



UAV MQ-9 Reaper

Photo: Senior Airman Daniel Snider

AERO

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2020

PURCHASE GUIDE

JETS, TURBOPROPS
AND HELICOPTERS

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BETWEEN THE PAST AND THE FUTURE

EDITORIAL

2020 is the last year of the second decade of the third millennium. It certainly is the termination of a cycle that will be remembered by historians of the future. For the aviation it has an unquestionable historic value. It marks a period of search for higher operating efficiency. Remotorized models developed by the leading world's aeronautical manufacturers reflect this trend.

It is the case of the triple seven, an icon in the international air transport. We highlight the first flight of the new version and we show the changes of the Boeing folding wings as well as the prospects of the certification of the 777-9 and the 777-8.

One more of these aircrafts, also from Boeing, is the 737 MAX, which has an even more symbolic signification. It is a project from the 1960s that incorporates technological solutions of the 21st century. By coincidence or not, such advances may have contributed to the two fatal errors that have put the centennial manufacturer on the biggest crisis of its history, In this edition we ask the following question: which is the future of the MAX, and of the aeronautical certifications?

Efficiency issue is the focus of the environmental debate. Activists have hit the headlines of big international publications in late 2019 when were involved in "anti-aircraft movements. The general director and CEO of the IATA, an association that gathers the world's leading airlines, replied. "The enemy is not the flight, but the carbon, and we are working to reduce its emission", has said Alexandre de Juniac,

Also in this edition, our traditional purchase guide with aircraft prices and models, updated for 2020. They are jets, turboprops and helicopters for different needs and conditions. As complement to the guide, we have prepared a special article with guidelines about how to assemble a team of specialists to purchase and sell an aircraft.

Finally, we have an attractive matter with hints about hotels for who is interested in hosting in an aircraft, a report on the aircraft involved in the recent US attack to an Iranian military leader, and the coverage of the Heli-Expo, the world's largest helicopter fair.

Have a good flight.

Giuliano Agmont and Christian Burgos

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TRAGIC MISTAKES

The accident with Ukraine International Airlines Flight PS752 has generated world shock, especially after Iran's government has assumed that its anti aircraft defense system has downed the Boeing 737-800 that took off from Tehran, killing all 173 people on board, due to a human error. Once again, a tragedy has reminded the authorities the need to implement stricter proto-

cols to ensure safety of civil aircrafts flying over areas in dispute or under conflict. This was not the first case of a civil aircraft being destroyed by mistake or from deliberate action by military forces. In the last five decades alone, at least eight cases of allegedly non-intentional shooting down of large-sized commercial aircrafts have occurred. Remember some of the previous cases.

JULY 17, 2014

>>> Victims: 298

Malaysia Airlines Flight MH17 was on route from Amsterdam, in the Netherlands, to Kuala Lumpur. When crossing Ukraine's air space, flying at 33,000 feet (10,060 meters), the Boeing 777-200ER was disintegrated in flight by a powerful Buk9M – a Russian-made anti-aircraft missile. At that time, pro-Russian separatist force was facing the Ukrainian government in the region, but no one has assumed the responsibility for the tragedy. Russians, Ukrainians and rebels have mutually accused themselves, since both countries had this weapon and there are evidences that the separatists had at least one movable battery with these missiles. Even now there are conflicting versions about the event.

OCTOBER 4, 2001

>>> Victims: 78

Russia and Ukraine were performing joint military exercises in the coastal region of Crimea peninsula when a anti aircraft missile – accidentally shot by the Ukrainian forces – has engaged and destroyed a commercial Tupolev Tu-154. The three-engine aircraft was making the flight 1812 of Siberia Airlines between Tel Aviv and Novosibirsk, with 66 passengers on board. They were, mostly, Israeli Jews travelling to visit relatives in Russia.

APRIL 20, 1979

>>> Victims: 2

Flying at night, a Korean Air Lines Boeing 707-300 was on the last leg of Flight 902 Paris-Anchorage-Seoul. Shortly after take off from a fuel stop at Anchorage, Alaska, the aircraft flew over the North Magnetic Pole and veered off course. It crossed over the polar icecap and the Barents Sea, entering Soviet airspace in the northern extreme of the Soviet Union, close to the Norwegian frontier. Intercepted by Sukhoi-Su-15 fighters, the aircraft was hit by several gunshots and by an air-to-air missile, which damaged one of the wings and the fuselage. Surprisingly, the crew was able to make a successful emergency landing on a frozen lake, but two passengers died in the attack.

JULY 3, 1988

>>> Victims: 290

During the Iran-Iraq War (1980-1988), the US maintained a naval force patrolling the Persian Gulf. An Iran Air Airbus A300 took off from Bandar Abbas airport to Dubai, in the Arab Emirates. The crew of the American cruiser USS Vincennes, which was irregularly located inside Iranian territorial waters in the Gulf of Ormuz, detected the aircraft and allegedly committed a catastrophic mistake by confusing it with an Iranian Grumman F-14 fighter. Hit by a surface-air RIM-66 SM-2, the Airbus disintegrated in the air. The black boxes were never found.

MARCH 23, 2007

>>> Victims: 11

During the Battle of Mogadishu, in Somalia, an Islamic militia would have hit a Belarusian airline TransAVIAexport IlyushinIl-76. Few minutes after takeoff, pilots requested a return to the Mogadishu International Airport due to technical problems. Ready for landing, already at low

altitude, the cargo aircraft was hit in the wing by a Russian-made 9K38 Igla portable missile. Among the eleven victims there were Belarusian engineers that have gone to Somalia to repair another identical aircraft, which has also been hit some weeks before by anti-aircraft fire.

MARCH 3, 1942

>>> Victims: 4

The Royal Dutch Indies Airways Douglas DC-3 was attacked by Japanese Imperial Navy aircraft, while flying over Carnot Bay region, in Australia. The aircraft was transporting eight passengers and nearly US\$ 20 million (updated value) in diamonds that were lost. Out of twelve occupants, eight have survived, including four passengers.



JUNE 14, 1940

>>> Victims: 9

A Junkers Ju-52/3m named Kaleva, flying for the Finn Aero Y/O airline, was shot down by two Soviet Ilyushin DB-3 bombers soon after took off from Estonia to Finland. It was the first case of a commercial aircraft hit in the shadows of the World War II battles, and occurred during a brief cease-fire between the so-called "Winter War" (Soviet-Finn War) and Estonia invasion by the Soviet Union. The reason for this attack was never cleared up.

FEBRUARY 21, 1973

>>> Victims: 108

In the eve of the Yom Kippur War, tension between Egypt and Israel was rapidly increasing. A Libyan Arab Airlines Boeing 727-200 took off from Benghazi, in Libya, to Cairo but the pilots lost orientation and began to fly over the Sinai Peninsula (then military occupied by Israel). Intercepted by two F-4 Phantom II fighters, the Boeing crew did not obey the order to land. The Israeli fighter pilots were authorized to shoot down the aircraft, which was considered hostile. With the aircraft severely damaged, the crew still attempted an emergency landing on the desert. Out of the 113 occupants, only five have survived, including the copilot.

JUNE 30, 1962

>>> Victims: 84

Aeroflot Flight 902 took off from Khabarovsk to Moscow, using a Tupolev Tu-104, the first successful Soviet passenger jet in service. The aircraft was flying in cloudy weather over Beryozovsky region when, after emitting a confused emergency call, it crashed on the ground, killing all aboard. Officially, the aircraft underwent a mechanical failure and stalled. Damages found in the fuselage wreckage suggest that it has caught fire after being hit by a missile, and it is known that military exercises are ongoing in the region. Moscow does not deny or confirm the downing of the plane.

AUGUST 24, 1938

>>> Victims: 15

It is considered the first commercial aircraft hit by mistake: a twin-engine Douglas DC-2 named Kweilin – operated by China National Aviation Corporation and Pan American Airways – was forced by Japanese fighters to make an emergency landing on a river near Hong-Kong, during the Second Sino-Japanese War (1937-1945). In spite of a successful landing, only the pilot and two of the passengers survived. The purpose of the attack was to murder a son of the Chinese president that was supposed to be in the plane. But the Japanese government never admitted involvement.

JULY 27, 1955

>>> Victims: 58

A Lockheed L-149 Constellation, operated by the newly founded El Al Israeli airline, was making Flight 402 from London to Tel Aviv, with stops in Vienna and Istanbul. By mistake, the four-engine aircraft penetrated into the interior of the Bulgarian air space, at that time part of the Soviet bloc. The Israeli pilots did not obey the orders for landing, and the aircraft was shot down by two MiG-15.

JUNE 1, 1943

>>> Victims: 17

During World War II, a Dutch KLM Douglas DC-3 was making BOAC Flight 777 from Lisbon to Bristol, when it was shot down by eight German Junkers Ju 88 fighter-bombers while flying over the Bay of Biscay. The attack was made by mistake.

SEPTEMBER 1, 1983

>>> Victims: 269

Five years later, Flight 902 luck was not repeated. Korean Air Lines Flight 007 was at New York-Seoul route, with a fuel stop in Anchorage. After took off for the last route leg, a navigation error made the Boeing 747-200 fly with a deviation of a few degrees to the west, progressively moving away from the flight-planned course line. During dawn, the aircraft inadvertently flew

through Soviet prohibited airspace two times, being confused with an American spy aircraft that has been detected some days before in a similar path. The Jumbo was flying west of the Sakhalin Islands, when was hit by an air-to-air missile fired by a Soviet Sukhoi Su-15 fighter. Uncontrolled, it crashed a few minutes later in the Okhotsk Sea, without survivors.

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BETWEEN ROTORS AND ROTARY WINGS

*The world's largest helicopter fair shows the industry
novelties and the market prospects*

BY | SHAILON IAN, FROM LAS VEGAS, SPECIAL FOR AERO MAGAZINE

There were over 700 exhibitors distributed in the convention center of Anaheim in the United States that has received at least 15,000 visitors from tens of countries. The 71st edition of the Heli-Expo, promoted by the largest association dedicated to rotary wings, the Helicopter Association International (HAI), has taken place on last January 28-30 and has shown the main novelties of the helicopter market. In addition to meeting together the world

trade in a unique place and offering free safety courses during the three days of the event.

The merger between two big operators – ERA and Bristow – was one of the commented subjects in the fair corridors, as well as the tragic accident that has killed the American basketball star Kobe Bryant. In view of the retraction of orders from the oil and gas industry, the main sale announcements have involved aeromedical rescue operators, with a big order announced by Airbus.



LEONARDO Y KOPTER

Leonardo announces
the purchase of Kopter
for US\$ 185 million

Leonardo's stand showed its main products. The high point of his participation was the announcement, just in the first day of the fair, of the acquisition of the Swiss Kopter for 185 million dollars. The purchase may represent a good solution for both sides, since Leonardo adds a competitive single-engine aircraft to its aircraft line, while Kopter has access to Leonardo's manufacturing and development expertise.

