**KURDISTAN REGIONAL GOVERNMENT**


# SULAYMANIYAH INTERNATIONAL AIRPORT

# MATS

# CHAPTER 23

## AIRCRAFT PERFORMANCE

**( First Edition )**

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**Prepared By**
**Fakhir .F. Mohammed**
**Civil Aviation Consultant**

## TABLE OF CONTENTS

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Airbus A340-200/-300 cockpit

## 23.1 Different Speeds Used During The Flight:

**23.1.1 For a better understanding of the subject, an aircraft should be considered as an object moving in an air mass, which is also on the move. The parameters of that air mass (temperature, density, pressure, speed) are constantly changing. The different speed references (or units) used by the pilot all along the flight are subject to the environment in which the aircraft is moving.**

## a. Ground Speed (G/S):

**As its name indicates, the ground speed is the speed of the aircraft over the ground. The speed of every object on or over the ground is:**

**G/S = D x T**

**D : the distance (in NM) and**

**T : the time (in minutes).**

**This speed unit is mainly used by the airline operations and management services to calculate flight time, fuel consumption and therefore, the flight's cost. The onboard computers are constantly using this speed to calculate estimates, as the different fixes and the destination airport are located on the ground.**

## b. True Air Speed ( TAS):

**TAS is the true air speed of an aircraft moving in an air mass. This is the speed pilots should theoretically use during climb and descent. For some reasons, explained later, they do not. The TAS is related mainly to the ground speed (G/S), the wind's speed (Vw) and air density. To simplify matters, the formula to obtain ground speed is:**

**G/S = TAS + Vw**

**G/S: the ground speed (in knots)**

**Vw : the wind (in kt.) e.g., if an aircraft is climbing at a constant TAS of 280kt and if it is experiencing a 30kt front wind then its G/S will be:**

**G/S = 280 –30**

**= 250kt.**

**If that same aircraft experiences a tail wind of 30kt, then its ground speed will be:**

**G/S = 280 + 30**

**= 310kt.**

**In addition, the True Air Speed is related to the Indicated Air Speed and increases with the altitude:**

**TAS = IAS + FL/2**

**meaning that at sea level TAS = IAS + 0/2 = IAS.**

## c. Calibrated Air Speed ( CAS):

**This is the speed used by pilots during climb and descent below a certain altitude. It is roughly equivalent to the IAS corrected for errors. This speed is not used for ATC purposes.**

## d. Indicated Air Speed (IAS):

**The name speaks for itself and is the speed shown on the aircraft navigation displays. IAS is related to the TAS by the air pressure at a specific altitude.**

$IAS = TAS \times \sqrt{d}$, **with "d" being the air density.**

**The air density decreases with the altitude e.g. on the ground where the air density is 1 (d=1), IAS = TAS.**
**But at 40.000ft, $\sqrt{d}$ is roughly of 0.5 only so the navigation display will show an indicated air speed half of the one on the ground. From this example, we can see that between two aircraft reporting the same indicated air speed, the higher one will be the fastest because its TAS will be greater.**

## e. Mach Number (M):

**The definition of the Mach number is:**

$$M = TAS \div C$$

**C : the speed of sound (approx.331 m/s in the air at temp. 0°).**

**This is the speed used by pilots during climb and descent above a specific altitude and the only one they use during the cruise. The Mach number is an important speed for ATC. The Mach number depends mainly on the air density, which decreases with the altitude. It has nothing to do with the type of aircraft itself and its mass. Two totally different types of aircraft flying at the same level, in the same air mass and having the same Mach number are moving at exactly the same speed and the distance between them will never decrease. The Mach number is a very easy and accurate speed for air traffic controllers to use.**
**As a rule of thumb:**

**M 0.01 = 6kt of TAS**

**So**

**M 0.1 = 60kt**

**M 0.10 = 600kt**

**This can be used to calculate the rate of closure between two aircraft at the same level.**
**Likewise, the aircraft's TAS can be obtained from the Mach Number if you multiply it by 600 e.g. an aircraft flying at M 0.80:**

**TAS = 0.80 x 600 = 480 kt, equivalent to 8NM/min.**

**An aircraft flying at M 0.75:**

**TAS = 0.75 x 600 = 450 kt equivalent to 7.5NM/min.**

**All these are quick and easy calculations for a Controller to use when working on position and. are used mainly to sequence en-route traffic. They are also useful when coordinating two or more flights at the same level entering another FIR using procedural or Mach Number technique separation e.g. When two aircraft have the same Mach Number but are flying at different levels, the higher one is always slower than the lower one: as the Mach Number is related to the TAS and the air density. So, to show the same Mach Number, the higher aircraft will have a lower TAS.**

## 23.2 FLIGHT AND AIRLINE GOALS

**23.2.1 Flights operations are grouped into three main categories, depending on the length of the trip. Each airline has its own goals, closely related to the type of flight that its aircraft are doing.**

### 23.2.2 Types of flights

**a. Short Haul Flight: (Flights of up to approx. 600NM.)**

**These flights are either called short haul or regional flights. The aircraft used for such flights range from small turboprops like the ATR42 to much larger airliners like the Boeing 747 , depending on the route density.**

**b. Medium Haul Flight: (Flights between 600 to 2,500nm.)**

Turboprops are no longer used (except for some cargo flights) for these flights because of their short range or low speeds. Medium to high capacity jets are used, ranging from the DC9 to B777 or Airbus A330.

c. Long Haul Flight: (Flights longer than 2,500nm.)

These flights are exclusively made by jet medium to high capacity long-range airliners like the Airbus A330, the A340, and the Boeing 767, 777 or 747.

## 23.2.3 Airline/Pilot goals (punctuality/economy)

Technically speaking, a flight is divided into three important sections: climb, cruise and descent. Depending on the type of flight and what economical goals the airline has set, aircraft performance during these three phases can be modified from the original specifications given by the manufacturer. Aircraft are certified with what is called a flight envelope i.e. available speeds, altitudes, rates of climb and descent, different weights etc. The manufacturer and the certification authorities allow the airlines to operate the aircraft the way they want within that flight envelope. Some of these goals are:

a. For regional flights, which are used mainly by businessmen, punctuality is a prime goal. No matter what the cost, the airline has to guarantee these passengers that they will be attending their business meeting or get their connecting flight on time. Operationally speaking, this means a quick climb to a medium altitude (usually between FL180 and 260) followed by a high-speed cruise and descent.

b. For medium haul flights, that carry a mix of leisure and business passengers, punctuality is less of a demanding requirement. But they are high yield passengers and economically valuable to the airline. Therefore the airline will try to ensure that they arrive on time at their destination and, at the same time, try to save on fuel. Accordingly, airlines usually profile these flights to have a quick climb and descent with a regular cruising speed.

c. For long haul flights the prime goal is economy. Because these flights are long distance, they are carrying a lot of fuel. Fuel is a wasted weight for an airline, as it does not make money. The more fuel that is carried, the fewer passengers an aircraft can transport. In addition, fuel is expensive and represents up to 30% of an airline budget.

