acquainted with the overall logic of the APC and PAR combo, here is what you can do to make your life a whole lot more realistic and exciting.

1. For your precision approach, turn on a semi-auto mode by mid-clicking on "PAR". The PAR lettering will turn green, indicating that from here on in you have to actively enter the values for headings and vspeed into the respective Autopilot cells. Naturally, the AP needs to be open for this to be done.

2. The 2D panel can all be hidden, whilst the verbal instructions continue – requiring you to carefully watch the plane's gauges.

3. Turn off the AP's heading lock and/or the altitude lock and execute the controllers' instructions solely by using the joystick and VC equipment.

4. Finally, select various kinds of bad weather – down to the infamous zero/zero condition (zero ceiling, zero visibility). Be warned: you will have your work cut out. Good luck!

Credits

"Alice" at fromtexttospeech.com (APC Controller's voice); Alan G. Ampolsk (PAR Controller's voice); Karol "COBS" Chlebowsky (AILA gauge); Nick Cooper (testing and voice file laundering); Doug Dawson (sound gauges); Tom Harnish (testing, research and documentation, tech support, videos); Manfred Jahn (GCA gauges); Ralf Scholten (compatibility testing).