Tutorial – Flying the Flight1 Mustang

Welcome to the first tutorial flight for the Flight1 Cessna Citation Mustang. My name is Kurt "Yoda" Kalbfleisch, a member of the Flight1 Mustang's beta test team, and a flight simulation hobbyist for over twenty-five years.

As a class of aircraft, Very Light Jets are very new, and even if you're a real world pilot, it's a pretty safe bet that you've never flown anything like the Cessna Citation Mustang. Now's your chance! Flight1 has done a truly outstanding job in developing this very complex add-on for FSX.

In this tutorial, I'm going to show you some of the capabilities and limitations of the Cessna Citation Mustang, familiarize you with the features of the Garmin G1000 avionics as modeled by Flight1, and introduce you to the Wide Area Augmentation System (WAAS) type instrument approach. By the time we're done, you'll understand why Cessna says their Citation Mustang is the key ingredient in "Instant Adrenaline."

Our flight today will take us from Lindbergh Field (KSAN) in San Diego, California to Norman Y. Mineta International Airport (KSJC) in San Jose, California. Lindbergh Field is located in downtown San Diego,

and is the busiest single-runway airport in the US. Field elevation is 17 feet, and the runway is 9401 feet long – nice and long for our little Mustang.

Since this isn't a training flight, it's a *familiarization* flight, our goal is to introduce you to the airplane's capabilities and limitations, and get you thinking about the operating procedures and flying techniques you'll need to get the most out of your new Mustang. **It is not my intention to teach you everything you need to know to fly the Mustang, so you should have read the Flight1 Mustang Pilot's Guide before attempting this tutorial. You should also be aware that there is often more than one way to do things with the Garmin G1000 avionics in the Flight1 Cessna Citation Mustang, and that this tutorial is not intended to show you all of its features, nor will it demonstrate every method of performing the tasks described below.** In this tutorial, I'll introduce you to:

1. Capabilities and Limitations of the Cessna Citation Mustang
2. Flight Planning Tools Within the Mustang's Garmin G1000
3. Enroute Navigation With the Garmin G1000
4. Wide Area Augmentation System (WAAS) Approaches

Along the way, we'll look at quite a few of the features built into the Flight1 Mustang.

One of the limitations of this kind of tutorial is that there's no way to interact with ATC, so our purposes today, you should not enable any ATC programs you have, nor file a flight plan with the default FSX ATC. I'll handle ATC communications by working it into the tutorial where it's appropriate.

Something else to keep in mind: You will need to read ahead and know what's coming up. Things may not happen for you in the order they do in the tutorial – climb speeds may differ, altitudes at which things happen may not coincide exactly. There's nothing I can do about that. You'll need to be familiar with what's coming up, so you can perform the tasks you need to safely operate your Mustang.

Let's get started, shall we?

First, you'll need to visit www.airnav.com and print out the plates for KSAN's PEBLE3 departure procedure (both pages), KSJC's ROBIE2 arrival, and the RNAV (GPS) RWY 29 approach into KSJC. Keep those pages handy, since we'll be referring to them often.

Now, start FSX and enter the sim. How you do this is critical, because the Flight1 Mustang's sophisticated programming depends on certain conditions being met in FSX in order to work properly. Going into the Mustang from any old saved situation may not properly initialize things and can cause problems for you.

Page 5 of the Flight1 Mustang Pilot's Guide explains how to create your own "Cold and Dark" starting situation, or you can use the FSX Safe Startup for Complex Aircraft situation Flight1 has provided here: http://www.flight1software.com/files/FSXSafeStartup.exe.   In the case of the Safe Startup, you'll need to shut the ultralight down completely in order to get a cold and dark cockpit when you switch to the Mustang. If you're using the keyboard to control your engines, press CTRL+SHIFT+F4 before you

switch to the Mustang from the ultralight, so that you won't be trying to start the Mustang's engines with the fuel cut off.

Once you've done that, switch to the Mustang, and we'll get started.

After the Mustang initializes, let's move to our starting position at Lindbergh Field. You can choose any parking spot you like, but I used the default AFCAD, starting from "Parking 2 – RAMP GA Large", which puts us near the entrance to RWY 27. In the real world, this is the Jimsair general aviation ramp.

I've filed our flight plan with Flight Service already: PEBLE3.SXC VTU RZS.ROBIE2. That should set us up nicely for the WAAS approach to runway 30L at San Jose. We're going to use the default "fair weather" setting in FSX.

Let's start with a walk around of the Mustang. Click on the registration number plate located on the glare shield above the Primary Flight Display to bring up the Auxiliary Control Panel. It'll come up with the Pilot & Co-pilot tab enabled. Click on the red boxes next to "Co-pilot is visible" and "Co-pilot is wearing sunglasses", and ensure that a checkmark appears in both boxes.

Next, click the "Exterior" tab, and make sure that all the boxes are unchecked. Do the same for the "Avionics" tab, as well.

Next, click the "Fuel & Service" tab. Fuel trucks are not available everywhere, but where they are, you could call for one here. This will bring up the FSX aircraft fuel function. The "Reload Aircraft" button will reset the Mustang if you suffer a failure inflight that shuts down some of your avionics.

Finally, click on the "Quick Reference" tab. There's a great deal of useful information here, and it's nice to have it in such a handy place. While we're thinking about it, let's open up the Mustang Pilot's Guide to page 55, and review some of the Mustang's limitations. We'll hit the high points, but you should study these in detail and know them well.