Near there, in its stand, Kopter was showing the SH09 model. The certification process is at its final stage and the helicopter already has over 60 orders. The acquisition by Leonardo was seen as beneficial and the company is expected to continue working with the independence and speediness of a startup. One more novelty of Leonardo, only confirmed after the fair is the construction of a maintenance center in Brazil, in the city of Itapevi, metropolitan region of Sao Paulo.



SIKORSKY

The American manufacturer has shown in the fair its main products. The S92B was highlighted, which incorporates modifications in the flight computer and in the gear box now made in aluminum. According to Sikorsky, the changes improve its reliability and availability,

in addition to including the Matrix Advanced Flight Computing hardware, which allows the use of advanced systems, such as that of search and rescue. The new gear box can fly for up to 500 kilometers at 80 knots without lubrication, an important advance in safety.



BELL

The Textron Group's company has brought the last update of the VTOL air taxi NEXUS, which is being modified and adapted as the project stages are being completed. The stand also had a Bell 525, still in certification process and without orders confirmed by the industry. The new helicopter, that incorporates a mix of technologies

under development with already existing resources, is not expected before late 2020. Moreover, a series of regulatory issues still need to be solved before a vehicle of this size could commercially operate, and Bell has said that it is already working jointly with the authorities in this sense



AIRBUS HELICOPTERS

The European consortium had various of its products in exhibition, especially the H145 with five blades. During the event, Airbus has announced 38 orders and 20 retrofits of

the H145. Alone, the German aeromedical rescue operator DRF Luftrettung, has ordered 15 H145, models. Becoming the world's largest operator of this helicopter.





FUTURO

The market has established at a new level after the oil and gas boom. Manufacturers seem to have adjusted their production capacity and the pace of new launchings to the new reality.

The development of electric and autonomous vehicles of vertical landing and takeoff (eVTOL) seems to more and more catch the industry attention, attracting players such as Embraer, which has sent representatives to study

the industry. In the same way, there was a Robinson 44 in exhibition modified by a workshop to operate with one electric motor. These are small steps indicating more electrical and autonomous future for the rotary wings.

Next year the fair will be in March, in New Orleans. It is expected that the market will maintain the current level of heating, with the possibility of the oil and gas sector resuming its vigor. 

YOUR DREAM TEAM

*The essential professionals for who does not want to
lose the sleep during an aircraft transaction*

BY | DAVID CLARK*, SPECIAL FOR AERO MAGAZINE



In 1992, during Barcelona Olympic Games, devastated from the defeat to the Soviet Union four years before, the United States have assembled the world's best talent collection, and have won a male basketball gold medal after a splendid exhibition. By getting an average advantage of 44 points per game, the American team has come to be known as the "dream team", with Michael Jordan, Magic Johnson, Larry Bird and Charles Barkley. The

event teaches us that, if we are willing to win without risks, we have to assemble the talents in our team. The same is valid for private aircraft transactions, which means, when it comes to purchase or sell an aircraft or a helicopter. Therefore, make sure you have the best possible brilliant team by your side. Otherwise, you will risk yourself. Just to help you, we have here prepared a list of essential "players" to be searched before venturing yourselves in the market.

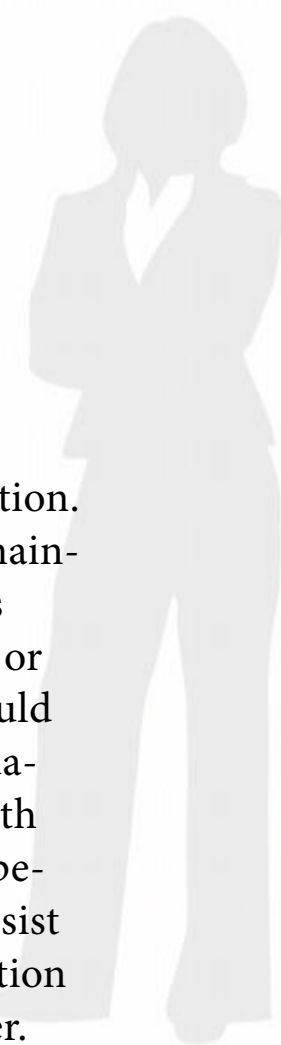
1 AIRCRAFT BROKER

An excellent broker does not only have good relations with hundreds of quality contacts, but also has wide experience in transactions of this nature. Definitively, he is no amateur. He is an exclusive dedication professional that knows how to manage a complex project with many variables. The broker must work for you – and only for you! –, without interest conflicts or being

given commissions from both sides. To prevent this, hire a broker that works exclusively for you, without accepting other conditions. Believe me, when the same broker works for both seller and purchaser, there is the risk of a disastrous transaction. When it comes to purchase or sell an aircraft, the only way to ensure broker loyalty, is by means of a loyalty contract, exclusive for rendering this service.

2 AERONAUTICAL LAWYER

Many times, purchasers and sellers try to save money by using their own lawyer or a "brother in law" that practices law as casual extra activity. Only a lawyer specialized in Aeronautical Law is updated with aviation-related legislation in Brazil and abroad. And, if he has no the right answer for a give issue, he will know how to look for the information. These professionals live and breathe laws related to the aeronautical world. They participate in conferences, every year they are given continued formation credits, write articles and books, and integrate specialized commissions. Latin America has excellent aviation lawyers, take advantage of this. You will never win your gold medal if you do not have an aeronautical layer in your "dream team". He is an essential figure to protect you.



3 SPECIALIZED TECHNICIAN

It is surprising how many owners send their pilots to supervise an acquisition or sale in service centers abroad. This is not good for the pilot, not even for the purchaser or seller. I have nothing against pilots – I am one of them and proudly. But, honestly, most of us simply do not have the expertise to represent the customer's interests during a complex pre-purchase inspection. This is why you should have in your team a specialized technician that

knows the model in question. Perhaps, not even your maintenance manager has this expertise, facing cultural or language barriers that could impair an unbiased evaluation. This is why it is worth to hire an independent specialized technician to assist you in the sale or acquisition of an aircraft or helicopter. Any other thing tends to become a recipe for failure – and I have seen many of them! Get the best technician in your dream team and you will never regret it.

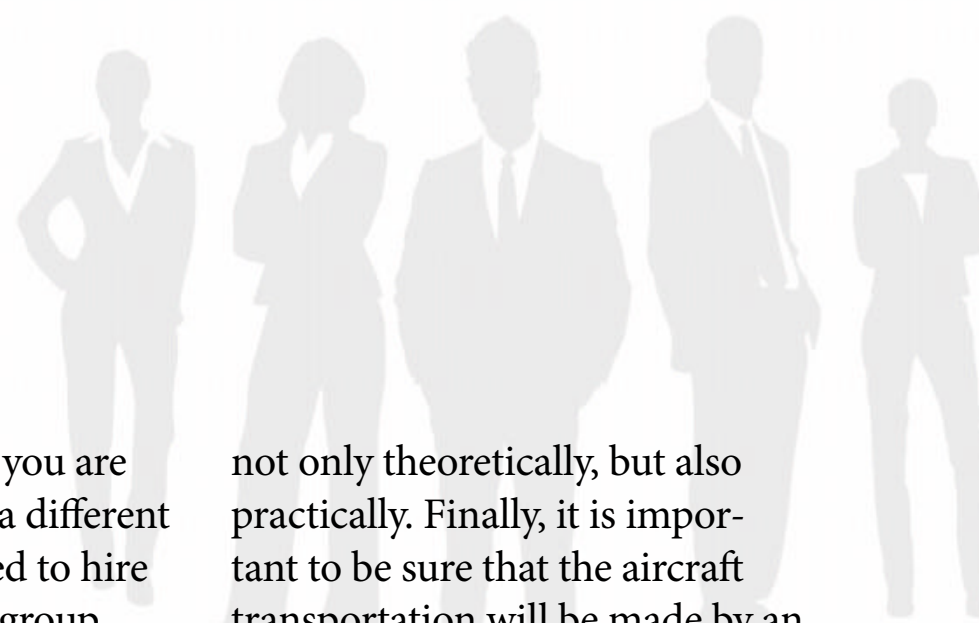
5 IMPORT & EXPORT SPECIALIST

This is another important player in your dream team – the import & export specialist. There are some of these companies in different countries of Latin America with a very specific knowledge to send and bring an aircraft from abroad. Be sure that their know-how also valid for the United States. If an aircraft has been introduced in the US without being properly declared, the seller or the purchaser may be subject to thousands of dollars in fines, including the aircraft seizure. Even an aircraft travelling to USA, just for a routine maintenance, if it is not properly declared, may be fined if the repair or installations work “adds value” to the aircraft. It is crucial to have this specialist in your team. Without his knowledge, the risk is very high and the cost of solving eventual problems may quickly rise to tens or even hundreds of thousand dollars.

4 TRADING

As you may know, Brazil is not a duty-free country, and aircrafts are not an exception. But, when it comes to purchase a plane, you may obtain a significant tax reduction in the import by using aviation specialized trading company. There are not only big cost savings, but their expertise could be essential in the transaction. Trading companies are obliged to purchase the aircraft

with their own funds before transferring the property title to the purchaser, so they will ensure to do everything in the right way. This is a good “filter” for the purchaser – because it ensures that all the laws, procedures and inspections were complied with before you take possession. As using a trading company is very easy. Finally, you get a transaction without worries and for less money.



6

OTHERS

A transaction team may also include the escrow account, who offers guarantees during the financial transaction to the administrating company, its financer and its insurance

company. Moreover, if you are making an upgrade to a different aircraft model, you need to hire an “entry into service” group that will ensure that pilots and technician are fully aware about how the new aircraft operates,

not only theoretically, but also practically. Finally, it is important to be sure that the aircraft transportation will be made by an experienced professional, mainly when the mission requires many legs and flights in hostile regions.



Your dream team is there to protect you, therefore, assemble it with care. Begin with a professional aircraft broker that can recommend the best professionals to be hired in the other areas. Prevention is the best antidote against transaction errors, and although money can solve most of the problems, nobody wants to have them. With a history of over 60 years in priva-

te aviation, since the first models, today we know that having a team that exclusively works for the purchaser or seller is the best way to commercialize an aircraft or a helicopter. This model is between the “best industry practices”. Contrarily to the Olympic Games in its romantic phase, in aviation amateurism has no place. Have specialized professionals working

for you, each one in its area – a truly Dream Team – and sleep well without worries. ✈️

**David Clark, an aviation consultant, is general director of the Integris Aviation Group and specialized in aircraft sales and acquisitions in Brazil, working with some of the biggest enterprises and individuals with very high assets in the country.*

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PURCHASE GUIDE 2020

GENERAL INFORMATION

List prices: FOB prices of aircrafts are based in the basic value publicized by manufacturers and in market references.