**To meet the economy goal, airlines profile these flights to have a low rate of climb, low-speed cruise and keep a "clean" profile e.g. no spoilers or flaps added during descent, meaning they will ask for a lower flight level much earlier.**

## 23.3. FLIGHT PROFILES

## 23.3.1 Climb

**The climb of an aircraft is closely related to its speed. The flight envelope and the airline goals determine this speed. The initial climb is done at a constant Calibrated Air Speed (CAS), which is equivalent to the Indicated Air Speed (IAS) corrected for errors and then later on, climbs at a constant Mach number. Theoretically, the climb should be done at constant True Air Speed (TAS), which provides the best rate of climb. But this speed increases very quickly and would be very uncomfortable, even dangerous at low altitudes because of turbulence, banking radius etc. This is the reason why pilots use a lower speed (between 280 - 340kt CAS). These are usually close to what the manufacturer recommends for turbulent air and allow better aircraft manoeuverability and comfort for the passengers.**

**During the climb, pilots use two different speed units, constant CAS until a certain altitude and then constant Mach number. When climbing at these relatively low speeds (± 300kt), pilots have to constantly check the differential with the stall speed, which depends on the aircraft's weight, its speed and its rate of climb. This is the reason for using CAS. Above a certain altitude, generally located between FL280 and FL300, the Mach number becomes reference speed, as this is easier for navigation and cruise management purposes.**

**The CAS and Mach number on climb are determined by the flight envelope and the airline's goal and depend greatly on the aircraft's weight. For example, an airline operating the Boeing 747 may have two different climbing procedures depending of the aircraft's Maximum Take Off Weight (MTOW) e.g. with a MTOW more than 290 tonnes they may climb at 310kt CAS then M0.82. while with a MTOW of less than 290 tonnes they may climb at 340kt CAS then M0.82.**
**During the climb at constant CAS, the Mach number increases. When it reaches the selected value (0.82 for instance), the autopilot manages the engines thrust and the aircraft's trim in order to keep that Mach number constant until reaching the assigned cruising level.**

## 23.3.2 Rate of climb:

**When an aircraft is climbing at a constant speed, the rate of climb varies for several reasons e.g. operational procedures or with the air density decreasing with the altitude. At low altitudes, the aircraft is climbing with the maximum rate of climb to avoid obstacles close to the airport and to get out of the air turbulence usually found at these lower altitudes. As most of the effort required from the engines is for climb, the speed of the aircraft (horizontal effort) is lower than for a normal rate of climb. For example a Boeing 747-200 may have a CAS of 250 to 290kt (depending on MTOW) at maximum rate of climb instead of 310 or 340kt for a normal one. After this, the aircraft takes up its normal climb at constant CAS and Mach number until reaching its cruising level. With the speed being constant and the air density decreasing with the altitude, the rate of climb slowly deteriorates. There are two simple reasons for this: firstly, the lower the air density, the less lift is obtained. Secondly, aircraft engines work on the same principle as a cars i.e. thrust (for aircraft) or power (for cars) is the result of the combustion of an oxygen-fuel mixture. The oxygen percentage in the air decreases with the altitude. Therefore thrust is lower at high levels and with the aircraft's speed being kept constant, the rate of climb therefore decreases.**

**An example of this is given for the average rate of climb of an Airbus A320 until it reaches its cruising level:**

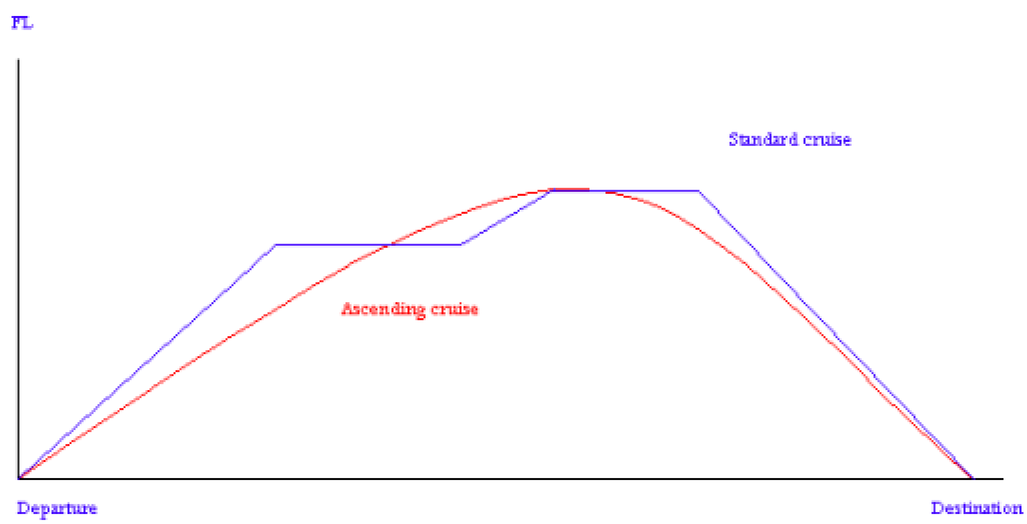
| | | |
|---|---|---|
| From ground to FL 150 | : | 2.500 ft/min and up to 6.000 for a few minutes |
| From FL150 to FL270 | : | Slowly decreasing to 1.500 ft/min |
| From FL270 to FL300 | : | Slowly decreasing to 1.000 ft/min |
| From FL300 to FL330 | : | Slowly decreasing to 600 to 700 ft/min |
| From FL330 to FL370 | : | 400 to 500 ft/min at the best |

**A Controller should always consider aircraft performance, especially when climbing an aircraft through the level of opposite direction traffic. As many of the parameters affecting the rate of climb of an aircraft are unknown to the Controller, it is always better to ask the pilot if he is able to make the expected level within a certain distance. As modern aircraft are nowadays highly computerized, this information is readily available to the pilot. Nevertheless, a Controller should always consider keeping a certain safety margin.**