First, maximum takeoff weight is 8,645 pounds. Flight1 configured the Mustang so that it's at maximum takeoff weight with full fuel tanks when you initialize it, and we'll check that in a few minutes. Maximum landing weight is 8,000 pounds. You can land at higher weights in an emergency, but for flight planning purposes, if you take off at max takeoff weight, you're committed to being in the air for at least long enough to burn off 645 pounds of fuel, except in an emergency.

Note that minimum controllable airspeed with the flaps up is 92 KIAS and 81 KIAS with the flaps set to Takeoff/Approach. We'll want to have the flaps and gear up before we reach 185 KIAS.

For takeoff and landing, we won't want to exceed 10 knots of tailwind or 25 knots of crosswind. The autopilot and yaw damper must be disengaged for takeoff and landing. We'll keep an eye out for icing, because the use of flaps in the LAND position is prohibited if there's ice anywhere on the aircraft.

Finally, we won't switch on the autopilot until we've climbed above 700 feet AGL on takeoff, and we'll switch off the autopilot at least 200 feet above the runway for a WAAS or ILS approach or at the Minimum Decision Altitude if we're on a non-precision approach.

Okay, the walk around is complete, so we can start our cockpit preparations. The Mustang Pilot's Guide contains the checklist, beginning on page 63. I strongly recommend you print out the checklist and use it with each flight.

> **Note: I personally recommend Pete Dowson's FSUIPC in its payware form because it will smooth out FSX's notoriously shifty winds aloft and because it will allow you to extend the life of the aircraft battery. If you don't have FSUIPC, you'll need to start engines before entering the flight plan into the G1000.**

Cockpit Preparation Checklist

> L/R GEN switches – GEN
> STBY INST Switch – BATT TEST (5 seconds); GREEN LIGHT ON
> STBY INST Switch – STBY INST; AMBER LIGHT ON
> Battery Switch – EMER (CHECK POWER TO EMERGENCY BUS ITEMS)
> Battery Switch – BATT
> STBY INST Amber Light – OFF
> Parking Brake – SET

> AVN POWER Switch – ON
> ATIS/Clearance – AS REQUIRED

Of course, we have the plates for Lindbergh Field handy, but we can also get the ATIS and Clearance Delivery frequencies from the G1000. So, position your view so that you'll be able to see the Multi Function Display (MFD) and open the Garmin GCU475 MFD Controller by clicking on the panel manager icon, the clickspot to the left of the glare shield registration plate, or selecting it in the Views > Instrument Panel menu.

On the GCU475, click at the upper left of the outer FMS knob to bring up the WPT – AIRPORT INFORMATION page on the MFD. (You can also use your mouse wheel.) Click the center of the FMS knob to activate the cursor, and using the keypad, type in "KSAN" and click the ENT key. (Another hint: you can use your computer keyboard for text entry in the MFD by enabling Scroll Lock.) The cursor should now be flashing over the airport designator, and you can move it by clicking the outer FMS knob (upper right or left corner). Move the cursor down the page to highlight the ATIS frequency and click ENT. Notice that the ATIS frequency is now loaded into the standby frequency on the COMM radio. Click the COMM radio frequency swap button and copy the ATIS broadcast.

As you're listening to ATIS, set the Kollsman knobs on the PFD and standby altimeter to the correct setting of 29.92, and note that we'll be departing on runway 27.

If you were handling your own communications with ATC, you could use this procedure to load the clearance, ground, tower, and departure frequencies, as you needed them. For now, I want you to dial in 121.50 and make it the active COMM1 frequency. From here on out, I'll be handling the comms.

Delivery has cleared us as filed via the PEBLE3 departure, Santa Catalina transition, then as filed to Norman Y. Mineta San Jose International Airport. Our initial altitude is 7,000 feet, and we can expect Flight Level 320 within ten minutes of departure. Our squawk code is 2404.

Right click on the lower left clickspot of the ALT SEL knob on the AFCS Controller to adust the altitude selection to 2,000 feet, then right click on the upper left of the ALT SEL knob to adjust in thousand foot increments to set 7,000 feet in the selected altitude window of the PFD.

Next, click the PFD XPDR softkey, click the CODE softkey, and enter 2404. The PFD will automatically return to the layer 1 softkeys when the transponder code is fully entered. Verify that the transponder window on the PFD now reads "2404 GND".

On with the checklist:
> Rotary TEST Switch – WARNING SYSTEMS CHECK
> Fuel Quantity and Balance – CHECK

We have full fuel tanks, or a total of 2,586 pounds of fuel, 1,293 pounds in each wing. Since our zero fuel weight is 6,100 pounds (empty weight of 5,350 plus the payload weight of 750), that makes our ramp weight 8,686 pounds. Maximum takeoff weight is 8,645 pounds, so we're overweight at the

moment, but we'll use up some fuel in start and taxi. Before takeoff, we'll check again to make sure the fuel is balanced and the total fuel is less than 2,545 pounds.

Let's first set up the PFD to display the things we'll need it to while we're flying. Click on the PFD softkey, located on the bottom edge of the PFD bezel. Now, click on the BRG1 softkey until the bearing window above it appears and shows "NAV1" as its source. Click on the BRG2 softkey until the bearing window above it shows NAV2 as its source. Click the BACK softkey when you're finished.

Now we're ready for some fun – entering the flight plan into the Garmin G1000!

If you don't still have the GCU475 MFD Controller popped up, bring it up now. Click on the FPL key. We're starting with a blank flight plan, and here's where the scroll lock trick really comes in handy. Left click on the center of the FMS knob, then the inner FMS knob (lower right corner) once to bring up the waypoint entry window. In the waypoint entry window, type "KSAN" and click ENT. The waypoint entry window closes automatically and the flight plan cursor moves down to the next blank, setting you up to enter the next waypoint.