Seats (pilot/passengers): The typical number specified in the columns is not the officially certified number by the aircraft. These numbers vary in accordance with the type of aircraft operation.

Weights: The maximum takeoff weight is specified during aircraft certifications. Fuel capacity is measured in gallons based on a factor of 6.7 pounds per gallon. Payload with full fuel is the useful fuel minus the used one.

Manufacturing (beginning/end): The year of the aircraft's first delivery until the year of the last delivery.

Technical support: Cássio Polli - Aérea Aviação Executiva

PERFORMANCE

Range of jets and turboprops: The maximum IFR range with all seats occupied.

Helicopter range: Maximum VFR range, with all seats occupied (all the helicopters).

Specific range: Distance that an aircraft is able to flight with a given useful quantity of fuel.

Cruising speed: It is the necessary speed to reach maximum flight range.

Operating ceiling: It is the maximum altitude an aircraft can reach.

For helicopters, it is the maximum certified for the operation.

JETS

Aircraft	US\$ (million)			Sittings		Height (max) lb	Range (nm)	Speed Cruise (kt)	Teto (ft)	Production	
	List	Used	Year	Pax (typical)	Pax (max)					Started	Ended
BOMBARDIER											
Challenger 300	24.8	13.0	2014	8	16	38.850	3.065	476	45.000	2004	2014
Challenger 350	26.6	20.0	2016	8	16	40.600	3.200	476	45.000	2014	-
Challenger 604	27.0	6.0	2017	10	19	48.200	3.756	488	41.000	1996	2007
Challenger 605	32.0	14.8	2015	10	19	48.200	3.756	488	41.000	2007	-
Challenger 650	32.5	24.0	2010	10	19	48.200	4.000	490	41.000	1996	-
Challenger 850ER	30.1	13.0	2015	15	19	53.000	2.456	459	41.000	1996	2012
Global 5000	50.4	36.0	2015	13	19	92.500	5.200	511	51.000	2004	-
Global 5500	46.0			14	19	92.500	5.700	504	51.000	2019	-
Global 6000	63.0	44.0	2018	13	17	99.500	5.890	511	51.000	2011	-
Global 6500	56.0			13	19	99.500	6.000	487	51.000	2019	-
Global 7500	73.0			13	19	114.800	7.700	530	51.000	2019	-
Global Express	43.0	11.0	2005	13	10	95.000	5.940	505	51.000	1999	2005
Global XRS	57.5	20.0	2012	13	19	98.000	6.055	511	51.000	2005	2012
Learjet 31A		1.0	2003	6	10	17.200	1.211	462	51.000	1991	2003
Learjet 40		1.7	2007	6	7	20.350	1.573	465	51.000	2003	2009
Learjet 40XR		3.0	2013	6	7	21.000	1.778	465	51.000	2005	-
Learjet 45		2.0	2007	8	9	20.500	1.423	465	51.000	1998	2007
Learjet 45XR		4.3	2012	8	9	21.500	1.685	465	51.000	1998	2012
Learjet 60		2.0	2005	7	10	23.500	2.186	465	51.000	1993	2007
Learjet 60XR		4.2	2013	7	10	23.500	2.044	465	51.000	2007	2013
Learjet 70	11.0	4.4	2014	7	10	21.500	2.060	465	51.000	2013	-
Learjet 75	14.0	10.0	2018	8	10	21.500	2.040	465	51.000	2013	-
CIRRUS											
VISION SF50	1.9			7	7	6.000	600	300	28.000	2016	-
DASSAULT											
Falcon 2000		7.0	2007	8	19	35.800	2.841	475	47.000	1995	2007
Falcon 2000 DX		11.5	2010	8	19	41.000	3.378	482	47.000	2007	2011
Falcon 2000EX		11.5	2008	8	19	42.200	3.878	482	47.000	2004	2009
Falcon 2000LX		17.0	2012	8	19	42.800	3.817	482	47.000	2007	2014
Falcon 2000LXS	36.0	30.5	2018	8	19	42.200	3.817	482	47.000	2013	-
Falcon 2000S	29.0	27.0	2018	8	N/A	41.000	3.613	482	47.000	2013	-
Falcon 50EX		5.0	2007	9	19	39.700	3.223	480	49.000	1997	2007

Falcon 7X



Falcon 2000S



Global 5500



Falcon 900LX



Aircraft	US\$ (million)			Sittings		Height (max) lb	Range (nm)	Speed Cruise (kt)	Teto (ft)	Production	
	List	Used	Year	Pax (typical)	Pax (max)					Started	Ended
Falcon 7X	54.0	42.0	2018	12	19	70.000	5.490	459	51.000	2007	-
Falcon 8X	60.0	55.0	2018	12	19	73.000	6.450	460	51.000	2016	-
Falcon 900B		5.0	2000	12	19	45.500	3.450	500	39.600	1986	2000
Falcon 900A		2.9	1991	12	19	45.500	3.450	466	51.000	1987	1999
Falcon 900DX		14.0	2010	12	19	46.700	4.100	482	51.000	2005	2011
Falcon 900EX		8.0	2003	12	19	48.300	4.500	420	51.000	1996	2003
Falcon 900LX	45.1	36.5	2018	12	19	49.000	4.800	482	51.000	2010	-
EMBRAER											
Legacy 450	16.0	15.5	2018	7	9	35.274	2.575	467	45.000	2015	-
Legacy 500	20.0	18.5	2018	8	12	38.360	3.125	462	45.000	2014	-
Legacy 600		12.9	2015	13	19	49.604	3.090	455	41.000	2006	2013
Legacy 650		8.9	2010	13	19	53.572	3.642	459	41.000	2010	2017
Legacy 650E	25.9	22.0	2018	13	19	53.572	3.900	459	41.000	2017	-
Lineage 1000		25.0	2013	13	19	120.152	4.237	470	41.000	2008	-
Lineage 1000E	53.9	45.0	2018	13	19	120.152	4.600	472	41.000	2008	-
Phenom 100		2.1	2013	5	6	10.472	926	390	41.000	2008	-
Phenom 100E	4.6	3.7	2017	5	6	10.472	1.178	405	41.000	2013	-
Phenom 300		8.0	2017	7	9	17.968	1.692	453	41.000	2009	-
Phenom 300E	9.6	8.5	2018	7	9	17.968	1.971	453	45.000	2017	-
Praetor 500	16.9			7	9	36.949	3.250	462	45.000	2018	-
Praetor 600	21.9			8	12	42.877	3.900	466	45.000	2018	-
GULFSTREAM											
GIV-SP		6.0	2002	13	19	74.600	3.880	476	45.000	1992	2002
GV		11.8	2001	13	19	90.500	6.250	508	51.000	1995	2002
G100		3.0	2006	7	9	24.650	2.550	474	45.000	2001	2006
G150		8.7	2016	7	8	26.100	2.760	470	45.000	2005	2017
G200		6.4	2011	8	10	35.450	3.130	470	45.000	1999	2011
G280	25.0	22.0	2018	8	10	36.600	3.387	482	45.000	2012	-
G300		5.0	2004	13	19	72.000	3.486	476	45.000	2003	2004
G350		12.0	2012	14	19	70.900	3.680	476	45.000	2005	2012
G400		6.0	2004	13	19	74.600	3.880	476	45.000	2003	2004
G450		24.0	2015	14	19	74.600	4.100	459	45.000	2005	2016
G500	48.5			18	19	79.600	5.200	516	45.000	2019	-
G550	61.5	44.7	2018	18	19	91.000	6.490	508	51.000	2003	-
G600	57.9			18	19	94.600	6.500	516	51.000	2019	-
G650	70.1	65.0	2018	18	19	99.600	7.000	516	51.000	2012	-
G700	75.0			13	19	107.600	7.500	516	51.000	2019	Em projeto

G600



G280



Praetor 600



Legacy 650



Phenom 300



G500



Aircraft	US\$ (million)			Sittings		Height (max) lb	Range (nm)	Speed Cruise (kt)	Teto (ft)	Production	
	List	Used	Year	Pax (typical)	Pax (max)					Started	Ended
HONDA											
HA-420	5.0	4.8	2018	5	6	10.600	1.223	420	43.000	2016	2018
HA-420 Elite	5.0			5	6	10.700	1.223	422	43.000	2018	-
PILATUS											
PC-24	9.0	8.4	2018	4	6	17.968	2.810	440	45.000	2017	-
TEXTRON AIRCRAFT											
Citation Bravo		1.8	2006	7	11	14.800	1.290	405	45.000	1997	2006
Citation CJ1		1.7	2006	5	6	10.600	775	381	41.000	2000	2005
Citation CJ1+		1.9	2005	5	6	10.700	895	389	41.000	2005	2011
Citation CJ2		2.8	2011	6	8	12.375	1.075	413	45.000	2000	2005
Citation CJ2+		4.4	2015	6	8	12.500	1.194	413	45.000	2005	2014
Citation CJ3		5.4	2015	6	8	13.870	1.374	417	45.000	2003	2014
Citation CJ3+	8.3	7.3	2018	7	9	12.750	2.040	416	45.000	2014	-
Citation CJ4	9.0	8.0	2018	7	9	17.110	1.667	454	45.000	2010	-
Citation Encore		2.2	2006	7	11	16.630	1.410	430	45.000	2000	2006
Citation Encore+		3.7	2009	7	11	16.830	1.494	430	45.000	2007	2009
Citation Excel		2.1	2004	7	12	20.000	1.449	433	45.000	1998	2004
Citation Latitude	16.6	15.1	2018	9	9	30.800	2.700	446	45.000	2015	-
Citation Longitue	25.8			9	12	39.500	3.500	476	45.000	2019	-
Citation Jet		1.2	1999	5	6	10.400	750	377	41.000	1993	1999
Citation M2	4.8	4.5	2018	5	7	10.700	1.550	404	41.000	2013	-
Citation Mustang		2.3	2017	4	5	8.645	718	340	41.000	2006	2017
Citation Sovereign		8.1	2013	9	12	30.300	2.620	459	43.000	2004	2013
Citation Sovereign+	18.0	16.5	2018	9	12	30.755	3.000	459	45.000	2013	-
Citation Ultra		1.1	1999	7	11	16.300	1.259	400	45.000	1994	1999
Citation VII		1.0	1995	7	13	23.000	1.693	452	43.000	1992	2000
Citation X		9.0	2012	8	12	36.100	2.890	525	51.000	1996	2012
Citation X+		19.8	2017	8	12	36.600	3.229	527	51.000	2013	2018
Citation XLS		4.1	2008	8	12	20.200	1.539	433	45.000	2004	2008
Citation XLS+	13.1	12.0	2018	8	12	20.200	1.528	440	45.000	2008	-
Beechjet 400A		0.9	2003	7	9	16.100	1.180	458	45.000	1990	2003
Hawker 4000		4.0	2012	8	14	39.500	3.283	489	45.000	2008	2012
Hawker 400XP		2.1	2010	8	9	16.300	1.180	450	45.000	2004	2010
Hawker 400 XPR				8	9	16.300	1.243	450	45.000	1994	2006
Hawker 750		3.5	2011	8	15	27.000	2.050	447	41.000	2008	2011
Hawker 800XP		1.8	2004	8	15	28.000	2.470	449	41.000	1995	2005
Hawker 800XPi		2.0	2005	8	15	28.000	2.470	449	41.000	2005	2006
Hawker 800XPR		2.0	2005	8	15	28.000	2.733	452	41.000	1995	2005
Hawker 850XP		3.0	2009	8	15	28.000	2.525	452	41.000	2006	2009
Hawker 900XP		5.4	2012	8	15	28.000	2.733	452	41.000	2007	2012
Premier I		1.1	2005	6	7	12.500	850	461	41.000	2001	2005
Premier IA		2.3	2012	6	7	12.500	850	461	41.000	2005	2012