## 23.3.3 Cruise

**The Flight Management System (FMS) computer onboard the aircraft is always calculating optimum cruising levels and speeds for each flight. These depend on the weight of the aircraft, the duration of the flight, temperature and upper winds at altitude. These data are constantly updated by the FMS during the flight e.g. as fuel is burnt as the flight goes along, so the aircraft becomes lighter. and the optimum cruising level will get higher and higher within the flight envelop.**

**The theoretically optimum flight is termed a "cruise climb". This means that the aircraft would be constantly climbing until the point of descent. This is the most effective cost saving cruise but is totally incompatible with air traffic control requirements. Aircrew has to compromise between aircraft and ATC requirements. They will cruise most of the time at constant Mach number, sometimes speeding up when getting close to destination. A level change is usually requested every time the onboard FMS will allow the aircraft to reach the next flight level.**




**This is the theory for a perfect flight but operationally speaking, pilots have to comply with ATC requirements (airspace limitations, for instance) and, with traffic increasing year after year, increasingly crowded airways.**

## 23.3.4 Descent

**The top of descent position to an airport varies from airline to airline and on what kind of flight (regional, medium or long haul) is being operated. Long haul flights, being operated for economy, will usually ask for an early descent so that they do not need to extend flaps and spoilers until close to the destination airport. (Extending the flaps or spoilers creates drag, which gives the aircraft a higher rate of descent but also means a higher fuel consumption). A "clean" (no flaps or spoilers) wing profile is more efficient for saving fuel but gives a lower rate of descent of around. 2.000 to 2.500 ft/min. That is the reason why pilots of such flights will ask you for descent clearance at approximately:**

**D = FL ÷ 3**

**= …. ( Minutes)**

**(D being the point of descent).**

**This is a rough formula but works well enough for Controllers to anticipate descent requests from pilots. (Pilots usually ask for descent clearance 3 to 4 minutes before actually descending so as to prepare the aircraft for the descent).**

**Medium haul and regional flights have a time goal; so they maintain their cruising level as long as possible and then start a very late high-speed descent.**

## 23.3.5 Speed on Descent

**The same goals and performance restrictions for the climb i.e. the flight envelope and the airline's goals, give speeds used on descent. A standard descent would be at constant Mach number then constant CAS (IAS). The aircraft starts descent with a Mach number equal or very close to the one used during the cruise. The TAS shown then on the instruments is very high, around 480 kts for a Boeing 747. The TAS then decreases with the altitude and when the CAS recommended for the descent is reached, this CAS is kept constant until about 40/50 NM to the destination airport. As in the climb, the reason for changing speeds during the descent is passenger comfort and aircraft manoeuverability e.g. a Boeing 747-200 will descend at M0.84 constant and then at 300 kts TAS (IAS) constant, unless otherwise instructed by the Controller.**

## 23.3.6 Relationship between speed and rate of descent

**As for the climb, the speed during descent is closely related to the rate of descent. The higher the speed, the higher the rate of descent; the lower the speed, lower the rate of descent. A pilot should not be asked to increase the rate of descent and slowdown or to give a low rate of descent while keeping up a high speed at the same time. If, for sequencing, there is a need to increase the rate of descent (because of opposite direction traffic) and decrease the speed (to keep him number 2 in the sequence), then the Controller needs to specify which one he needs first e.g. "IA 179 descend to FL 200 at 3.500 ft/min or greater until passing FL280, then reduce to 300 kts IAS or less." The pilot will apply a high rate of descent (3.500 ft/min or more) until FL280. Doing this, the IAS will increase dramatically. Once vacating FL280, he will reduce to 300 kts IAS or less, which will take a few minutes. During this slowdown period it may be noticed that the rate of descent will slow down, or even stop.**

## 23.3.7 Emergency descent:

**The most usual cause of an emergency descent is explosive decompression or sudden depressurisation. During the flight, the cabin pressure is artificially kept at the same level found at about 8,000Ft AMSL. In the case of a sudden depressurisation, cabin pressure and the breathable air (oxygen) drop to unbearable levels for the passengers. The aircraft structure might also be damaged in such a case. The pilot has no other option than to descend as quickly as possible to an altitude where he can recover normal oxygen and pressure levels: this altitude is at or below 12,000 feet.**

**In these situations, the pilot will initiate an emergency descent with a rapid 10 to 12,000ft/min rate of descent. As it is a sudden action, the pilot will possibly have no time to advise ATC about the situation until he reaches a suitable altitude. The pilot should follow international procedures for such a descent i.e. by turning to the right to get off the airway centerline. Other traffic liable to be affected by an emergency descent should be given essential traffic information and if necessary, vectored clear of the descending traffic with a right turn.**

### 23.3.8 Use Of Vectors Or Intermediate Flight Levels For Climbing Traffic

**The type of flight (regional, medium, long haul) is of importance to a Controller when deciding whether to vector or use an intermediate flight level (level off traffic) because of conflicting traffic. As regional and medium haul flights are usually looking for punctuality, they like to get to their cruising level as fast as possible, whatever the cost. Given a choice of either maintaining FL290 for 5 minutes and then to expect further climb to the requested level after passing opposite direction traffic or to accept a vector and climb unrestricted to the requested cruising level, most pilots will go for the second solution.**

**Long-haul flights are looking for maximum economy and, because of the type of flight, the rate of climb may be slow as the aircraft is usually heavy. These types of flights may prefer to maintain a lower level, close to the cruising level, for a period of time rather than being vectored. However, if a flight has to be leveled off several times before it can get to its requested cruising level, it should be vectored away from the conflicting traffic.**

## 23.4 AIRBORNE COLLISION AVOIDANCE SYSTEM ( ACAS )

## 23.4.1. General

**23.4.1.1 ACAS is an acronym of *T*raffic *C*ollision *A*voidance *S*ystem. The latest version as of February 2001 is ACAS II : This is the generic name for such equipment, ACAS II being one of the different versions available.**

## 23.4.2 Operation of ACAS

**23.4.2.1 ACAS II is now compulsory equipment in many parts of the world because of the dramatic increase of air traffic worldwide.**