Click the lower right clickspot on the FMS knob again, and type "VTU" in the waypoint entry window. Click ENT when you're finished typing. If you had more than one enroute waypoint, you'd repeat this process for each of the waypoints in your flight plan. For now, just enter the destination field: KSJC. When you're finished, the active flight plan name at the top of the page should be "KSAN/KSJC" and there should be a magenta arrow indicating that the first leg from KSAN to VTU is the active leg. Press the scroll lock key on your computer keyboard to disable the Mustang's keyboard text entry feature.

Now, we'll select the PEBLE3 departure procedure. You'll sometimes hear departure procedures, or "DPs" referred to as "SIDs" for "Standard Instrument Procedure". The term SID is outdated, at least in the United States.

On the GCU475, click the PROC key, then use the FMS knob to highlight "SELECT DEPARTURE", and click the ENT key.   As of cycle 0906, four DP's will come up in the list window: BRDR5, LNSAY2, PEBLE3, and POGGI2. Highlight "PEBLE3" and click ENT. The choices in the selection window will change to allow you to select the departure runway, or to the word "ALL", meaning that the DP applies to all runways. In this case, we'll get "ALL". Click ENT. The next list to come up in the selection window is the list of transition fixes. We'll be flying the PEBLE3.SXC DP, so highlight "SXC" and click ENT.

The right side of the PFD should now look like this:

Note that the first point in the sequence is "414FT", and the second is "INTERCPT". This indicates that we'll climb on the runway heading to an altitude of 414 feet MSL, then turn to intercept the Mission Bay VOR 293 radial. We'll be able to do all this with the CDI set to GPS, but it's important to understand what the AFCS is doing. **No matter how sophisticated your avionics are, navigation is still your responsibility!**

Sometimes, you'll see the word "MANSEQ" on the sequence list. This indicates that you'll need to manually sequence this part of the DP; the autopilot will not automatically sequence to the next waypoint. To understand why this is here, let's look at the description of the BANYO4 DP out of Scottsdale Municipal Airport in Phoenix, Arizona:

> "<u>TAKE-OFF RUNWAY3</u>: Turn left heading 260° and intercept PXR R-336 to BANYO INT. Thence . . . . Via radar vectors to (assigned route)."

"MANSEQ" appears in the sequence list at the point where you will be relying on instructions from ATC to vector you to your assigned route.

Let's stop and think for a moment about how we'll fly the PEBLE3 DP. We need to make our turn to intercept the MZB 293 radial at 414 feet, which is less than 400 feet above field level. Click on the registration plate above the PFD again, and look at the Quick Reference tab on the Auxiliary Control

Panel. The autopilot minimum use height for takeoff and climb is 700 feet. So, that turn to intercept? You'll be hand flying that!

Look at the PEBLE3 departure plate you printed out. At the bottom of the plate, you'll find the departure route description. The first part reads: "<u>TAKE-OFF RUNWAY 27</u>: Climbing right turn via heading 290° until crossing OCN VORTAC R-170, then turn right via heading 305° to intercept and proceed via MZB VORTAC R-293 to PEBLE INT. Aircraft climbing to 14000' or above cross MELDY at or above 14000'." Sound complicated? It is, but we'll go through it step by step.

Close the Auxiliary Control Panel and turn your attention back to the MFD. Notice that below the DP sequence list, the word "LOAD" appears in a flashing highlight. The G1000 is asking if you want to load the DP into the flight plan. Click the ENT key to do so.

When you do, the MFD will revert to the MAP display. Pretty slick!

Notice that the first leg of the flight on the map display is a dashed line. This indicates a course to intercept.

Before we move on, let's select the ROBIE2 arrival. This time, let's use the PFD to enter our procedure selection. On the PFD bezel, click the PROC key. Highlight "SELECT ARRIVAL" and click the PFD bezel ENT key. In the window that pops up on the PFD, use the PFD FMS knob to select ROBIE2, and click the PFD bezel ENT key. The next window to appear on the PFD is the transition selection window. Select RZS and click the PFD bezel ENT key. Another window will pop up that will usually allow you to select a runway, but in this case, it merely says "ALL". Press the PFD bezel ENT key to complete the arrival selection. The word "LOAD" now appears in the lower left corner of the arrival selection window on the PFD. Press the PFD bezel ENT key one more time to load the RZS.ROBIE2 STAR.

Using the GCU475, open the MFD FPL page and verify that the flight plan is correct, showing the PEBLE3.SXC DP, an enroute section containing only the VTU VOR, and the RZS.ROBIE2 STAR.

You'll notice that the last waypoint on the list is now GILRO, and not KSJC. The G1000 knows that your destination is KSJC, but as is, will make all of its fuel and timing calculations to the GILRO intersection. Now, click the FPL key again to close the flight plan page.

We may have the flight plan loaded in the G1000, but we've got a couple more things to do before we can proceed with the rest of the checklist. Let's take another look at the PEBLE3 departure procedure, and the specific instructions for after takeoff. "<u>TAKE-OFF RUNWAY 27</u>: Climbing right turn via heading 290° until crossing OCN VORTAC R-170, then turn right via heading 305° to intercept and proceed via MZB VORTAC R-293 to PEBLE INT."