HondaJet



Pilatus PC-24



Citation X+



Citation V



Citation Sovereign



TURBOPROPS

Aircraft	US\$ (million)			Sittings		Height (max) lb	Range (nm)	Speed Cruise (kt)	Teto (ft)	Production	
	List	Used	Year	Pax (typical)	Pax (max)					Started	Ended
DAHER											
TBM 700C2		1.3	2006	5	6	7.394	1.000	292	31.000	2003	2006
TBM 850		2.4	2013	5	6	7.394	1.102	320	31.000	2006	2014
TBM 900		3.2	2016	5	6	7.430	1.730	330	31.000	2014	2016
TBM 910	3.7	3.5	2018	5	6	7.394	1.730	330	31.000	2017	-
TBM 930	4.0	3.9	2018	5	6	7.394	1.730	330	31.000	2016	-
TBM 940	4.13	3.9	2018	5	6	7.394	1.730	330	31.000	2019	-
Kodiak 100	2.1	2.0	2018	5	9	7.255	524	180	25.000	2008	-
PIAGGIO											
Avanti P180		1.8	2005	6	9	11.550	980	390	37.000	1990	2005
Avanti P180 II	7.1			6	9	12.100	752	402	39.000	2006	-
PILATUS											
PC-12	2.9	2.6	2008	7	10	10.450	1.340	261	30.000	1995	2008
PC-12 NG	4.7	3.9	2018	7	10	10.450	1.309	280	30.000	2008	-
PIPER											
M600	2.9	2.3	2008	6	6	6.000	1.658	274	30.000	2016	-
M500	2.0	2.0	2018	6	6	5092	1.000	260	30.000	2015	-
Meridian PA-46TP	2.2	1.3	2015	5	5	5.092	489	267	30.000	1999	2014
TEXTRON AIRCRAFT											
208 Caravan	2.0	1.9	2018	9	13	8.000	325	186	25.000	1985	-
208B Grand Caravan		1.2	2008	9	13	8.217	529	184	25.000	1990	2013
208B Grand Caravan EX	2.5	2.0	2018	5	13	8.807	494	194	25.000	2013	-
Denali	4.8			4	11	0	1.600	285	31.000	2015	
King Air 250	6.2	5.0	2018	6	15	12.500	1.259	292	35.000	2011	-
King Air 350	6.1	2.8	2009	8	15	15.000	1.440	320	35.000	1990	2013
King Air 350ER		4.7	2012	8	15	16.500	1.878	303	35.000	2005	-
King Air 350i	7.4	6.5	2018	8	15	15.000	1.440	320	35.000	2009	-
King Air 350iER	7.3			8	15	16.500	2.271	303	33.000	2010	-
King Air B200	5.4	2.1	2012	6	15	12.500	1755	260	35.000	1981	2013
King Air B200GT	5.8	2.6	2011	6	15	13.420	960	284	35.000	2007	2011
King Air C90B	2.7	1.3	2005	5	12	10.485	640	250	30.000	1992	2005
King Air C90GT	2.9	1.5	2007	5	12	10.100	981	270	30.000	2006	2007
King Air C90GTi	3.3	1.7	2009	5	15	10.485	1.321	240	30.000	2007	2010
King Air C90GTx	3.7	3.5	2018	5	12	10.485	903	240	30.000	2010	-



Piaggio Avanti EVO



Kodiak 100



Pilatus PC-12



TBM 900



Piper M600



KingAir 350ER

Airbus H135



Bell 407



Leonardo AW169



Sikorsky S76D



HELICOPTERS

Aircraft	US\$ (million)			Sittings		Height (max) lb	Range (nm)	Speed Cruise (kt)	Production	
	List	Used	Year	Pax (typical)	Pax (max)				Started	Ended
AIRBUS HELICOPTERS										
AS 332L1 Super Puma		21.7	2011	12	19	18.960	406	141	1986	2011
AS 332L1e Super Puma	24.0			12	19	18.960	406	141	2011	-
AS 332L2 Super Puma		13.9	207	9	19	20.502	392	150	1993	2007
AS 350B2 - Esquilo		2.0	2012	4	6	4.960	312	133	1990	-
AS 350B3 (2B) - Esquilo		2.0	2012	4	6	4.960	300	137	1997	2008
AS 350B3 (2B1) - Esquilo		1.9	2012	4	6	5.225	300	137	2008	2011
AS 350B3e - Esquilo		2.3	2014	4	N/A	5.225	300	137	2011	-
AS 365N2 Dauphin		2.3	2001	6	14	9.369	420	151	1990	2001
AS 365N3 Dauphin		5.4	2011	6	14	9.480	354	152	1998	2010
AS 365N3+ Dauphin		10.0	2016	6	14	9.480	341	149	2011	-
H 120B		2.0	2017	4	9	3.780	240	125	1997	-
H 130 B4		2.2	2015	5	4	5.351	280	135	2000	2012
H 130 T2	3.0			5	7	5.512	268	130	2012	-
H 135P1		2.1	2003	5	7	6.250	254	140	1997	2004
H 135P2		5.2	2015	5	7	6.250	254	140	2004	2006
H 135P2+		4.6	2010	5	7	6.415	254	140	2006	2011
H 135P2E	5.0			5	7	6.504	278	137	2011	-
H135 T1		2.0	2003	5	7	5.984	262	141	1997	2004
H 135 T2		5.1	2015	5	7	6.250	262	140	2004	2006
H 135 T2+	4.8			5	7	6.415	254	140	2006	2011
H 135 T2e	5.1			5	7	6.504	256	137	2011	-
H 145		5.9	2014	8	9	7.904	274	133	2001	-
H 145 T2	9.6	5.5	2015	8	9	8.047	260	134	2013	-
H 155 B1		12.7	2015	6	14	10.692	373	151	2003	-
H 175	14.8			10	N/A	16.535	N/A	N/A	2012	-
H 225	24.9			12	N/A	24.250	354	152	2005	-
BELL										
206B3 - Jet Ranger		2.2	2010	3	9	3.200	270	118	1977	2010
206L4 - Long Ranger		1.0	2009	5	14	4.450	353	110	1993	-
407		2.1	2012	5	7	5.250	N/A	128	1996	-
429		6.5	2016	5	14	7.000	276	155	2009	-
430		2.2	2008	5	14	9.300	N/A	140	1996	2008
LEONARDO HELICOPTER										
AW109 Grand		4.1	2011	5	7	7.000	360	155	2005	2011
AW109 GrandNew	7.9			5	7	7.000	357	158	2010	-
AW109 Power		5.0	2014	5	7	6.614	260	154	1997	-
AW119 Koala		3.0	2006	5	7	5.997	N/A	140	2000	2006
AW119 KX	3.6			5	7	6.283	380	140	2013	-
AW139	11.9			8	15	14.110	460	165	2004	-
AW169	8.5	-	-	4	8	10.141	440	165	2015	-
AW189	26.0	-	-	17	19	18.298	617	155	2014	-
ROBINSON										
R22 Beta II	0.3			1	1	1.370	161	96	1997	-
R44 Raven I	0.45			3	3	2.400	204	113	2003	-
R44 Raven II	0.45			3	3	2.500	251	117	2003	-
R66 Turbine	0.81			3	4	2.700	260	N/A	2010	-
SIKORSKY										
S-300C	0.4			1	1	2.050	195	88	1970	-
S-300CBi	0.4			1	1	1.750	215	85	2005	-
S-76C++		8.1	2012	6	13	11.700	335	155	2006	2013
S-76D	14.1			6	13	11.700	329	160	2012	-
S-92	25.0			10	24	26.500	439	155	2002	-



THE 737'S FUTURE

*A crisis involving the most popular jet of all times
obliges Boeing to consider new strategies, also
launching a substitute before than expected*

BY | EDMUNDO UBIRATAN



Boeing's decision to stop production of the 737 MAX has occurred because it would be inviable for the firm to maintain active the assembly line of the new jet without a definite term to begin again commercial flights of the model. Even so, it is an unprecedented fact in the history of aeronautical industry. A sales record holder, very much appreciated by airlines, pilots and many passengers, loses the aura of impeccable aircraft to become an endless nightmare. But what does it mean? Would be the end of the legendary 737, the most popular aircraft of all times?

SUBSTITUTE

The pause in the production of the 737MAX, that accumulates over 4,500 orders, with at least 400 new aircrafts ready to be delivered to clients, has created a series of doubts regarding the future of the jet. Not only in relation to its commercial performance, but mainly the capacity of Boeing to honor all the orders. Specialists in the United States believe that the American manufacturer will be able to shorten the life of MAX version by beginning to work on a substitute much before than expected.

It was expected that the 737MAX family could be marketed for 15 or 20 years more, when its retirement would be justified. The issue is that, after the two accidents, the Federal Aviation Administration (FAA) is making an unparalleled close examination on the 737 project including the NG family, and Boeing's plans

may change - if they do not have already changed.

PROCESSES

Failure in an aircraft project is something fairly serious. But this has already happened and has not aroused so much attention and has not generated the controversy involving the 737MAX case. What has happened? Problems seem to have gone beyond an engineering error. The way how the old Boeing's top management has conducted the process could have been decisive for the current situation, which has become as much serious as uncontrollable. And the unthinkable has happened.

When the accident with Lion Air flight has fulfilled one year, in October 2019, the then CEO of Boeing Dennis Muilenburg was invited for a hearing at the US senate. With more political than judicial consequences, at least in a direct way, the committee has created an impasse for the company. In addition to impair the commercial future of the program, damages to 737 MAX image have created opportunities for lawyers around the world making legal indemnification claims against Boeing, an avalanche of them.