**23.4.2.2 The system interrogates surrounding SSR transponders and provides the pilot with information on their position, speed and altitude. The pilot can select different ranges of distance and altitude depending on what kind of airspace he is flying through. During the approach phase for instance, the selected range will be closer as ATC radar separations are closer (in the order of 3 to 5 NM). This allows the pilot to create an artificial safety envelope around his own aircraft. Once the altitude and distance ranges have been selected, the ACAS provides the pilot with different kinds of information:**

a. **Traffic Alert (TA): the system alerts the pilot about any traffic entering that safety envelope, either laterally or vertically. It is then up to the pilot to decides whether to take any action or not, depending on how close the other traffic is.**

b. **Resolution Advisory (RA): this information comes after the TA, when separation gets even closer and the system predicts a near miss or a collision. It analyses the trajectory and the speed of the conflicting aircraft and then displays a course of action to the pilot avoid the predicted conflict: The conflict resolution could be given as an emergency altitude change (up or down), as a dramatic deviation in the actual route or as both, depending on the gravity of the situation. In such a case, the pilot will always follow the Resolution Advisory given by the ACAS.**

*NOTE: Traffic Alert, or even Resolution Advisory, can be originated by surrounding traffic with a faulty Mode C in the transponder. The ACAS will not read the actual altitude of the conflicting traffic but the one given by its Mode C. For example, when an aircraft is actually maintaining FL280 and the Mode C shows FL286, the opposite direction traffic at FL290 will get a TA and, most probably a RA.*

**This is one of the reasons why it is important to ask a pilot to check his altitude settings when the difference between his actual altitude and the one shown by his aircraft mode C is greater than 300 feet. If the problem cannot be solved, then the pilot should be instructed to stop squawking Mode C (or "altimeter").**

# 23.5 Average Aircraft Performance Figures

## 23.5.1 Long Haul Aircraft

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| A306 | Airbus A300-600R | 280/310 kt | M0.78/0.81 | 250/320 kt | 280/350 | L2J |
| A310 | Airbus A310-200/-300 | 280/320 kt | M0.78/0.81 | 250/330 kt | 280/390 | L2J |
| A332 | Airbus A330-200 | 280/320 kt | M0.78/0.84 | 250/340 kt | 330/410 | L2J |
| A333 | Airbus A330-300 | 280/320 kt | M0.78/0.82 | 250/340 kt | 310/370 | L2J |
| A342 | Airbus A340-200 | 280/320 kt | M0.81/0.84 | 250/340 kt | 310/370 | L4J |
| A343 | Airbus A340-300 | 280/320 kt | M0.81/0.84 | 250/340 kt | 310/370 | L4J |
| B701 | Boeing 707-100 | 280/320 kt | M0.79/0.82 | 250/320 kt | 280/350 | L4J |
| B703 | Boeing 707-320 | 280/320 kt | M0.79/0.82 | 250/320 kt | 280/350 | L4J |
| B720 | Boeing 720 | 280/320 kt | M0.79/0.82 | 250/320 kt | 280/370 | L4J |
| B741 | Boeing 747-100 | 280/320 kt | M0.82/0.85 | 250/340 kt | 310/370 | L4J |
| B742 | Boeing 747-200 | 280/320 kt | M0.82/0.85 | 250/340 kt | 310/370 | L4J |
| B743 | Boeing 747-300 | 280/320 kt | M0.82/0.85 | 250/340 kt | 310/370 | L4J |
| B744 | Boeing 747-400 | 280/320 kt | M0.82/0.86 | 250/340 kt | 350/410 | L4J |
| B74S | Boeing 747 SP | 280/320 kt | M0.82/0.85 | 250/340 kt | 310/410 | L4J |
| B762 | Boeing 767-200 | 280/320 kt | M0.79/0.82 | 250/340 kt | 310/430 | L2J |
| B763 | Boeing 767-300 | 280/320 kt | M0.79/0.82 | 250/340 kt | 310/430 | L2J |
| B764 | Boeing 767-400 | 280/320 kt | M0.79/0.82 | 250/340 kt | 310/430 | L2J |
| B772 | Boeing 777-200 | 280/320 kt | M0.80/0.85 | 250/340 kt | 310/410 | L2J |
| B773 | Boeing 777-300 | 280/320 kt | M0.80/0.85 | 250/340 kt | 310/410 | L2J |
| C135 | Boeing 135B Stratolifter (B707) | 280/320 kt | M0.79/0.82 | 250/320 kt | 280/350 | L4J |
| C141 | Lockheed Starlifter | 270/300 kt | M0.76/0.79 | 250/310 kt | 280/350 | L4J |
| C5 | Lockheed Galaxy | 270/300 kt | M0.77/0.80 | 250/320 kt | 270/330 | L4J |
| CONC | Aerospatiale/Bae Concorde | | M0.84/.9/2.0 | | 330/370 | L4J |
| DC10 | Douglas DC10-30 and KC10 | 280/320 kt | M0.81/0.84 | 250/320 kt | 310/370 | L3J |
| DC86 | Douglas DC8-60 | 280/310 kt | M0.77/0.81 | 250/320 kt | 280/350 | L4J |
| DC87 | Douglas DC8-70 | 280/320 kt | M0.77/0.83 | 250/320 kt | 280/370 | L4J |

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| IL62 | Ilyushin 62 | 280/320 kt | M0.78/0.82 | 250/340kt | 280/350 | L4J |
| IL86 | Ilyushin 86 | 280/320 kt | M0.80/0.84 | 250/340kt | 280/350 | L4J |
| IL96 | Ilyushin 96 | 280/320 kt | M0.80/0.84 | 250/340kt | 280/350 | L4J |
| K35A | Boeing KC135A Stratotanker(J57 engines) | 280/320 kt | M0.79/0.82 | 250/320 kt | 280/350 | L4J |
| K35R | Boeing KC135R Stratotanker (Cfm56 engines) | 280/320 kt | M0.79/0.82 | 250/320 kt | 280/350 | L4J |
| L101 | Lockheed 1011 Tristar | 280/320 kt | M0.80/0.84 | 250/320 kt | 280/370 | L3J |
| MD11 | Douglas/Boeing MD11 | 280/320 kt | M0.81/0.86 | 250/320 kt | 310/410 | L3J |
| T154 | Tupolev 154 | 280/320 kt | M0.78/0.81 | 250/320 kt | 280/410 | L3J |
| VC10 | Vickers/BAE VC10 | 280/320 kt | M0.77/0.82 | 250/320 kt | 280/350 | L4J |

## 23.5.2 Medium Haul Aircraft

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| A124 | Antonov 124 Ruslan | 270/300 kt | M0.76/0.80 | 250/310 kt | 270/330 | L4J |
| A3ST | Airbus A300-600 ST Beluga | 260/300 kt | M0.74/0.77 | 250/320 kt | 260/350 | L2J |
| A30B | Airbus A300-B2/B4/C4 | 280/310 kt | M0.76/0.80 | 250/320 kt | 280/350 | L2J |
| A306 | Airbus A300-600/-600R | 280/310 kt | M0.78/0.81 | 250/320 kt | 280/350 | L2J |
| A310 | Airbus A310-200/-300 | 280/320 kt | M0.78/0.81 | 250/330 kt | 280/390 | L2J |
| A318 | Airbus A318-100 | 280/320 kt | M0.76/0.80 | 250/320 kt | 280/390 | L2J |