To set that up, we'll first set the HDG cursor on the PFD to 290. That'll serve as a reminder of our desired heading as you hand fly the turn. Then, tune NAV2 to the frequency for OCN. Yes, we have it on the DP plate, but let's look it up in the G1000's database anyway. On the GCU475, switch the MFD to the WPT – VOR INFORMATION page by clicking on the upper right of the FMS knob once, then on the lower right of the FMS knob three times. Click the center of the FMS knob to activate the cursor,

activate the scroll lock, and type "OCN". Click ENT and scroll the cursor to the VOR frequency using the FMS knob. To make sure we load the frequency into the correct NAV radio, click the center of the NAV knob on the PFD bezel, and verify that the blue box indicating the active NAV tuner is on the lower, NAV2 line. Back on the GCU475, click ENT again and the frequency is loaded into the NAV2 standby position. On the PFD bezel, click the NAV frequency swap button to tune the NAV2 radio to the OCN VORTAC. Ordinarily, we'd verify that the letters "OCN" come up to the right of the active frequency, but we can't receive the OCN VORTAC while on the ground at KSAN. We'll check it in the air. Finally, click the CDI softkey on the PFD to set the CDI to GPS.

Click the center of the GCU475's FMS knob to disable the cursor, then upper left side of the FMS knob to return the MFD to the map page, and we'll continue with the checklist:

> L/R IGNITION Switches – NORM
> L/R FUEL BOOST Switches – NORM
> FUEL TRANSFER Knob – OFF
> Pilot MIC Switch – HEADSET
> Wing Stab Deice System – CHECK
> > WING STAB Deice Switch – HOLD IN MANUAL THEN RELEASE
> > WING STAB Deice Switch – OFF
> PITOT-STATIC Switch – RESET STALL WARN then OFF
> All Other ICE PROTECTION switches – OFF
> LANDING GEAR Handle – DOWN – THREE GREEN LIGHTS/NO RED LIGHT
> ANTISKID Switch – ON
> PAX SAFETY Switch – OFF
> All Exterior Light Switches – AS REQUIRED
> Cockpit Lighting – AS REQUIRED

You've probably noticed by now that the "flow" for cockpit preps goes from left to right across the lower panels. If you hadn't that's okay, you know now. Knowing the "flow" helps you find things quickly when you're performing your checklists.

From here on out, I'm going to call for a checklist in the Mustang Pilot's Guide provided by Flight1, and you'll perform the steps there. (Tutorials should help create good habits.) That said, finish the Cockpit Preparation Checklist on page 63, picking up with the AIR CONDITIONING Switch.

While you're doing that, I'll call Ground and get permission to start engines.

Now, perform the Before Starting Engines Checklist on page 64 of the manual. Ready for the engine start? Good. We have permission, and a thumbs up from the line attendant that all is clear, so let's light the fires. Remember that the memory items for startup are to move the starting engine's throttle out of CUTOFF to the IDLE detent when N1 passes 9%, ensure that the ITT doesn't exceed 830°C for more than five seconds, and if the engine doesn't reach a stabilized idle within 45 seconds, shut it down.

With all that in mind, perform the Starting Engines Checklist. When the engines are in a stable idle, perform the Before Taxi Checklist. When you get to the item for setting takeoff data, we'll go to back to the Auxiliary Control Panel for the quick reference tab's information, and use the numbers in the "Take Off Speeds – Flaps 15°" section. On the PFD , click the TMR/REF softkey, and using the FMS knob, move the cursor down to the takeoff references, V1, by left clicking on the upper right of the FMS knob. First, highlight the speed, and using the lower left and lower right click spots on the PFD FMS knob, adjust the V1 from 91 KTS to 89 KTS. Move the cursor to the Vr setting by clicking the upper left clickspot of the FMS knob twice, and adjust that value to 89 KTS, as well. You should now have V1/Vr/V2 and Venr flags set to 89, 89, 97, and 119 respectively. On the PFD bezel, click the MENU button, highlight "TAKEOFF REFERENCES ON", and click ENT. On the PFD speed tape, you'll see the stack of four flags at the bottom.

Move the cursor down to the bottom field, marked "DEST ELEV". This setting will establish the pressurization schedule for our flight. We'll need the destination field's altitude, so look at the approach plate you printed out for KSJC. In the upper left corner, you'll see a box listing the approach course, runway length, "TDZE" (touch down zone elevation), and airport elevation. We're interested in the airport elevation, which is 59 feet. Round that to the nearest ten. Left click the lower right clickspot on the PFD FMS knob until the value in the DEST ELEV field reads "60 ft". Verify that the destination elevation is entered in the cabin pressurization system window on the MFD, then click the PFD TMR/REF softkey to close the TMR/REF window.

At this point, the only CAS messages we should have are related to the pitot heat: "PS HTR L-R" and "STALL WARN HTR". If you were handling your own comms, you'd be ready to ask for taxi clearance at this point.

> *"Citation 510F1, Lindbergh Ground, altimeter 29.92, taxi to runway 27 via taxiway C and C1, and hold short. Contact tower on 118.30 when ready for takeoff."*

There we go. Turn on the taxi/recognition lights, release the parking brakes, and get us rolling a little bit. As soon as the plane starts rolling, get on the brakes again to make sure they work, then turn to the right toward taxiway C. After you complete the turn and you're clear of other airplanes, make sure the nose wheel steering will turn you to the left as well, then make a sweep of the flight instruments. Click on the "Pull to Cage" knob below the standby altimeter, and that completes the taxi checklist.