The crisis has caused the falling of Muilenburg, substituted by David L. Calhoun, after a temporary administration of Greg Smith. "The Administration Council has decided that a change of leadership was necessary to reestablish the confidence in the company, which was working to repair the relationship with regulators, clients and all the inte-

rested persons", stated Boeing in an announcement. In the day of the change of command announcement, Boeing shares has gone up and, in the following weeks, market optimism was confirmed. The new administration has shown to be more attentive in the process, proactively cooperating with the investigations and taking pragmatic decisions.

HISTORIC ERROR

In 2018, soon after Lion Air flight accident, still on the heat of the moment, the American manufacturer has shown to be fairly evasive in the way it has dealt with the situation. In the days following the catastrophe, already was distrust in relation with the angle of attack (AoA) sensor and some suspicion about the MCAS operation in some cases. At that time, however, Boeing has got to affirm the accident was possibly caused by piloting error, without direct connection with the AoA, the MCAS or any other technical failure.

Situation has begun to change when a 737 MAX of Ethiopian Airlines, considered one of the world's most safe airlines, has dived without control after takeoff and was involved in one more accident without survivors. The MCAS has come back to the debate, but this time, with strong evidences that there was something wrong in the system. Again, Boeing has tried to exempt itself from any responsibility "Perhaps this has been the greatest error in 100 years of existence", evaluates William Clark, analyst on an insurance company specialized in the

WITH THE ESCALATING CRISIS INVOLVING 737 MAX SYSTEMS, THE FAA WAS ACCUSED OF OMISSION IN THE CERTIFICATION PROCESS

aeronautical sector. "By deliberately hiding that it knew about MCAS failures, the executives have undermined all the confidence of the aeronautical community in Boeing and in the certification process".

INTERNAL MESSAGES

During the hearing at the Senate Commerce Committee, the issue was emphatically debated by senators, who have accused Boeing of omitting information. Among the themes treated in the hearing was the content of internal messages exchanged between Boeing's employees. They suggested the MCAS problems were known by the engineering area and most of the company command chain. Moreover, they implied that the FAA had not complete information about the system.

During the committee's opening meeting, Senator Maria Cantwell, from Washington, has characterized the process as a reduction in safety standards, and highlighted the need to reevaluate how automated systems are classified, which could also involve an audit made by third parties.

On the other hand, Senator Roger Wicker from Mississippi, who chairs the committee, has

objected about how the certification process of the 737 MAX was made and that Boeing has not considered internal messages, e-mail formalized, suggesting a serious failure in the MCAS. In one of the internal conversations, Mark Forkner, the main test pilot of 737 MAX program, has described problems found by him in the MCAS activation in a series of simulator flights. The pilot has also stated that, based on what he has previously observed, he has "without knowing" deceived the FAA.

"The statement that the engineering area has deceived the regulatory body is all that engineering would no like to happen", evaluates Clark. "Deceiving, consciously or not, is something very strong and criminal. And worst, the e-mail message leads to believe that, even after being advised about the problems, Boeing has opted for not letting know FAA and its clients about it."

MCAS

During the committee, Wicker has said the publicized messages reflected a disturbing level of casualness and insensateness and because of this, they seemed to corroborate the criticisms to Boeing and FAA. According to her, messages suggest that the manufacturer was informed that there were at least "exceptions" about the function of the MCAS. When questioned about the internal message exchange, Muilenburg has stated that he believed they were sent before the second accident.

"Boeing has come to my office soon after these accidents and has

said they were the result of pilot error", revealed Senator Richard Blumenthal. from Connecticut, while he was questioning Muilenburg about Boeing's internal processes, "These pilots never have had a chance. These beloved persons never have had a chance. They were in flying coffins as a result of Boeing's decision to hide the MCAS from the pilots".

"We do not blame the pilots. This is not the position of our company and It will never will be". replied the executive. However, in previous statements, Muilenburg has had said that pilots' actions would be a factor contributing to the accidents,

When questioning Muilenburg about why Boeing's top management has not done anything, even after an internal message raising concerns about MCAS operation, Blumenthal firmly stated that the accident was not only avoidable, but was the result of a deliberated occultation.

"We know we commit mistakes and we understand some things", replied Muilenburg. "We are solving this" Soon after the executive has admitted that, after the second accident, in Ethiopia, the company has known about relation between MCAS operation and the fatalities. "When the accident of Ethiopian Airlines still was under the investigation of Ethiopia's authorities, we have come to know that both accidents have involved the repeated activation of a flight control software, the so called MCAS, which has replied to wrong signals from a sensor that measures the aircraft angle of attack", admitted the executive.



When being questioned about why, even after the first accident, nobody at Boeing have raised concerns to prevent the second accident, Muilenburg has stated that if he would know everything he knew at the time of the hearing, "would have taken a different decision".

THE PILOTS

The MCAS operation issue was several times questioned during the hearing, as well as the fact of Boeing having omitted its operation and its existence to the pilots. "The original concept for the MCAS development was an extension of the speed adjusting system in the 737 NG", commented Muilenburg. "More information in the training





manuals is not necessarily safer". According to Senator Blumenthal, the MCAS is only mentioned once in the MAX manuals, only in the glossary. "Our approach is training pilots on the effects of a failure. And this is in the training manual. We train pilots to respond to the

effects of a failure, not to diagnose the cause", explained Muilenburg.

Boeing's approach is questioned even by veteran pilots, who consider that the system has serious failures and does not alert the pilots. "Every aircraft should have redundancies for a system acting in the command surface, something that the 737 MAX does not have", points out Rafael, 737 captain, who has preferred not revealing his surname. "It is necessary to have a contingency for each probable failure and training the pilots so they can identify and react according to the problem". The captain still maintains that identification could be by means of an announcement, made by an alarm or a signal. For him, the absence of any alert has made more difficult for the pilots reacting why the MCAS has inadvertently started to act. "In the case of this fai-

ture there was no announcement, which has made the reaction more delayed and fatal", says the pilot. The software based system existing in the 737 NG, where the Runaway Stabilizer Memory Items covered the MCAS failure, is considered effectless by several pilots.

Fault identification in the case of the 737 failure occurs by the electric trim, that begins to act uninterruptedly, which makes the pilot associating the failure identification to a constant trimming. In the case of the MCAS, data points out that trimming would occur intercalary, for only few seconds, thus making difficult immediate problem identification. "When a pilot delays to identify a failure cause, in a situation of high workload, for example at takeoff - like in the two accidents, the delay is potentially catastrophic", considers Fernando Oliveira, 737 pilot.



Senator Jacky Rosen, from Nevada, has remembered that the ANAC has considered MCAS change sufficiently great to be highlighted in training manuals of Brazilian pilots and has criticized the fact that this information was not given by Boeing to operators of other countries. When questioning the reasons why FAA and Boeing had not taken into consideration ANAC position, Muihlenburg replied: "It is this way the process should work".

FAA CERTIFICATION

With the escalating crisis involving 737 MAX systems, the FAA was accused of omission in the certification process and also in the regulation. The top management was substituted and the change analysis process in the aircraft project has suffered several delays. Moreover, documents published by the American

press reveal that Boeing had managed to change the way an agency acts in the certification process,

Traditionally, American authorities deliver to the responsible for the project a simplified documentation, in which the manufacturer assumes it has met all the existing rules. Even so, in the case of the FAA there was an active participation in several processes and project analyses, certification and complying with standards. The change in the rules, sponsored by Boeing has allowed manufacturers to assume more responsibilities in the process reducing bureaucracy and costs; But it has also allowed the industry to challenge a series of rules, especially of safety, when making the manufacturer responsible for its acts. In practice if a company affirms that it has met a rule, but the FAA considers this insufficient, the engineering will

just say that it will be responsible for future eventual problems.

An article from The New York Times, after interviewing regulators, executives of the sector, Congress employees and lobbyists, states that Boeing has assisted to develop the current legislation, molding the law language and overcoming the criticisms of regulators in accordance to its needs. At the time of the normal change, the FAA has affirmed that the process "would not be of the interest of safety" and that, at the end of the process, the agency would merely become a surety, stamping what is delivered without being able to veto several points; The Intervention power would occur only one year after the accident. The procedure has made American lawmakers to found out that the FAA had never completely analyzed the MCAS.



NEW PROBLEMS

"The problem is that now Boeing has two accidents in its account and the FAA has power to veto everything it considers incorrect" says the analyst Willian Clark. "Witch-hunt has been opened", Since flights prohibition, the FAA had begun a highly detailed review of 737MAX project, extending the evaluation to the Next Generation series.

During the recertificaron process audit of the 737 MAX, Boeing has found problems in the aircraft wiring. The original project has put very close two wiring harnesses of the control system for the control surfaces in the stabilizer, which, in case of an overload,

could generate a short circuit. The FAA has demanded full tests to evaluate fire risk, which, in case, of resulting positive, would oblige Boeing to review the wiring of the nearly 800 737 MAX already constructed.

Another recent problem was a defect in the slat rails, which has affected (upon the closure of this edition) 178 set of rails, installed in the 737 MAX and other 133 systems flying in the 737 NG. In an announcement, the FAA has reported to have found the problem in 311 assemblies of the 737 family and that, in case of a potential breakage could affect flight safety. The agency has highlighted that is shall apply a penalty to Boeing, because the manufacturer has informed that the involved aircrafts were under perfect flight conditions.

One more aggravating circumstance, according to FAA, Is that Boeing has not ensured that the parts delivered by its suppliers met the demanded technical criteria. The penalty applied to the MAX was US\$ 5.4 million and to NG reached up to 3.9 million.

A third serious case was announced by Boeing itself, which has provided the US Congress with text messages of its employees criticizing the certification process of the 737 MAX conducted by Boeing and sealed by the FAA. Pilots refer to failures in flight simulators. "This aircraft [the 737 MAX] was designed by clowns, who in turn, are supervised by monkeys", says an internal message exchanged by employees in 2017, one year before the accident with Lion Air flight. At that time, Boeing has stated to have



publicized all the messages due to its commitment to transparency in the recertification process of the 737 MAX.

RECERTIFICATION

Analysts evaluate that the FAA will carry out a complete reevaluation of all the systems, processes and construction of the 737 MAX. "There is the risk that now the FAA will revert the certification standards, beginning to demand from the 737 projects, current safety levels and standards, different from those of the 1960's, when the 737 was constructed", suggests Clark.

The fear is that such a measure would delay the recertification even more, since, from the -200, series, Boeing has basically homologated the Classic, Next Generation and MAX series based upon an update and not as a new project. "It was something trivial,

since they were isolated changes to each project and not a new design. Now depending on how the authorities around the world will consider the MAX, a new project shall follow the current standards or an update of the 1968 project".

The authorities still shall demand additional simulator training, for all the 737 MAX pilots, which will burden even more the program and extend the time schedule for resuming operations.