## 23.5.2 Medium Haul Aircraft

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| A319 | Airbus A319-100 | 280/320 kt | M0.76/0.80 | 250/320 kt | 280/390 | L2J |
| A320 | Airbus A320-100/-200 | 280/320 kt | M0.76/0.80 | 250/320 kt | 280/390 | L2J |
| A321 | Airbus A321-100/-200 | 280/320 kt | M0.76/0.80 | 250/320 kt | 280/390 | L2J |
| A332 | Airbus A330-200 | 280/320 kt | M0.78/0.84 | 250/340 kt | 330/410 | L2J |
| A333 | Airbus A330-300 | 280/320 kt | M0.78/0.82 | 250/340 kt | 310/370 | L2J |
| AN24 | Antonov 24 | 220/260 kt | 260/300 kt | 240/300 kt | 200/260 | L2T |
| B712 | Boeing 717-200 | 280/310 kt | M0.77/0.80 | 250/320 kt | 310/390 | L2J |
| B721 | Boeing 727-100 | 270/300 kt | M0.78/0.81 | 250/320 kt | 280/370 | L3J |
| B722 | Boeing 727-200 | 270/300 kt | M0.78/0.81 | 250/320 kt | 280/370 | L3J |
| B732 | Boeing 737-200 | 270/330 kt | M0.71/0.74 | 250/310 kt | 280/370 | L2J |
| B733 | Boeing 737-300 | 280/310 kt | M0.73/0.76 | 250/310 kt | 280/370 | L2J |
| B734 | Boeing 737-400 | 280/310 kt | M0.73/0.76 | 250/310 kt | 280/370 | L2J |
| B735 | Boeing 737-500 | 280/310 kt | M0.73/0.76 | 250/310 kt | 280/370 | L2J |
| B736 | Boeing 737-600 | 280/310 kt | M0.77/0.80 | 250/320 kt | 350/410 | L2J |
| B737 | Boeing 737-700 | 280/310 kt | M0.77/0.80 | 250/320 kt | 350/410 | L2J |
| B738 | Boeing 737-800 | 280/310 kt | M0.77/0.80 | 250/320 kt | 350/410 | L2J |
| B739 | Boeing 737-900 | 280/310 kt | M0.77/0.80 | 250/320 kt | 350/410 | L2J |
| B74D | Boeing 747-400 (domestic) | 280/320 kt | M0.82/0.86 | 250/340 kt | 350/410 | L4J |
| B752 | Boeing 757-200 | 280/320 kt | M0.78/0.81 | 250/330 kt | 310/390 | L2J |
| B753 | Boeing 757-300 | 280/320 kt | M0.78/0.81 | 250/330 kt | 310/390 | L2J |
| B762 | Boeing 767-200 | 280/320 kt | M0.79/0.82 | 250/340 kt | 310/430 | L2J |
| B763 | Boeing 767-300 | 280/320 kt | M0.79/0.82 | 250/340 kt | 310/430 | L2J |
| B764 | Boeing 767-400 | 280/320 kt | M0.79/0.82 | 250/340 kt | 310/430 | L2J |
| B772 | Boeing 777-200 | 280/320 kt | M0.80/0.85 | 250/340 kt | 310/410 | L2J |

| ICAO CODE | Designation | Climb IAS | Cruising Speeds | Descent IAS | Cruising Fl | Power Plant |
|---|---|---|---|---|---|---|
| B773 | Boeing 777-300 | 280/320 kt | M0.80/0.85 | 250/340 kt | 310/410 | L2J |
| BA11 | BAC 1-11 | 270/300 kt | M0.72/0.78 | 250/300 KT | 280/350 | L2J |
| C17 | Douglas C17 Globemaster III | 270/300 kt | M0.74/0.78 | 250/300 kt | 280/350 | L4J |
| C22 | Boeing 727-100 (US transport) | 270/300 kt | M0.78/0.81 | 250/320 kt | 280/370 | L3J |
| C9 | Douglas DC9-30 Nightingale | 280/300 kt | M0.74/0.78 | 250/310 kt | 280/350 | L2J |
| CT43 | Boeing 737-200 (US transport) | 270/330 kt | M0.71/0.74 | 250/310 kt | 280/370 | L2J |
| DC91 | Douglas DC9-10 | 280/300 kt | M0.74/0.78 | 250/310 kt | 280/350 | L2J |
| DC92 | Douglas DC9-20 | 280/300 kt | M0.74/0.78 | 250/310 kt | 280/350 | L2J |
| DC93 | Douglas DC9-30 | 280/300 kt | M0.74/0.78 | 250/310 kt | 280/350 | L2J |
| DC94 | Douglas DC9-40 | 280/300 kt | M0.74/0.78 | 250/310 kt | 280/350 | L2J |
| DC95 | Douglas DC9-50 | 280/300 kt | M0.74/0.78 | 250/310 kt | 280/350 | L2J |
| F100 | Fokker 100 | 260/290 kt | M0.73/0.76 | 250/290 kt | 280/350 | L2J |
| F70 | Fokker 70 | 260/290 kt | M0.73/0.76 | 250/290 kt | 280/350 | L2J |
| IL18 | Ilyushin 18/20/22/24 | 220/260 kt | 260/320 kt | 240/300 kt | 180/260 | L4T |
| IL76 | Ilyushin 76/78/82 | 280/300 kt | M0.74/0.78 | 250/310 kt | 270/330 | L4J |
| IL86 | Ilyushin 86/87 | 280/320 kt | M0.80/0.84 | 250/340 kt | 280/350 | L4J |
| IL96 | Ilyushin 96 | 280/320 kt | M0.80/0.84 | 250/340 kt | 280/350 | L4J |
| MD81 | Douglas MD81 / Boeing MD81 | 280/320 kt | M0.76/0.80 | 250/320 kt | 310/370 | L2J |
| MD82 | Douglas MD82 / Boeing MD82 | 280/320 kt | M0.76/0.80 | 250/320 kt | 310/370 | L2J |
| MD83 | Douglas MD83 / Boeing MD83 | 280/320 kt | M0.76/0.80 | 250/320 kt | 310/370 | L2J |
| MD87 | Douglas MD87 / Boeing MD87 | 280/320 kt | M0.76/0.80 | 250/320 kt | 310/370 | L2J |
| MD88 | Douglas MD88 / Boeing MD88 | 280/320 kt | M0.76/0.80 | 250/320 kt | 310/370 | L2J |
| MD90 | Douglas MD90 / Boeing MD90 | 280/320 kt | M0.76/0.80 | 250/320 kt | 310/370 | L2J |
| T134 | Tupolev 134 | 270/300 kt | M0.74/0.78 | 250/300 kt | 310/390 | L2J |
| T154 | Tupolev 154 | 280/320 kt | M0.78/0.81 | 250/320 kt | 280/410 | L3J |
| T204 | Tupolev 204/214/224/234 | 280/320 kt | M0.73/0.76 | 250/320 kt | 310/390 | L2J |
| YK40 | Yakovlev Yak 40 | 230/280 kt | M0.72/0.76 | 250/280 kt | 250/290 | L3J |
| YK42 | Yakovlev Yak 42/142 | 240/280 kt | M0.74/0.77 | 250/280 kt | 250/330 | L3J |

