# CitationJet Aircraft Flight Manual

In 1978, GAMA, General Aviation Manufacturers Association, transitioned from the POH, or Pilot Operating Handbook concept to the AFM, or Aircraft Flight Manual concept of documenting aircraft performance. CitationJet Flight manuals are typically organized into 8 sections. The first several pages consist of the Introduction, beginning with the List of Effective Pages. The AFM is a living document and is typically updated many times in the life of an airplane. As these updates occur, it can become difficult to make certain that the AFM is current and that all updates have been collated into their proper locations. The List of Effective Pages, or LOEP can be helpful in determining that the AFM has been updated and contains current information. Remember, the properly updated AFM is required to be onboard the aircraft in order to maintain airworthiness. Next in the introduction resides the Table of Contents, identifying the individual Sections of the AFM.

**Section I** contains the Introduction. In this chapter, you will typically find discussions on applicable Serial numbers, how updates are indicated, some useful definitions, Service Bulletins and Configuration Codes. Configuration Codes are used primarily to cull pages from various checklists that are not applicable due to the options that may or may not be installed in the particular aircraft.

**Section II** is titled Operating Limitations. It contains limitations in such areas as weight, speed, powerplant, fluid types, systems & many other operational limitations. This entire section is fair game for oral questioning on the CitationJet Type Rating practical test. The Kinds of Operations Equipment List, or KOEL is presented at the very end of the Limitations section. This list provides some guidance on what equipment is required for different “kinds” of operations, such as Day VFR, Night VFR, Day IFR, Night IFR and during icing conditions. Note that this list is not effective if there is an approved MEL in the airplane and is applicable only for operations under FAR Part 91. It provides similar guidance to the MEL if there is not an approved MEL on the aircraft.

**Section III** is titled Operating Procedures. This section contains the three checklists, Emergency, Abnormal and Normal Procedures Checklists. The “BOXED” items included in the EMERGENCY Procedures Checklist are considered immediate action items, those that the pilot should be able to execute without consulting the checklist. In addition to their appearance in the AFM, the procedures in these checklists are typically printed on one or more durable, easily handled documents for use in the cockpit. The Normal, Abnormal and Emergency Checklists in the cockpit should be in agreement with those in the AFM. Like Limitations, the BOXED items of the Emergency Checklist are fair game on aural questions on the Type Rating check ride.

By the way, checklists are best used to "check" that we have accomplished the necessary tasks, hence the name "check"list. They are not intended to be do-lists, and can be somewhat cumbersome when used as do-list. Most experienced crews will "flow" the cockpit by memory and then "check" to make certain all items were accomplished, when workload permits. It is difficult to fly the airplane while simultaneously reading the book of instructions. During Initial training, it may be necessary to resort to a "read and do" operation, but the eventual goal should be to first "do" what needs to be done and then "check" to be certain nothing was missed, only when doing so will not distract from flying the airplane. If not used properly, checklist can actually become a distraction to flying the airplane, especially during single pilot operations.

**Section IV** is titled Performance, and it describes what the airplane is capable of from a performance point of view. This section is one of the most frequently used sections in the Flight Manual. This chapter begins with a compliance statement confirming that the aircraft performance data is based on 14 CFR, Part 23, commonly referred to as FAR Part 23. If you look at the upper right hand corner of the Certificate of Airworthiness of any short body CitationJet, the CJ2 or CJ2+, you will see the word NORMAL typed into the Category field. These aircraft have a maximum certificated weight of 12,500 pounds or less. If you look at the upper right hand corner of the Certificate of Airworthiness of any CJ3, CJ3+ or CJ4, you will see the word Commuter typed into the Category field. These aircraft have a maximum certificated weight over 12,500 pounds but can be flown Single Pilot as a result of their Commuter certification.

Later in Section IV, you will find discussions on the configurations and procedures followed when takeoff and landing data were being created, some definitions and discussion on noise characteristics. Familiarity with all of these definitions is suggested, but at least one of them deserve additional comment. Surprisingly, there is no Takeoff Field Length data provided for normal "all engines operating" departures. We do not have access to data telling us how much runway is consumed during a normal 2 engine takeoff. Published Takeoff Field Length is the longest of: The distance required to accelerate the airplane to V1, or decision speed, and stop: The distance required to accelerate the airplane to V1, suffer an engine failure and continue the takeoff and climb to 35 feet at V2 with one engine inoperative: or 115% of the distance required to depart normally and climb to 35 feet with both engines operating. The longest of these three distances will be published as Takeoff Field Length. We don't know which of these distances is published and we actually don't care. We just need to know that we have adequate runway for all of those possible outcomes.

Next in Section IV, a number of Standard Charts are presented. These very useful charts cover things like temperature, pressure, distance and fuel quantity conversion factors, International Standard Atmosphere, stall speeds as well as several others.

Then comes one of the more frequently used parts of the Performance Section, Takeoff Performance. This section begins with a discussion of Simplified Criteria, a set of conditions that cover the vast majority of the departure conditions that exist. Typical conditions that must prevail in order to use simplified criteria include: no obstacles, anti-ice selected "OFF", flaps set to Takeoff & Approach, at least 5000 (or 5200) feet of runway available, no tailwind and no runway gradient. Departure Airport Altitude is limited to either 5000 or 6000 feet pressure altitude, depending on model. Temperature limits will also apply. This criteria will provide you with default V speeds, which will typically be slightly above the actual V speeds you would find if you accessed specific performance tables applicable to prevailing conditions.