As we taxi to the runway, you'll want to keep the speed down to around 10 knots. At an airport where you're not so close to the runway entry, you can safely taxi at 15 – 20 knots, except during turns, when you'll slow to ten. Don't try to perform any checklists while taxiing, as it's unsafe.

When you arrive at the hold short line for runway 27, set the parking brake, and we'll run through the takeoff briefing before performing the takeoff checklist.

> "This will be a normal takeoff, flown from the left seat. Flaps set to TO/APR, V1 and rotate at 89 knots, V2 is 97 knots, gear up on positive climb, flaps up at 119 knots. At 414 feet, pilot performs a climbing right turn to a heading of 290. After completing the turn, pilot will activate the AFCS in HDG mode, establish vertical speed of 2,000 feet per minute and set climb power. In the event of an engine failure before V1, pilot will immediately pull both throttles to idle, deploy the speed brakes, and apply maximum braking effort. If an engine fails after V1, pilot will continue the takeoff, and once safely airborne, co-pilot will notify ATC of the emergency."

Briefing complete, perform the Before Takeoff Checklist "to the line" (to the line marked "**CLEARED AND READY TO TAKEOFF**"), check the total fuel once again and make sure it's below 2,545. (If it isn't, don't worry, it should be close. You can hold the brakes for a few seconds to get the fuel below 2,545, then start your takeoff roll.) I'll call for takeoff clearance.

> **"Lindbergh Tower, Citation 510F1 is ready for takeoff, runway 27."**
>
> *"Citation 0F1, winds calm, altimeter 29.92, cleared for takeoff."*
>
> **"Altimeter 29.92, cleared for takeoff, Citation 0F1."**

Okay, run through the "below the line" portion of the Before Takeoff Checklist, then position the plane on the runway and set the parking brake. When you're ready to go, click on the TOGA mode button located on the left throttle. (There is a small pop up in the 2D panel that makes this easier if you're

using the 2D panels.) The Flight Director should now be set for ten degrees nose up, and the AFCS status bar on the PFD should read "TO -- -- TO".

Advance the throttles slowly and smoothly until the Thrust Mode Indicator shows TO. Check the engine instruments to make sure the N1 matches the command bug, check for cabin prepressurization, and release the brakes. Pitch up smoothly at Vr to follow the Flight Director Command Bars (or command vee).

At 50 feet above the field level, raise the gear. Maintain pitch at ten degrees nose up to follow the flight director, and continue the acceleration to 119 KIAS, then raise the flaps. At 414 feet, start your right turn to a heading of 290, and be sure to maintain the climb attitude shown by the flight director.

Rolling out on your heading of 290, you should now be passing 700 feet. Activate the autopilot by pressing the AP key on the AFCS controller. Select HDG mode, then press the VS key twice (once sets Pitch Mode, the second time sets Vertical Speed Mode), and adjust the AFCS thumb wheel to establish a 2,000 feet per minute rate of climb. Pull the throttles back into the CLB detent. The Mustang will really begin to accelerate now. At 170 KIAS, set the vertical speed to 3000 feet per minute.

Check that NAV2 is now receiving the OCN VORTAC by verifying the NAV2 tuner shows "OCN".

> *"Citation 0F1, contact departure, have a good flight."*

> **"Over to departure, Citation 0F1, good day."**

> Now, notice that the transponder window on the PFD indicates "2404 ALT".

> **"SOCAL Departure, Citation 510F1 is with you."**

> *"Citation 0F1, radar contact. Climb and maintain one five thousand."*

> **"Up to one five thousand, Citation 0F1."**

Right click on the upper right clickspot of the ALT SEL knob to set the altitude selection to 15,000 feet. When we rolled out on the 290 heading, the AFCS automatically sequenced to the next leg, so you should now see the magenta track for the leg to the MELDY intersection. Notice that it seems to start at a point over the water, rather than at a fixed waypoint. This is normal for many departure procedures. We have to maintain our 290 heading until we pass cross the OCN 170 radial, so don't switch to NAV just yet. Run through the After Takeoff Checklist, leaving the landing lights and seatbelt signs on below ten thousand feet.

When your airspeed falls to 180 KIAS, reduce your climb rate to 2500 feet per minute. You'll accelerate a little again before the airspeed begins to drop off, and this time, let the airspeed bleed off until you're at about 172 KIAS, then reduce the vertical speed to 2000 feet per minute.

As we pass through ten thousand feet, you can switch off the landing lights and the PAX SAFETY switch. At this point, the only items left on the After Takeoff Checklist should be the cabin pressurization check and the altimeter check. The first part of the cabin pressurization check is to confirm that the cabin differential pressure is rising. The arrow on the horizontal indicator tape at the bottom of the CABIN PRESS section of the EICAS display on the MFD should still be in the green range. We'll perform the second part of the cabin pressurization check and the altimeter check later.

Keep an eye on the tail of the NAV2 arrow. When it points at 170, use the HDG bug to turn to a new heading of 305.

> "*Citation 0F1, contact Los Angeles Center on 133.40.*"

> **"Over to center, Citation 0F1. Good day! Los Angeles Center, Citation 510F1 is with you passing one four thousand feet for one five thousand."**

> "*Citation 0F1, radar contact, climb and maintain flight level 210.*"

> **"Up to two one zero, Citation 0F1."**

There we go. Remember that the DP plate instructed us to ensure that we cross MELDY above 14,000 feet. Once again, check the cabin pressure differential to make sure it's still in the green.

At around 18,000 feet, our airspeed will have dropped to below 180 KIAS, so we can reduce the vertical speed to 1500 feet per minute.