# 23.5.3 Regional (Short Haul) Aircraft

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| AN12 | Antonov 12 | 220/260 kt | 280/340 kt | 240/300 kt | 200/280 | L4T |
| AN24 | Antonov 24 | 220/260 kt | 260/300 kt | 240/300 kt | 200/260 | L2T |
| AT43 | ATR 42-200/-300/-320 | 180/220 kt | 250/270 kt | 200/230 kt | 180/280 | L2T |
| AT44 | ATR 42-400 | 180/220 kt | 250/270 kt | 200/230 kt | 180/280 | L2T |
| AT45 | ATR 42-500 | 180/220 kt | 250/290 kt | 200/245 kt | 180/280 | L2T |
| AT72 | ATR 72-200/-300/-500 | 180/220 kt | 250/290 kt | 200/230 kt | 180/280 | L2T |
| ATP | BAE ATP and Jetstream 61 | 180/220 kt | 240/265 kt | 200/240 kt | 180/250 | L2T |
| B190 | Beech 1900C (C12J) | 180/220 kt | 230/270 kt | 200/250 kt | 180/250 | L2T |
| B350 | Beech/Raytheon B300 Super King Air 350 | 180/220 kt | 250/315 kt | 200/270 kt | 220/280 | L2T |
| B461 | BAE 146-100 Statesman | 220/260 kt | M0.68/0.71 | 230/290 kt | 240/290 | L4J |
| B462 | BAE 146-200 Statesman/Quiet Trader | 220/260 kt | M0.68/0.71 | 230/290 kt | 240/290 | L4J |
| B463 | BAE 146-300 | 220/260 kt | M0.68/0.71 | 230/290 kt | 240/290 | L4J |
| BA11 | BAC 1-11 | 270/300 kt | M0.72/0.78 | 250/300 kt | 280/350 | L2J |
| BE20 | Beech Super king Air 200 | 180/220 kt | 250/290 kt | 200/250 kt | 220/280 | L2T |
| BE30 | Beech Super king Air 300 | 180/220 kt | 250/315 kt | 200/270 kt | 220/280 | L2T |
| C208 | Cessna 208 Caravan I, Super Cargomaster and Grand Caravan | 120/130 kt | 170/190 kt | 140/150 kt | 80/100 | L1T |
| CRJ1 | Canadair RJ100 Regional Jet | 220/260 kt | M0.74/0.78 | 230/290 kt | 310/370 | L2J |
| CRJ2 | Canadair RJ200 Regional Jet | 220/260 kt | M0.74/0.78 | 230/290 kt | 310/370 | L2J |
| D328 | Fairchild Dornier 328-100/-120 | 180/220 kt | 250/330 kt | 200/270 kt | 240/290 | L2T |
| DH8A | De Havilland Canada DHC8-100 Dash 8 | 160/180 kt | 250/290 kt | 200/230 kt | 180/250 | L2T |
| DH8B | De Havilland Canada DHC8-200 Dash 8 | 160/180 kt | 250/290 kt | 200/230 kt | 180/250 | L2T |
| DH8C | De Havilland Canada DHC8-300 Dash 8 | 160/180 kt | 250/290 kt | 200/230 kt | 180/250 | L2T |
| DH8D | De Havilland Canada DHC8-400 Dash 8 | 160/180 kt | 250/290 kt | 200/230 kt | 180/250 | L2T |
| DHC6 | De Havilland Canada DHC6 Twin Otter | 120/140 kt | 160/170 kt | 140/155 kt | 60/100 | L2T |

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| E120 | Embraer EMB-120 Brasilia | 180/220 kt | 220/270 kt | 200/250 kt | 220/280 | L2T |
| E135 | Embraer ERJ-135 | 260/310 kt | M0.76/0.78 | 250/320 kt | 310/370 | L2J |
| E140 | Embraer ERJ-140 | 260/310 kt | M0.76/0.78 | 250/320 kt | 310/370 | L2J |
| E145 | Embraer ERJ-145 | 260/310 kt | M0.76/0.78 | 250/320 kt | 310/370 | L2J |
| F100 | Fokker 100 | 260/290 kt | M0.73/0.76 | 250/290 kt | 280/350 | L2J |
| F27 | Fokker 27 Friendship | 160/180 kt | 210/260 kt | 200/230 kt | 160/240 | L2T |
| F28 | Fokker 28 Fellowship | 260/290 kt | M0.70/0.73 | 250/290 kt | 280/350 | L2J |
| F50 | Fokker 50 | 160/180 | 210/280 kt | 200/230 kt | 200/250 | L2T |
| F70 | Fokker 70 | 260/290 kt | M0.73/0.76 | 250/290 kt | 280/350 | L2J |
| I114 | Ilyushin 114 | 170/190 kt | 240/270 kt | 180/200 kt | 200/230 | L2T |
| IL18 | Ilyushin 18 | 220/260 kt | 280/330 kt | 240/300 kt | 180/260 | L4T |
| J328 | Fairchild Dornier 328JET | 260/320 kt | M0.62/0.66 | 280/330 kt | 280/350 | L2J |
| JS31 | BAE 3100 Jetstream 31 | 160/220 kt | 240/265 kt | 200/230 kt | 180/250 | L2T |
| JS41 | BAE 4100 Jetstream 41 | 160/220 kt | 250/280 kt | 200/240 kt | 180/280 | L2T |
| L410 | LET L-410/420 Turbolet | | 180/210 kt | | 160/240 | L2T |
| PC12 | Pilatus PC12 | | 200/250 kt | | 220/290 | L1T |
| RJ1H | BAE/Avro RJ-100 Avroliner | 220/260 kt | M0.68/0.71 | 230/290 kt | 240/290 | L4J |
| RJ70 | BAE/Avro RJ-70 Avroliner | 220/260 kt | M0.68/0.71 | 230/290 kt | 240/290 | L4J |
| RJ85 | BAE/Avro RJ-85 Avroliner | 220/260 kt | M0.68/0.71 | 230/290 kt | 240/290 | L4J |
| SB20 | Saab 2000 | 160/180 kt | 230/290 kt | 200/260 kt | 240/310 | L2T |
| SF34 | Saab Fairchild 340 A/B | 160/180 kt | 230/270 kt | 200/260 kt | 200/250 | L2T |
| SW3 | Fairchild/Swearingen Merlin III | 180/220 kt | 250/300 kt | 200/250 | 210/270 | L2T |
| SW4 | Fairchild/Swearingen Metro IV | 180/220 kt | 250/280 kt | 200/250 | 210/270 | L2T |
| YK40 | Yakovlev 40 | 230/280 kt | M0.72/0.76 | 250/280 kt | 250/290 | L3J |
| YK42 | Yakovlev 42 | 240/280 kt | M0.74/0.77 | 250/280 kt | 250/330 | L3J |