Next in the Performance Section, you will find a chapter outlining Procedures for use of Takeoff Tables. This chapter will include tables which show Maximum Takeoff Weight Permitted in order to assure that minimum climb gradient can be maintained if an engine were to fail after V1. It will present tables which present corrections to Decision Speed and Takeoff Distance if uphill or downhill runway gradients apply. In general, you would prefer to takeoff with flaps set to Takeoff & Approach on most CitationJets, unless the Maximum Weight Permitted by Climb

Requirement table dictates a lesser flap takeoff. A zero flap takeoff will require more runway but climb performance will be better in the clean configuration

Next comes the tables that provide Takeoff Field Length performance from sea level to 14,000 feet, with both takeoff flap options and with engine anti-ice selected to ON or OFF. These tables are presented at a wide range of temperatures and provide V speeds and resulting Takeoff Distances you can expect as a result. We typically will use these tables when one or more conditions in the Simplified Criteria table are not met.

Next, you will typically find a chapter showing "Single Engine Takeoff Flight Path Distances" in all takeoff configurations. It shows either the 3 or 4 climb-out segments used during flight tests data acquisition when the airplane was certified. Regardless of whether 3 or 4 segments were used, the most restrictive climb segment will typically be second segment. That is the segment that begins after gear retraction is complete, typically by 35 feet and continues to either 400 feet above the departure runway or in some cases, 1500 feet above. Minimum permitted engine out climb gradient during this segment is typically 2.4%, or 2.4 feet per hundred. The Maximum Takeoff Weight Permitted by Climb Requirements table described earlier, assure us that gradient can be met. Since Climb Gradient is not provided on any of the aircraft flight instruments, it is understandable that this 2.4% number in itself, doesn't provide the average pilot with much useful information.  However, applying a little math can convert that performance index into a number we are more familiar with, "feet per minute" rate of climb. 2.4% is equal to 2.4 feet per hundred or 24 feet per thousand or approximately 150 feet per nautical mile. The target single engine climb-out speed during second segment is V2. Let's say V2 is published as 110 KIAS, which is pretty typical. In order to climb out at a 2.4% gradient at 110 knots in still air near sea level, the airplane must be capable of climbing at approximately 275 feet per minute, a number that is presented on the vertical speed indicator and a number most of us can relate to. Some of these Single Engine Takeoff Path Flight Distances can be somewhat eye opening. As an example, let's see how far we would have to travel, single engine, to get to pattern altitude after departing Flagstaff Arizona in a Citation 550 at 13,300 pounds on a 20 degree Centigrade, or 68 degree Fahrenheit day. At those conditions, we would just make second segment climb gradient with flaps set to 15 degrees, per our Maximum Weight Permitted by Climb Requirement table. Published takeoff distance required would be 6640 feet, V1 would be 105, Vr would be 107 and V2 would be 114. If we lost an engine after V1 however, it would require 105595 feet, over 17 miles to get to 1500 feet AGL!

If that 6640 feet published takeoff distance sounds a little longer than you were expecting, remember that published takeoff distance for a multiengine jet is different than it is in a light twin. The published takeoff distance for the entire Citation family, is the longest of:

Distance required to accelerate to V1 and stop,

Distance required to accelerate to V1, lose an engine and continue to 35 feet at V2 with

one engine inoperative, or

115% of all engine takeoff distance to 35 feet, whichever is longest.

We do not have access to "all engine operating" takeoff distance in most multiengine civilian jets.

The next few tables presented are primarily supporting data for those performance parameters we just described. They present actual climb gradient during first and second segment at a variety of weights and temperature.

The final chapter in the Performance Section is titled Approach and Landing. This is where we go to look up published landing distance. It begins with a discussion of procedures to follow to utilize the data and then presents conditions that restrict landing under certain conditions, even if the aircraft is lighter than the published maximum landing weight. There will be limitations on how heavy you can land at high altitude airports based on your ability to go around, both with an engine failed and with both engines operating normally. In other words, if the airplane doesn't have the performance to go around at any airport you plan on landing at, at current temperature, weight and altitude, you aren't authorized to go there. That information is presented in the "Maximum Weight Permitted by Climb Requirements" charts. In essence, the airplane has to be able to climb out at roughly a 3.2% climb gradient with both engines operating, flaps set to 15 degrees and gear UP and it must be able to climb out at about a 2.1% gradient with one engine inoperative, flaps set to 15 degrees and gear UP.

**Section V** is titled Supplements and it includes information on certain options that may or may not be installed on the airport and frequently includes information on operations under certain foreign, non-N registration entities.

**Section VI** is titled Weight & Balance and it contains aircraft specific weight, moment and arm information. The most recent weighing and calculated effect of additions & deletions should be presented in this section. Instructions on calculating weight and balance, showing station locations of seats and baggage areas, Weight & Balance forms used to compute Weight & Balance, and certain weight limitations ate typically included.

**Section VII** is the final section and it is titled Advisory Information. Information in this section is not necessarily supported by flight test data, but it may be the best source of information available to deal with certain conditions, such as wet or contaminated runways and standing water. Different “Types” of anti-icing and de-icing fluids are also typically covered in this section. There is typically a drawing of the aircraft, showing areas of the airframe that must be clear of ice and frost before taking off presented in this section.