Watch the CDI now, as we get close to the intended track for MELDY. When the CDI needle is one dot to the right of center, press the AFCS controller NAV key.

As we pass 18,000 feet, perform the altimeter check. The altimeters should already be set to 29.92, but press the BARO knob on the right side PFD bezel anyway. In the real airplane, this would not set both the primary and standby altimeter Kollsman settings, but in FSX, there doesn't seem to be any way around it. As an alternate means of setting the standard barometric pressure, you can press the PFD softkey on the PFD, then press the STD BARO softkey.

Passing FL180, you'll see the cabin pressurization start to change. The RATE FPM tape should rise to about 400 – 600 fpm, and the number underneath that tape should agree. The ALT FT tape will begin to increase, and the altitude readout beneath that should agree. With that, the After Takeoff – Climb checklist is complete.

"Citation 0F1, climb and maintain flight level 320, proceed own navigation."

"Up to three two zero, own navigation, Citation 0F1"

Keep an eye on your airspeed as we climb through FL200. It will probably be at around 180 KIAS and decreasing. When it's around 172 KIAS, reduce our rate of climb to 1200 feet per minute. That will reduce the rate of airspeed decay as we climb.

Right around FL230, the airspeed will likely be 170 KIAS, and at this point, you can press the FLC key on the AFCS controller. Since we're climbing to FL320, we should be concerned now about maintaining airspeed in the climb, and I wanted to show you how to smoothly transition to the FLC mode. **Remember it's airspeed and not vertical speed that enables you to maintain a climb!** The reason for the technique I've just shown you for entering an FLC mode climb is that a rapid transition to FLC will cause porpoising that can be uncomfortable for your passengers and may even induce a loss of control.

One of FSX's many oddities is that if you switch to an external view while the aircraft is on autopilot and in an airspeed mode such as FLC, you'll experience fairly large pitch oscillations. You can usually avoid these by leaving your view inside the cockpit or by switching to a vertical speed mode before looking at the outside of the plane. **DO NOT PAUSE THE FLIGHT WHILE THE AFCS IS IN FLC MODE!**

Watch the indicated mach number at the bottom of the speed tape on the PFD. When it reaches 0.44 mach, click on the SPD key located below the FLC key on the AFCS controller. Adjust the mach speed bug to 0.44 mach, and continue the climb. Your indicated airspeed will drop off, falling through 160 KIAS at about FL305, but you'll maintain a higher rate of climb.

If you've done everything right to this point, you should be leveling off at FL320 just after passing the Santa Catalina VOR.

As we level off at FL320, watch the airspeed increase. In the real Mustang, you have the option to leave the throttles in the CLB detent for up to ten minutes after level off, in order to accelerate more quickly to your cruise speed. Given the limitations of FSX, the Flight1 Mustang's FADEC doesn't work exactly like the real thing, so as soon as you level off, you can move the throttles to the CRU detent, and the FADEC will manage your thrust to achieve the optimum cruise speed just as quickly. If you'd like to leave the throttles in the CLB detent, then watch your airspeed and move them to CRU at around 200 KIAS.

After you move the throttles to the CRU detent, perform the Cruise Checklist. Make sure that the cabin differential pressure is still in the green range. Since we're at FL320, we're in RVSM airspace, so we'll also need to cross check the altimeters every hour. Cross check them now, but I guarantee that if you put it in your mind to check them again in an hour, you'll forget. Make it a habit to cross check at the

top of the hour, even if it's been less than an hour since the last cross check. Better still, cross check every time you look at the altimeter in cruise.

Take note of the warning regarding use of the wing de-ice boots: **DO NOT OPERATE DEICE BOOTS WHEN INDICATED RAT IS BELOW -30°C.** Check the RAT displayed in the lower left corner of the PFD, and note that it's about -34°C. If we encounter icing, your first action should be to request a descent to lower, warmer air.

So, we're in cruise now, so we can relax and enjoy the flight from here, right? WRONG! When you're flying, if you're not busy, it's because you've forgotten something. We want to stay ahead of the airplane, and the way to do that is to think through the rest of the flight and prepare for the next step. Since we're in cruise, the next step is the start of our descent.

Look at the ROBIE2 arrival plate you printed out. Notice that the text below the Salinas VORTAC information bubble tells you to expect clearance to cross SNS at 16000 feet. We'll do our initial descent planning to get us to the Salinas VORTAC (SNS) at 16000 feet.

Time for a little math: We need to descend from 32,000 feet to 16,000 feet, an altitude change of 16,000 feet. Multiply the altitude change by three, then divide that number by 1,000 to calculate the distance in miles we need for our descent. Forty-eight miles.

Now, call up the flight plan on either the PFD or the MFD and look at the distances between waypoints. Count back forty-eight miles from SNS. Since ROBIE is 50 miles from SNS, we'll have to start our descent no later than 2 miles after passing ROBIE. You can also use the arrival plate to determine your top of descent.

The rate of descent can be calculated even more easily. Multiply your ground speed by five, rounding up to the next highest hundred feet. Since my groundspeed is currently 316 knots, I'll need a 1590 feet per minute rate of descent, rounded up to 1600 feet per minute. Remember to always round up – if I'd come up with 1505 feet per minute, I'd still set a 1600 feet per minute rate of descent, or I'd risk missing any crossing restrictions I might have. (I don't have any today, but if I did, I'd have to remember to factor them in.) Adjust your rate of descent as your groundspeed changes.