# 23.5. 4. Business Aircraft ("BizJets")

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| ASTR | IAI 1125 Astra SPX | 260/300 kt | M0.74/0.80 | 250/320 kt | 350/430 | L2J |
| A319 | Airbus 319 Corporate Jetliner | 280/320 kt | M0.78/0.82 | 250/320 kt | 330/410 | L2J |
| B190 | Beechcraft 1900C | 180/220 kt | 230/270 kt | 200/250 kt | 180/250 | L2T |
| B350 | Beech/Raytheon B300 Super King Air 350 | 180/220 kt | 250/315 kt | 200/270 kt | 220/280 | L2T |
| B737 | Boeing Business Jet BBJ1 | 280/310 kt | M0.78/0.81 | 250/320 kt | 330/410 | L2J |
| BE9L | Beech 90, A90 to E90 King Air | 160/180 kt | 210/265 kt | 200/250 kt | 220/270 | L2T |
| BE9T | Beech F90 King Air | 160/180 kt | 210/265 kt | 200/250 kt | 220/270 | L2T |
| BE10 | Beech 100 King Air | 160/180 kt | 210/265 kt | 200/250 kt | 220/270 | L2T |
| BE20 | Beech 200 Super King Air | 180/220 kt | 250/290 kt | 200/250 kt | 220/280 | L2T |
| BE30 | Beech 300 Super King Air | 180/220 kt | 250/315 kt | 200/270 kt | 220/280 | L2T |
| BE40 | Beech 400 BeechJet | 260/320 kt | M0.74/0.79 | 250/340 kt | 350/430 | L2J |
| C25A | Cessna 525A Citation CJ2 | 220/250 kt | M0.68/0.72 | 230/280 kt | 310/390 | L2J |
| C500 | Cessna 500 Citation, Citation I | 220/250 kt | M0.66/0.71 | 230/280 kt | 310/390 | L2J |
| C501 | Cessna 501 Citation I SP | 220/250 kt | M0.66/0.71 | 230/280 kt | 310/390 | L2J |
| C525 | Cessna 525 CitationJet, Citation CJ1 | 220/250 kt | M0.68/0.72 | 230/280 kt | 310/390 | L2J |
| C526 | Cessna CitationJet | 220/250 kt | M0.68/0.72 | 230/280 kt | 310/390 | L2J |
| C550 | Cessna 550,S550, 552 Citation II/SII/Bravo | 220/250 kt | M0.66/0.71 | 230/280 kt | 350/410 | L2J |
| C551 | Cessna 551 Citation II SP | 220/250 kt | M0.66/0.71 | 230/280 kt | 350/410 | L2J |
| C560 | Cessna 560 Citation V/V Ultra/V Ultra Encore | 220/270 kt | M0.72/0.75 | 230/280 kt | 350/430 | L2J |
| C56X | Cessna 561XL Citation Excel | 220/270 kt | M0.72/0.75 | 230/280 kt | 350/430 | L2J |
| C650 | Cessna 650 Citation III/VI/VII | 260/290 kt | M0.76/0.81 | 250/320 kt | 390/490 | L2J |
| C680 | Cessna 680 Citation Sovereign | 260/290 kt | M0.76/0.82 | 250/320 kt | 390/490 | L2J |
| C750 | Cessna 750 Citation X | 270/310 kt | M0.84/0.92 | 250/330 kt | 390/490 | L2J |