Several operators expect to be able to resume commercial services in mid-June or July of 2020, in case the FAA and the other aviation agencies issue the type certificate before March. Until then, the future of the 737MAX continues to be uncertain, at the same time when Boeing will be able to collect up to US\$ 5 billion in additional debts, to help covering the expenses that will reach, in the first semester up to US\$ 15 billion. ✈

SEVERAL OPERATORS EXPECT TO BE ABLE TO RESUME COMMERCIAL SERVICES WITH THE 737 MAX UNTIL AUGUST

INDUSTRY



THE WORLD'S LARGEST TWIN-ENGINE AIRCRAFT

With the inaugural flight of the 777-9, Boeing consolidates the plan of maintaining hegemony of the “triple seven” family in international routes

BY | EDMUNDO UBIRATAN

Boeing has promoted in this early 2020 the inaugural takeoff of its newest aircraft, the 777-9X. After some setbacks, the jet is now performing an extensive campaign of flight tests, which considers the increase of more test aircrafts in the program. The new “triple seven” is the world’s largest twin-engine aircraft with capacity to fly 13,500 kilometers (7,285 nautical miles), enough to non-stop interconnecting nearly all the world’s capital cities. In a two class configuration, the 777-9 will be able to transport up to 426 passengers, only 30 less than what has carried the old Jumbo 747-200.

LEGACY OF THE 777-300ER

The 777X program faces significant challenges. The main one is about a version with less capacity and longer range, the 777-8, which will have to repeat the sales success of its older

brother, the 777-300ER, which is today the model preferred by most world airlines in long range routes. Some of the sales difficulties of the Airbus A380 and of the 747-8 intercontinental are due to the 777-300ER success.

Launched in early 2000s, the 300ER offers a range of 13,649 kilometers (7,370 nautical miles) and an average capacity of 350 passengers in the three-class usual configuration, being able to achieve up to 550 passengers in single class or 396 in two classes. In few time, it has become unbeatable in the routes where until then reigned the giant four-engine aircrafts. Contrarily to the A380, the 300ER can operate in airports with space restrictions in the apron and does not demand changes in airport infrastructure.

By developing the Extended Range (ER) version of the series 300, Boeing was solving a problem with the original 777 that provided large capacity, but had a relatively short



On January 25 of this year, the 777-9 has successfully made its first flight.

range. By conciliating range and capacity, the model has been so successful that not only has become a natural substitute of the veteran 747-400 (and of all the A340 and A330-300 family) but has also cannibalized the market of its smaller version, the 777-200. Moreover, it has launched the old “lime shovel” on the MD-11 three-engine aircrafts in passenger transport.

THE THREAT OF THE A350

Over the last years, however, the development of even more efficient engines for the 787 Dream-

liner and A350 XWB programs threatens to put in a hard spot the supremacy of the 777-300ER. Specially, in the case of the Airbus’s rival: the European widebody offers similar capacity and range, together with an engine that can be up to 15% more economic in certain routes. In practice, the A350 XWB was designed as an intermediate aircraft between the 787 and the 777-300ER. By occupying the center of a space that Boeing disputes with two families, again Airbus has begun a fight for the market’s most profitable slice.

Boeing’s response was designing new updates of the 777, so it could compete with Airbus without cannibalizing the space occupied today by the 787 Dreamliner – a model that accumulates over 1,500 firm orders. This way, the new 777X was presented in two versions. The Boeing 777-8 has similar capacity to the 777-300ER (384 seats in two classes), but as competitive advantage offers an impressive range of 16,170 kilometers (8.730 nautical miles), which will allow it to fly non-stop between practically all the big cities of the world. On the other hand, the Boeing 777-9, of higher capacity, presents itself as a natural substitute to the 747-8 four-engine aircraft, which did not have success in the passenger market due to the high operating cost.

When announced in the early 2010s, the 777X series promised to repeat the sales success of the 787, accumulating at least 1,000 firm orders and conflicting with the A350. However, the market have shown to be reticent towards the new aircrafts – both versions today have little more than 300 orders, not all of them firm. The main client continues to be Emirates Airline, with 115 orders. Lufthansa,



which may be the first airline to receive a 777-9, has already placed 20 orders and may, in the medium term, use it to substitute its 747-8 fleet and, eventually, the A380.

Much worrying is the situation of the long range version of the 777-8, with which Boeing estimated to get at least 40% of the orders. Without having yet the development confirmed, the project continues in stand-by. The lack of interest of the market that continues to prefer the renowned 787 family, leaves doubts in relation to the viability of this model.

TIME SCHEDULE

Boeing has made the rollout of the 777-9 on March 13, 2019, three days after the accident of the 737 MAX 8 of Ethiopian Airlines – which has obliged the manufacturer to organize a ceremony without big shows or commemorations. To make the situation more delicate, in May, a failure in the GE9X engines has caused the first delay in the time schedule of the first flight. A new setback has occurred soon after, resulting from a catastrophic failure in one of the aircrafts intended for static tests.

The diverse problems that have hit Boeing the last year

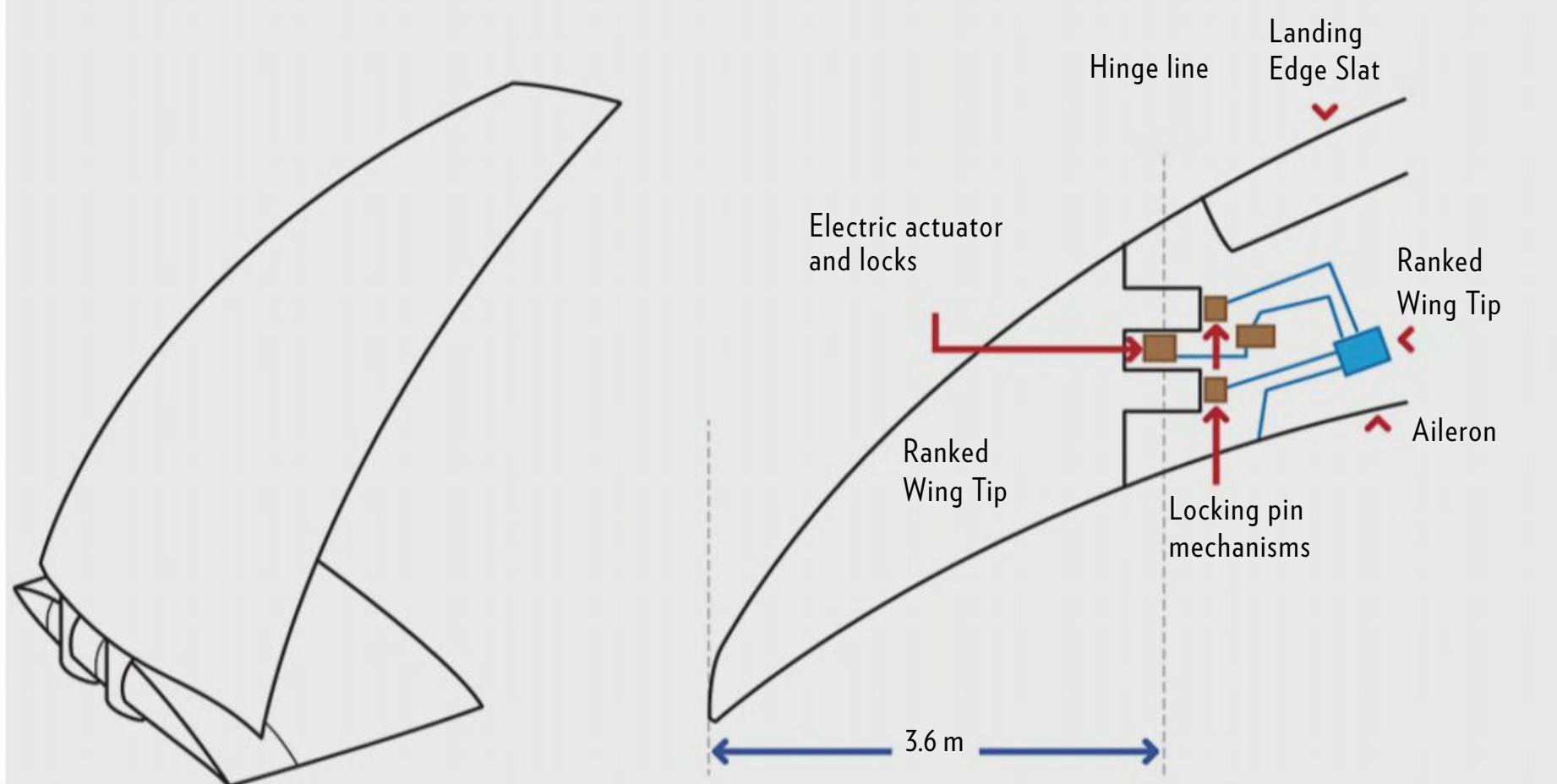
have also affected the program. They have not only impaired its development, but have casted shadows in relation to its quality. The CEO of Emirates, Tim Clark, in an interview at the Dubai Air Show, has affirmed that he expected the living hell, asking for rigor in the certification phase of the 777-9. The distrust has come in the wake of scandals involving the 737 MAX and the polemic relationship between Boeing with the FAA: a certification that has given margin to questionings.

Soon after taking over the presidency of Boeing, David Calhoun has said that the certification process shall

IT IS EXPECTED THAT THE 777-9 WILL BECOME, IN SOME MONTHS, BOEING'S LARGEST AIRCRAFT, IN CASE THE PRODUCTION LINE DISCONTINUATION OF THE 747-8 IS CONFIRMED



SCHEME OF THE 777X FOLDING WING



Folding wing ends reduce the span on the ground, allowing the operation of the 777X in Code E airports

change for all the new aircrafts, considering the revision of procedures involving the 737 MAX. “The certification process is new and will be applied to all the next aircrafts, because of this, we have a lot of things to do about the 777X program, to ensure that we will be able to comply with a really complete revision and investigation”, has affirmed Calhoun.

FOLDING WINGS

Apart from troubles, the 777X program innovates by incorporating a series of unprecedented resources and technologies in the “triple seven”, some of them originated from the 787 program. Cockpit is practically identical to that of the Dreamliner, increasing the communality between the families. The same is valid for the passenger cabin windows. also very similar.

However, one of the greatest innovations of the 777-9 are its wings. Constructed within a new aerodynamic concept, they were given carbon spars that have increased its strength and at the same time have considerably reduced the weight. Visually, catch the attention the folding ends, which have the purpose to reduce span in ground operations, reduced from 71.7 to 64.8 meters.

The idea is not new. Boeing had suggested folding wing ends still in the 1990s, for the 777-200 and -300 version. At that time, the market was not interested. Adopting the solution in the 777-9 is due to the real need to reduce span, maintaining the new aircraft within the so called Code E airport.