There's more, though. Did you also notice that the ROBIE2 plate tells you to expect clearance to cross GILRO at 8,000 feet? Using the 3 miles per thousand feet and five times the ground speed thumb rules, we'll need twenty-four miles to make the descent. Since the distance between SNS and GILRO is only 22 miles, we'll need to make a steeper descent than our thumb rules tell us.

Let's consult the manual for a better option. Turn to page 90 in the Flight1 Mustang Pilot's Guide and consult the Normal Descent Table. The recommended normal descent is 2,000 feet per minute. The table shows us that a 10,000 foot descent will take ten minutes and cover 22 miles. 8,000 is 80% of 10,000, so we can plan on taking about 18 miles to complete our descent from 16,000 to 8,000 (22 x 80% = 17.6).

Let's take some time to look at some of the features of the Flight1 Mustang's Garmin G1000 avionics. Set your view so that you can see the MFD and bring up the GCU475.

To save us a little time later, let's bring up the airport information for San Jose. Using the GCU475's FMS knob, left click on the upper right clickspot to switch to the Waypoint Group (WPT). Use the FMS knob's lower left and right clickspots to change to the AIRPORT INFORMATION window. Click the center of the FMS knob to activate the cursor, then use the GCU475 keyboard or the "scroll lock" feature to type in "KSJC". Click the ENT key to call up the Norman Y. Mineta San Jose International Airport information. Click the center of the FMS knob again to disable the cursor.

Next, left click the upper right clickspot on the GCU475's FMS knob, and that will bring up the AUX group. Initially, you'll see the TRIP PLANNING page, so let's look at what's available there.

This page is divided into four parts. The upper half of the page is the INPUT DATA window, which is itself divided into three parts. On the left, you can see a map display. The GCU475's range knob allows you to zoom in or out on this map. It's small, but it does have the advantage of being oriented NORTH UP. In the middle section of the INPUT DATA window, you'll see "P.POS → GILRO". This indicates that all the figures on the trip and fuel stats elsewhere on this page are calculated from on your current position to your arrival at the end of the STAR (a quick check of the arrival plate tells us that the last point on the arrival is GILRO) via the flight plan currently loaded. DEP TIME will always be the current sim time,

because page mode is set to AUTOMATIC. The values for GS, FUEL FLOW and FUEL ONBOARD are the current values, and these are used to calculate the trip stats and fuel stats in the lower half of the TRIP PLANNING page.

It will help to remember that the trip stats and fuel stats are based on current speed and fuel flows. They are not adjusted for throttle reductions and speed changes in the descent until you actually make those throttle and speed changes.

Very often during the initial climb, you'll see negative values for remaining fuel and remaining endurance. This is because these values are calculated from the current speed, fuel flow, and fuel remaining. At the high CLB throttle setting, you may not have enough fuel to reach your destination. Once the throttles are reduced to CRU, these values should change to more acceptable positive numbers. If they don't, start looking for a place to land.

That leads us to the next feature of the G1000 – the NRST page group. On the GCU475, left click to the upper right of the FMS knob to bring up the NRST page group. The first page in the group is the NRST – NEAREST AIRPORTS page. This gives you a list of the nearest airports in order from near to far, and some useful information about those airports. Clicking on the center of the GCU475 FMS knob will enable the cursor, and you can scroll down through the airport list to get information about each airport. When you've chosen a field, click the Direct-To key to set it as the next waypoint in the G1000.

As we approach ROBIE, we get a call from Center:

> *"Citation 0F1, at pilot's discretion, descend and maintain one four thousand. Cross SALINA VOR at one six thousand. Altimeter 29.92."*

> **"Discretion to one four thousand, cross SALINAS at one six thousand, altimeter 29.92, Citation 0F1."**

Change your altitude selection to 16,000 feet. Right after we cross ROBIE, click on the VS switch and use the thumb wheel to establish a 1600 foot per minute rate of descent. You should also pull the throttles out of the CRU detent, and manage the throttles manually from now until shutdown. As we accelerate in the descent, adjust the vertical speed as needed to ensure we cross SNS at 16,000 feet, and manage the throttle to keep your airspeed at or below 240 KIAS.

Passing SALINAS, Center calls again: *"Citation 0F1, descend and maintain six thousand, cross GILRO at eight thousand. Contact NORCAL Approach on one two zero decimal one, and have a good day."*

> **"Down to six thousand, crossing GILRO at eight thousand, over to NORCAL Approach on one two zero point one, Citation 0F1, good day."**

Remember we figured out that we'd need a 2,000 fpm descent to make our crossing restriction at GILRO? As soon as we start our turn past SALINAS, set the vertical speed for a 2,000 fpm descent. You'll have to retard the throttles again to hold airspeed at 240 KIAS.

> **"NORCAL Approach, Citation 0F1 is with you out of sixteen thousand for six thousand, passing SALINAS on the ROBIE2 arrival."**

> *"Citation 0F1, NORCAL Approach, radar contact. Passing GILRO, descend and maintain four thousand. Expect vectors to the GPS runway 29 approach. San Jose altimeter two-niner-niner-two."*

> **"NORCAL Approach, down to four thousand after GILRO, vectors to the GPS runway 29 approach, altimeter 29.92, Citation 0F1."**

Here again, we'll use the altitude selection in the G1000 to help us get to our crossing restriction, so we'll set it to 8,000 feet until we're in the turn passing GILRO.

Now is a good time to select the approach. Since ATC has told us we're going to get the GPS runway 29 approach, that's the one we'll choose. It's an oddity of the G1000 that it isn't named "GPS RWY 29", though.