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| CL60 | Canadair 600/601/604 Challenger | 260/320 kt | M0.77/0.82 | 250/340 kt | 310/390 | L2J |
| E135 | Embraer Legacy | 260/310 kt | M0.76/0.78 | 250/320 kt | 330/770 | L2J |
| F2TH | Dassault Falcon 2000 | 260/320 kt | M0.81/0.83 | 250/340 kt | 390/470 | L2J |
| F900 | Dassault Falcon 900/B/C/EX | 260/320 kt | M0.77/0.82 | 250/340 kt | 390/490 | L3J |
| FA 10 | Dassault Falcon 10/100 | 260/300 kt | M0.76/0.80 | 250/340 kt | 350/410 | L2J |
| FA20 | Dassault Falcon 20/200 | 260/290 kt | M0.76/0.80 | 250/320 kt | 390/430 | L2J |
| FA50 | Dassault Falcon 50/50EX | 260/320 kt | M0.77/0.82 | 250/340 kt | 390/490 | L3J |
| GALX | IAI 1126 Galaxy | 260/320 kt | M0.75/0.80 | 250/320 kt | 350/430 | L2J |
| GLEX | Bombardier Global Express | 260/320 kt | M0.85/0.88 | 250/320 kt | 390/450 | L2J |
| GLF2 | Gulfstream II/IIB/IISP (C20J) | 260/320 kt | M0.77/0.82 | 250/340 kt | 350/430 | L2J |
| GLF3 | Gulfstream III | 260/320 kt | M0.77/0.82 | 250/340 kt | 350/430 | L2J |
| GLF4 | Gulfstream IV/IVSP | 260/320 kt | M0.78/0.83 | 250/340 kt | 350/430 | L2J |
| GLF5 | Gulfstream V (C37) | 260/320 kt | M0.80/0.85 | 250/340 kt | 390/490 | L2J |
| H25A | Hawker Siddeley 125-400/600 | 260/290 kt | M0.73/0.76 | 250/320 kt | 310/390 | L2J |
| H25B | BAe 125-700/-800 (C29) Raytheon Hawker 800 | 260/290 kt | M0.74/0.80 | 250/320 kt | 350/410 | L2J |
| H25C | BAe 125-1000 Raytheon Hawker 1000 | 260/290 kt | M0.76/0.80 | 250/320 kt | 350/410 | L2J |
| HRZN | Raytheon Hawker Horizon | 260/290 kt | M0.73/0.76 | 250/320 kt | 310/390 | L2J |
| J328 | Fairchild Dornier Envoy 3 | 180/220 kt | 250/330 kt | 200/270 kt | 240/290 | L2J |
| J428 | Fairchild Dornier Envoy 4 | 180/220 kt | 250/330 kt | 200/270 kt | 240/290 | L2J |
| J728 | Fairchild Dornier Envoy 7 | 180/220 kt | 250/330 kt | 200/270 kt | 240/290 | L2J |
| L29A | Lockheed 1329 Jetstar 6/8 | 260/290 kt | M0.71/0.74 | 250/320 kt | 330/370 | L4J |
| L29B | Lockheed 1329 Jetstar 2/731 | 260/290 kt | M0.74/0.76 | 250/320 kt | 330/370 | L4J |
| LJ24 | Lear Jet/Gates Lear 24 | 260/300 kt | M0.76/0.79 | 250/340 kt | 370/490 | L2J |
| LJ25 | Lear Jet/Gates Lear 25 | 260/300 kt | M0.76/0.79 | 250/340 kt | 370/490 | L2J |
| LJ31 | Gates Lear/Learjet 31 | 260/320 kt | M0.77/0.80 | 250/340 kt | 410/490 | L2J |
| LJ35 | Gates Lear/Learjet 35/36 (C21) | 260/320 kt | M0.77/0.81 | 250/340 kt | 350/430 | L2J |

| ICAO CODE | DESIGNATION | CLIMB IAS | CRUISING SPEEDS | DESCENT IAS | CRUISING FL | POWER PLANT |
|---|---|---|---|---|---|---|
| LJ45 | Learjet 45 | 260/320 kt | M0.77/0.80 | 250/340 kt | 410/510 | L2J |
| LJ55 | Learjet 55 | 260/320 kt | M0.77/0.81 | 250/340 kt | 410/490 | L2J |
| LJ60 | Learjet 60 | 260/320 kt | M0.78/0.81 | 250/340 kt | 410/490 | L2J |
| P180 | Piaggio Avanti | | 260/340 kt | | 260/390 | L2T |
| PC12 | Pilatus PC12 Eagle | | 200/250 kt | | 220/290 | L1T |
| PRM1 | Raytheon 390 Premier I | | | | | L2J |
| SBR1 | North American/Rockwell Sabreliner 40/50/60/65 | 260/300 kt | M0.74/0.76 | 250/320 kt | 310/390 | L2J |
| SBR2 | North American/Rockwell Sabreliner 75/80 | 260/300 kt | M0.74/0.76 | 250/320 kt | 310/390 | L2J |
| SJ30 | Sino Swearingen SJ30-2 | 260/300 kt | M0.74/0.79 | 250/300 kt | 370/490 | L2J |
| STAR | Beech/Raytheon 2000 Starship | 240/280 kt | 290/335 kt | 250/290 kt | 280/350 | L2T |
| TBM7 | Socata TBM 700 | 180/210 kt | 230/270 kt | 200/230 kt | 240/290 | L1T |

## 23.5.5 ICAO Designators For Military Aircraft And Their Civilian Equivalents

| ICAO CODE | MILITARY DESIGNATION | CIVILIAN EQUIVALENT |
|---|---|---|
| ATLA | Dassault/Dornier Atlantic II/II NG | N/A |
| C12 | Beechcraft 200 Super King Air | BEECHCRAFT 200 SUPER KING AIR |
| C12J | Beechcraft 1900C | BEECHCRAFT 1900C |
| C130 | LOCKHEED HERCULES | L382 COMMERCIAL HERCULES |
| C135 | BOEING C135B STRATOLIFTER | BOEING 707 |
| C141 | LOCKHEED STARLIFTER | N/A |
| C160 | TRANSALL | N/A |
| C17A | BOEING C17A GLOBEMASTER III | N/A |
| C2 | GRUMMAN C-2 GREYHOUND | N/A |
| C20A | GULFSTREAM C20A | GULFSTREAM III |
| C20F | GULFSTREAM C20F | GULFSTREAM IV/IVSP |
| C20J | GULFSTREAM C20J | GULFSTREAM II/IISP |
| C21 | LEARJET C21 | LEARJET 35A/36A |
| C22 | BOEING 727-100/-200 | BOEING 727-100/-200 |
| C23 | SHORTS BROS. SHERPA | SHORTS BROS. 330 |
| C27 | AERITALIA C27 SPARTAN | AY22 OR G222 |
| C29 | BAE 125-700/-800 | BAE 125-700/-800 |
| C32A | BOEING 757-200 | BOEING 757-200 |
| C37 | GULFSTREAM C37 | GULFSTREAM V |
| C5A | LOCKHEED GALAXY | N/A |
| C9 | MC DONNELL DOUGLAS DC9 SKYTRAIN | DC9-30 |
| CT43 | BOEING CT43 | BOEING 737-200 |
| E-3 | BOEING E-3A/B/C SENTRY AWACS | N/A |
| E-4 | BOEING 747-200 US PRESIDENT | N/A |
| K35A | BOEING KC135A TANKER (J57 ENGINES) | BOEING 707 |
| K35R | BOEING KC135R TANKER (CFM 56 ENGINES) | BOEING 707 |
| KC10 | MC DONNELL DOUGLAS KC10 TANKER | MC DONNELL DOUGLAS DC10-30 |
| NIM | BAE NIMROD | N/A |
| P3C | LOCKHEED P3C ORION | N/A |
| T1A | BEECHCRAFT JAYHAWK | BEECH JET 400A |
| T19 | CASA NURTANIO T19 | CASA NURTANIO 235 |
| T47 | CESSNA T47 | CESSNA CITATION 550/552/BRAVO |
| VC10 | BAE VICKERS VC10 | all civilian versions retired from service |