The International Civil Aviation Organization (ICAO) has a reference document for airports that define in five categories (A to F) the apron classification in relation with the aircrafts able to operate there. A code E airport can operate aircrafts with a span of up to 64.99 meters. A change in



the 777 span would drastically restrict the number of airports in the world apt to receive the aircraft. Over this there is the Code F, with span between 65 and 79.99 meters, which is the case of the Airbus A380.

A GIANT ENGINE

The 777X was also given structural improvements, increasing the use of composite materials, aerodynamic refinements and new propellers. The GE9X engines stand out both due to their capacity and their size. Derived from the current GE90-115, used in the

777 family in operation, the new engine has incorporated a series of improvements adopted by the GENx engines, used in the 787 and in the 747-8, including new combustion chambers, construction of single-part sections – produced in three dimensional printers – and the largest fan ever used in a jet engine.

The GE 9X has a fan diameter of 3.4 meters, basically the same width of the front section of the Boeing 737 fuselage. The width of this new engine with the nacelles is 4.40 meters, larger than the widest point of an Airbus A320 fuselage (4.14 meters).

Contrarily to what could be imagined, the engine is not more powerful than the GE90-115B, providing a push of 150,000 pounds-force (lbf), 10,000 less than its predecessor. Even so, it is more than double the power of the CF6-50 used in the old Boeing 747-400 (51,000 lbf). Even that the traction force is slightly lower, the better efficiency of the GE-9X gives the aircraft a higher performance. What we need to know is if the certification campaign will encourage what is today the most important mission of the program: increasing order portfolio.

Boeing offers diverse class and seat configurations. Large windows are a competitive advantage of the model

UNSTABLE WEATHER

IATA rehearses a reply to anti-aircraft movements lead by environmental activists while it is expected to close the decade with all the years above the world average

BY | GIULIANO AGMONT, FROM GENÈVE



The general director and CEO Alexandre de Juniac: "The flight is not the enemy"

The International Air Transport Association (IATA) completes 75 years of existence in 2020, exactly in April. Founded in Havana, capital city of Cuba, the entity emerged from the Chicago Convention, the global treatise that sets forth the basis of civil aviation as we know them today. Unceremoniously, IATA has reminded the date during a meeting that promotes every year with journalists from all over the world at its headquarters in Genève, Switzerland, to present balance sheets and the industry prospects.

The event took place in a delicate moment for the world air transport, not only due to the crisis involving the Boeing 737 MAX, but also, and mainly, because at some kilometers from there, in Madrid, Spain, was taking place the United Nations Conference on Climatic Change, the COP 25, with the presence of the Swedish activist Greta Thunberg, who was in Time magazine cover as personality of the year and had crossed the Atlantic in a sail boat just to protest against air travels.

CARBON

In spite of theses about climate changes are still dividing opinions, the environmental movement lobby has already shown to be enough powerful to interfere in the businesses, mainly with us from a global acting industry as is the case of aviation. IATA general director and CEO, the French businessman Alexandre de Juniac, is aware of this. Representative of 290 companies that account for 82% of the world

air traffic, he has mostly focused his opening speech on the environmental issue. “Carbon is the enemy, not the flights”, emphasized the executive, in reply to anti-aircraft movements, “And we are doing our part, we have the goal of reducing our carbon emission until 2050 to a level equivalent to the half of we have emitted in 2005”.

IATA’s challenge is the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) program, which comes in force this year, and also technological solutions to make aviation more sustainable. “We may cut over 80% of carbon emissions with biofuels”, Juniac believes. “Creating environmental taxes making flights more expensive, is not the solution”.

Currently, air transport accounts for nearly 2% of carbon emissions in the atmosphere, according to estimations. Every year, transports over 4.5 billion passengers and 61 tons of cargo between at least 22,000 cities around the world. It is twice the movement of two decades ago, in the late 1990. “When IATA emerged, in 1945, the aircraft transported nine million people per year. “It is the number of passengers that travel today in 18 hours”, compares the entity’s CEO.

BIOFUEL

Over the last decade, in spite of the growth, regular aviation has exceeded the goal of efficiency increase in fuel consumption, recording an annual improvement of 2.3% since 2009, as compared with the fixed goal of 1.5% per year. With investment of nearly

one trillion dollars, which has determined the arrival to market of models such as the Boeing 787 and the Airbus A350 and the entry into service of the reauthorized A220, neo family and EMBRAER E-Jet E2, the replacement of old aircrafts by new ones has become inevitable, thus fairly contributing to this result.

Next step is to invest in a wide energetic transition to the so-called sustainable aviation fuels (SAF). The intent is that until 2025, biofuels will represent at least 2% of the large jet consumption and will become economically viable. IATA also expects improvements in air traffic control systems, by adopting more direct routes and improving flight coordination in critical terminals.

Thinking in the long term, airlines discuss the use of electricity to drive aeronautical motors. The problem is that energy storage creates an impasse for designers. To get the power, they need bigger and heavier batteries, which interferes in the flight. This is why the goal is to develop projects with enough range to meet most of the routes today operated by large jets.

OPERATING PROFIT

In the economic sphere, IATA’s chief economist, Brian Pierce, has announced a downward revision of the global profit expected by the air sector in 2019, dropping from 28 billion dollars to 25 billion dollars. For 2020, profit is estimated in 29.3 billion. If the result is confirmed, the 2010s will end with all the years without losses for the aviation. The expected income for the next year is 87.2 billion dollars, an increase

The chief economist Brian
Pierce: "Economy depends on
connectivity efficiency"



FORCAST FOR 2020

23.162 CITIES
with direct
connections served
by the airlines

**\$ 908,000
MILLION**
in expenses in
air transport of
consumers and
companies

\$ 7.1 TRILLION
transported by
the commerce

**\$ 968,000
MILLION**
tourism expenses
associated with air
travels

**\$ 136,000
MILLION**
for the treasure
chest of
governments in
duties and taxes

of 34 billion in relation to 2019, achieving 7.72 billion passengers. Airlines employ nearly 50 million people around the world.

According to IATA, global GDP must be 2.7% this year, with commerce growth of 3.3% and less tensions generated by trade wars and political instabilities. The average price of oil barrel remained in 65 dollars (Brent) in 2019 and may drop in 2020 to 63 dollars per barrel, at least in estimation prior to the US - Iran crisis. On the other hand aviation kerosene may have a small drop, to 75.6 dollars per barrel. "The expenses of the sector with fuel should be 182 million dollars and will represent 22.1% of the expenses", IATA reports.

LATIN AMERICA

IATA has presented figures that show that the economic performance of a region is related to its air network. "Economy depends

on connectivity efficiency", said Brian Pierce. A message to less developed regions such as Latin America, which remained in the red in 2019, with a deficit of 400 million dollars. For 2020, IATA expects that airlines will benefit from the 1.8% recovery expected by the FMI, with stronger growth in Brazil and Mexico and less accentuated drops in Argentina and Venezuela. "This represents a positive balance of 500 million dollars", the entity says.

For Peter Cerdá, IATA's regional vice president, in charge of the Americas, air traffic should double in the region in the next 20 years. "Some countries like Panama, which has a pro-aviation government, a strong hub like Tocumen and a robust airline like Copa, should have an average growth of 5.5% per year in two decades", the executive says. For Brazil it is expected an increase of 105 million passengers until

2038. "Brazil has also potential considering that the number of trips per capita in the country is only 0.5 per inhabitant. In Spain is 4.4 and in Canada 2.6. Chile has 1.2 and Panama 1.3".

CHALLENGES

According to IATA, Latin America's growth relies on five factors: better airport infrastructure and air traffic control, less tariffs, duties and taxes, more Intelligent rules, safety increase and fraud reduction. The infrastructure issue is especially critical in relation to the Next Gen air traffic environments. According to IATA, the region is fairly underdeveloped in this matter. On the other hand, the problem with taxes mainly affects fuel price, especially in Brazil. A new phenomenon that catches the attention of the entity regarding laws is the "judicialization". "In this question, Brazil is the worst place of



the world to operate. Many times airlines have to pay for pain and suffering damages upon which they have not control, such as traffic control system failures”, Cerdá criticizes. Finally, there is the issue of frauds in ticket purchase and reservation, which costs nearly 1.4 billion dollars to the industry.

IATA’s CEO has also talked about Brazil. He commented the bankruptcy of Avianca Brasil. “Bankruptcies occur all over the world. We are a very fragile industry. People have difficulties to understand this, especially the politicians. We don’t have too much money. We have very much income, but few margins, few profit”, says Juniac. “In Brazil, there is an aggravating circumstance. Operation cost is very high, Starting with the fuel cost. We also have high tariffs, especially the airport ones. Moreover, it is a great country. It’s not easy”,

737 MAX

In the conference on flight safety, the main theme was the case of the Boeing 737 MAX. The senior vice president Gilberto López Meyer, in charge of IATA’s Flight Safety and Operation area, said that he has flown the simulator of the new jet and he is convinced that the situation tends to be solved in the best possible way. “The occurrence of two accidents with the same model in such short time interval is really something very rare”, admitted López. “Confidence in the aircraft will be decisive for it flying again. Also because the certification process of Boeing 737 MAX is critical, and not only for the Boeing 737 MAX, but for all the future aircrafts. IATA has also highlighted the concern with the transport of lithium batteries and the cybernetic vulnerability of the aviation system;



Gilberto López Meyer: “Confidence in the 737 MAX will be decisive for the aircraft flying again

THE ATTACK TO IRAN'S MILITARY LEADER

*Details of the American offensive in Bagdad using
this genuine assymetrical war machine, the MQ-9 Reaper drone*

BY | FELIPE SALLES





In the dawn of the first Friday of 2020, January 3, two Hellfire missiles launched by an USAF MQ-9 Reaper drone hit upon vehicles of a convoy leaving Bagdad International Airport, in Iraq. The attack killed major-general Gaseem Soleimani, Iran's most important military leader, in addition to other important figures of Iraqi Shiite Militia. In spite of his title, Soleimani did not belong to the Army or other military forces of the Islamic Republic of Iran. He occupied the highest position in the hierarchy of the powerful Quds Force of the Islamic Revolutionary Guard Corps – a paramilitary organization directly reporting to ayatollah Ali Khamenei, the supreme leader of Iran. The Quds Force is the organization in charge of the

external operations of Iran and Soleimani, old acquaintance of the Americans, was the mentor of several military and intelligence Iranian initiatives over the past two decades, including interventions in places such as Persian Gulf, Syria, Iraq, Lebanon and Yemen.



THE AIRCRAFT

The air platform MQ-9 Reaper is a direct and substantial evolution over MQ-1 Predator, a pioneer unmanned aircraft that entered in service in 1994. The inaugural flight of the first MQ-9 prototype took place on February 2, 2001. While the Predator is a relatively



The Honeywell TPE331-10GD engine is positioned at the tail in pusher configuration

small machine, with the approximate size of a Cessna 170, its inheritor has practically the same dimension of an Embraer A-29 Super Tucano, which means, nearly 50% longer - and a fairly wider span.