First, call up the GCU 475 and click on the FPL key. Click the center of the FMS knob to bring up the cursor in the FPL window, then scroll down to the entry for KSJC at the bottom of the flight plan. On the GCU 475, click on the PROC key, and ensure "SELECT APPROACH" is highlighted. Click the ENT key, and you'll get a list of the approaches in the G1000's nav database. Using the FMS knob, scroll down to the one marked "RNAV 29 LNAV+V". The "+V" tells us that the approach is in the WAAS database, so we'll

be able to fly a coupled approach all the way to minimums. Click on the ENT key to select the RNAV 29 LNAV+V approach.

As with other stored procedures, the next window that pops up is the transition window. Using the FMS knob, scroll to highlight the initial approach fix, which in this case is LICKE. Press the ENT key, and the approach loading window will give you the choice to load or activate the approach. We're still flying the arrival, so for now, we'll load the approach. With the FMS knob, highlight LOAD and click the ENT key one more time. That will take us back to the MFD Map page.

As we descend through 10,000 feet, switch on the landing lights, and the seatbelt signs.

Passing GILRO, we should be at 8,000 feet. While we're in the turn, dial the altitude selection down to 4,000 feet, and press the VS key. Use the thumb wheel to set a descent rate of 1500 fpm and retard the throttles to hold our speed between 200 and 220 KIAS.

> *"Citation 0F1, cleared for the San Jose GPS runway 29 approach. Descend and maintain three thousand five hundred until established."*

> **"Cleared for the GPS runway 29 approach, down to thirty-five hundred, Citation 0F1."**

To make things easier, you can activate the approach from the PFD. Press the PROC key on the PFD bezel. The PROCEDURES window opens, allowing you to use the PFD's FMS knob to cycle through the selections. Initially, SELECT APPROACH will be highlighted, so use the PFD FMS knob to select ACTIVATE APPROACH, and then click the ENT key on the PFD bezel. The active leg indication in the PFD will change from "GILRO -> KSJC" to "-> LICKE", indicating that we are now proceeding direct to the initial approach fix. The HSI mode will change from GPS ENR to GPS TERM, and the active leg shown on the MFD map will change to show a magenta line to LICKE.

Now, change the selected altitude to 3500 using the AFCS mode controller.

Now that the airplane is set up to fly the approach, we should set the approach minimums into the PFD. For this approach, the LNAV/VNAV Decision Altitude is 540 feet. On the PFD, click the TMR/REF softkey, and use the PFD FMS knob to scroll the cursor down to the MINIMUMS line. Highlight the word "OFF", then use the PFD FMS knob to select BARO. The BARO MIN window will appear on the PFD. With the FMS knob, highlight the minimum altitude field and dial in 540 feet.

We should level off at 3500 feet somewhere between LICKE and FAPUT. When we do, allow the airplane to slow to around 160 KIAS. Change the altitude selection to 2700 feet, and as we pass FAPUT, select VS mode and use the thumbwheel to command a 600 fpm descent. Retard the throttles as necessary to keep the speed at or below 160 KIAS.

Crossing NETBE, we'll be above 2700 feet, but you'll see the glide path indicator on the left side of the PFD altitude tape appear. The glide path indicator should show us as below the glide path. On the AFCS controller, click the APR key, and ensure the APR light illuminates.

Lower the landing gear. The additional drag will slow the airplane, and as our speed falls below 150 KIAS, you can set flaps to TO/APPR. Add power as needed to cross the Final Approach Fix (HASOD) at 140 KIAS.

Things will start happening pretty quickly now. In addition to setting the airplane up for a good landing, we'll also need to set up for a missed approach. The missed approach procedure for the RNAV (GPS) RWY 29 approach calls for a climb on the runway heading of 303 to 2100 feet, then passing JOSUN, fly direct to SUNNE, where we'll hold at 2100 feet. So, to set this up, we'll move the HDG bug to 303, and as the airplane descends through 2100 feet, we'll set the altitude selection to 2100 feet.

Once we're on the glide path, retard the throttles to hold about 125 KIAS. Watch the PFD now, and ensure that the airplane stays on the track and on the glide path. If you start to drift below the glide path, add a little power to correct.

When you see the BARO MIN caret appear in the altimeter tape, you should extend your visual scan to outside the airplane and look for the runway. Any time after you see the runway, you can switch off the autopilot and manually fly the final approach. In any case, you should switch off the autopilot by 200 feet AGL, which for KSJC is 260 feet MSL. Use the YD key on the AFCS controller to switch off the autopilot, and NOT the AP key.

As you pass the barometric minimums, and hear the "MINIMUMS" call from the G1000, you should see the runway. Select full flaps and adjust power as necessary for landing. Your target should be to cross the runway threshold at about 100 KIAS, and touch down at about 95 knots.

As soon as you touch down, retard the throttles to idle, gently set the nose wheel down and apply full braking. As you slow, you should be able to judge what speed you need to make a particular turnoff, so don't let yourself come to a complete stop on the runway. Make the turnoff at around 10 knots of groundspeed.

As you clear the runway, retract the flaps, and switch off the landing lights and strobes. When cleared by ATC, taxi to parking, and shut down.

We've walked through all the steps needed to fly the Mustang properly, and introduced a fair number of the tools available for you with the Flight1 Cessna Citation Mustang's Garmin G1000 system. You've had a chance to see some of the limitations of the Mustang, practice enroute navigation, and learned how perfectly integrated WAAS approaches are in the G1000. Now, it's up to you to pick your destinations. Go fly the Mustang!

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