The adoption of a Honeywell turboprop engine in the MQ-9 has doubled its patrol speed in relation to the previous model. Its capacity to carry weapon systems and sensors has been increased by ten times. On the other hand, maximum operating altitude has doubled, from

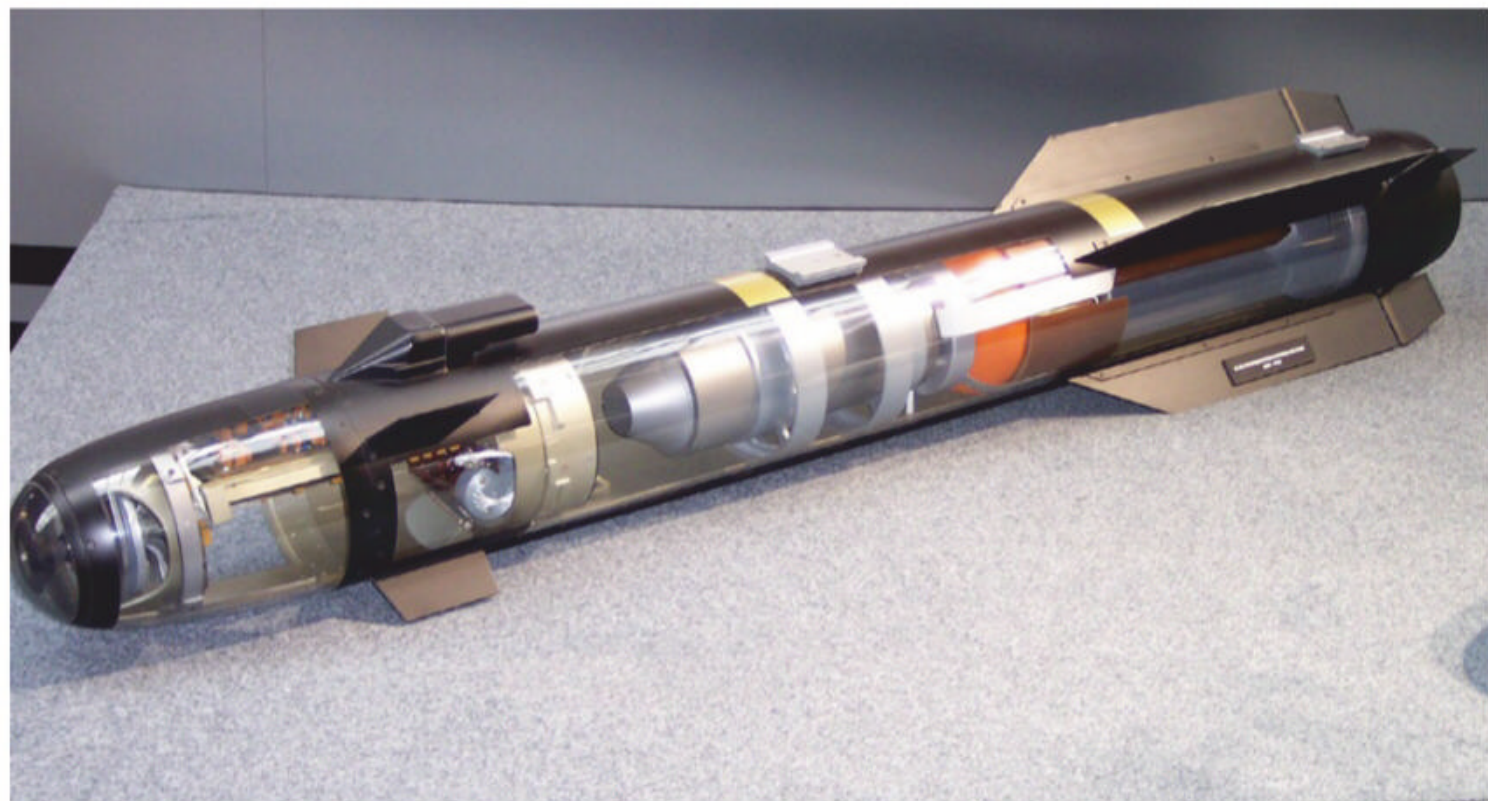
25,000 to 50,000 feet. Endurance was the only parameter that has remained unchanged: 24 hours until fuel exhaustion.

THE OPERATION

Multimission by nature, the Reaper, in addition to marking its own targets with the optical laser turret, it is able to receive, via datalinks, target designation data transmitted from ground teams in order to guide its weapons. Alternatively, it can also be used to identify, with laser turret, targets for GBU bombs transported by

other aircrafts, including fighters and B-1B bombers.

Drones like the Reaper are normally known under the acronym MALE, indicating its long range and operation at medium altitudes. Long and narrow wings, like those of a glider, allow vital long range flights for this type of mission. Under wing roots the MQ-9 has four robust pylons, with capacity to launch two JDAM bombs, of up to 500 kilos each, guided by GPS signal, in addition to four Hellfire missiles in dual racks.

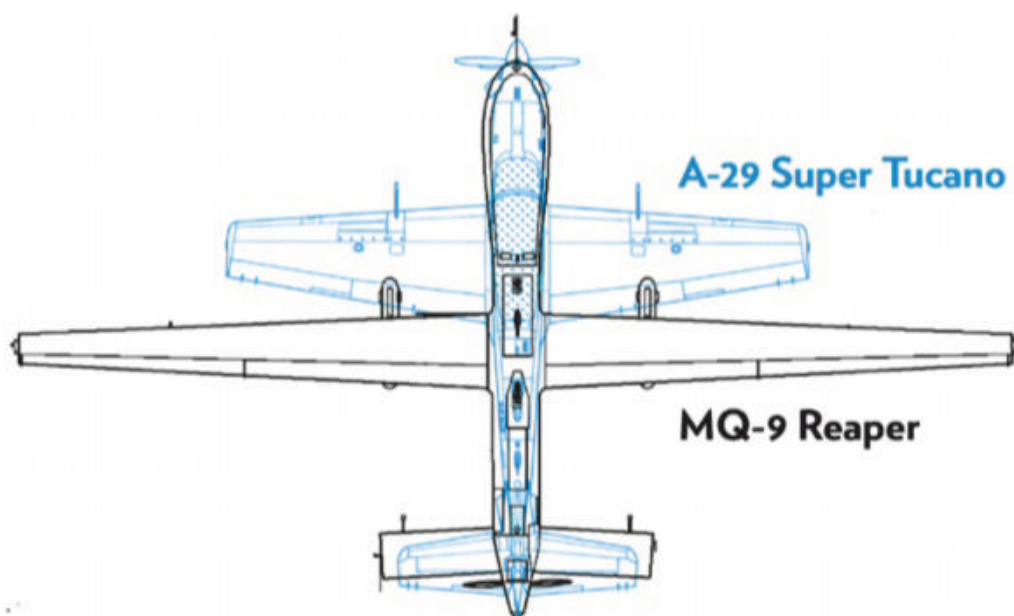
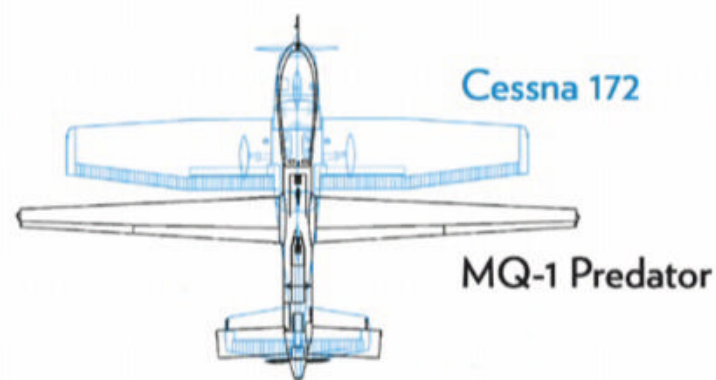


THE CONTROL

Reaper control system is divided into two separate environments, the Launch and Recovery Element (LCE) and the Mission Control Element (MCE). The aircraft always takes off and lands under the radio control of a human pilot of the LCE, located in its temporary base - In Middle East or wherever the operation is taking place. After takeoff, control is transferred to a pilot and a sensor operator installed at the

MCE, at a distance of over 12,000 kilometers. In fact, the pilot who killed the military Iranian leader was controlling the drone from the Creech Air Base in the American state of Nevada, by means of data-links via fiber optics and satellites. The long distance existing between operator and aircraft, on both sides of the Atlantic Ocean, creates a delay of two seconds between the given command and the desired effect in the aircraft.

COMPARACIÓN DE TAMAÑO





Differently from traditional fighter pilots, who only identify their targets a few seconds before launching the missile and coming back to their base, the extremely long endurance of the Reaper allows “its crew members” to observe their target for weeks or months while they perform their daily tasks, before the shooting command is finally given. A senior commander of the

Reaper unit has confirmed this moral burden when stating that, in fact, the impact of these of operations is “much higher than ever was in a manned cabin”.

THE HISTORY

During the Bosnian War, in 1999, the United States Air Force (USAF) began using Predator drones to monitor activities and movements of the enemies



The Honeywell TPE331-10GD engine is positioned at the tail in pusher configuration

initially in missions classified as Intelligence, Monitoring and Recognition (ISR). Each MQ-1 team was composed of four aircrafts and nearly 60 military.

The first great evolution of this system came with the installation of two anti-tank missiles in the drones; The AGM-114 114 has originally been created to equip attack helicopters that should face the waves of Soviet armored tanks on the plains of Central Europe. The AGM-114P variant of the Hellfire was especially designed to be launched by drones flying at an altitude of 15,000, a much higher level than the 2,000 feet usual in helicopters.

In spite of a negative analysis in 2001, by the operating tests and evaluation office of the Pentagon - alleging than Predator system was nor operationally effective or suitable” - ironically these drones were the first USAF equipment sent to Central Asia after September 11.

WAR ON TERROR

Drones have been used by the Americans to kill “terrorists”

since the beginning of the so called War on Terror. From the September 11 attack, President George W, Bush and his successors Barack Obama and Donald Trump have adopted the targeted killing practice against terrorist leaders abroad, killing members of al-Qaeda and other similar groups in distant countries such as Pakistan, Somalia, Yemen and now Iraq.

The offensive model has revealed a paradigm of asymmetric war times, where conflicts do not involve two countries. Being controversial, these attacks are carted out previously to “any clear and evident act of the targets” and, mainly without them could be judged and condemned by the American Congress, thus summarily suppressing what one day was the Criminal Defense Rights. By means of a “beheading” such as it has come to be known, it is expected that the enemy’s military structure (or also the paramilitary organizations) will lost the adequate combat capacity when deprived of the guidance of his leaders (the “heads”).

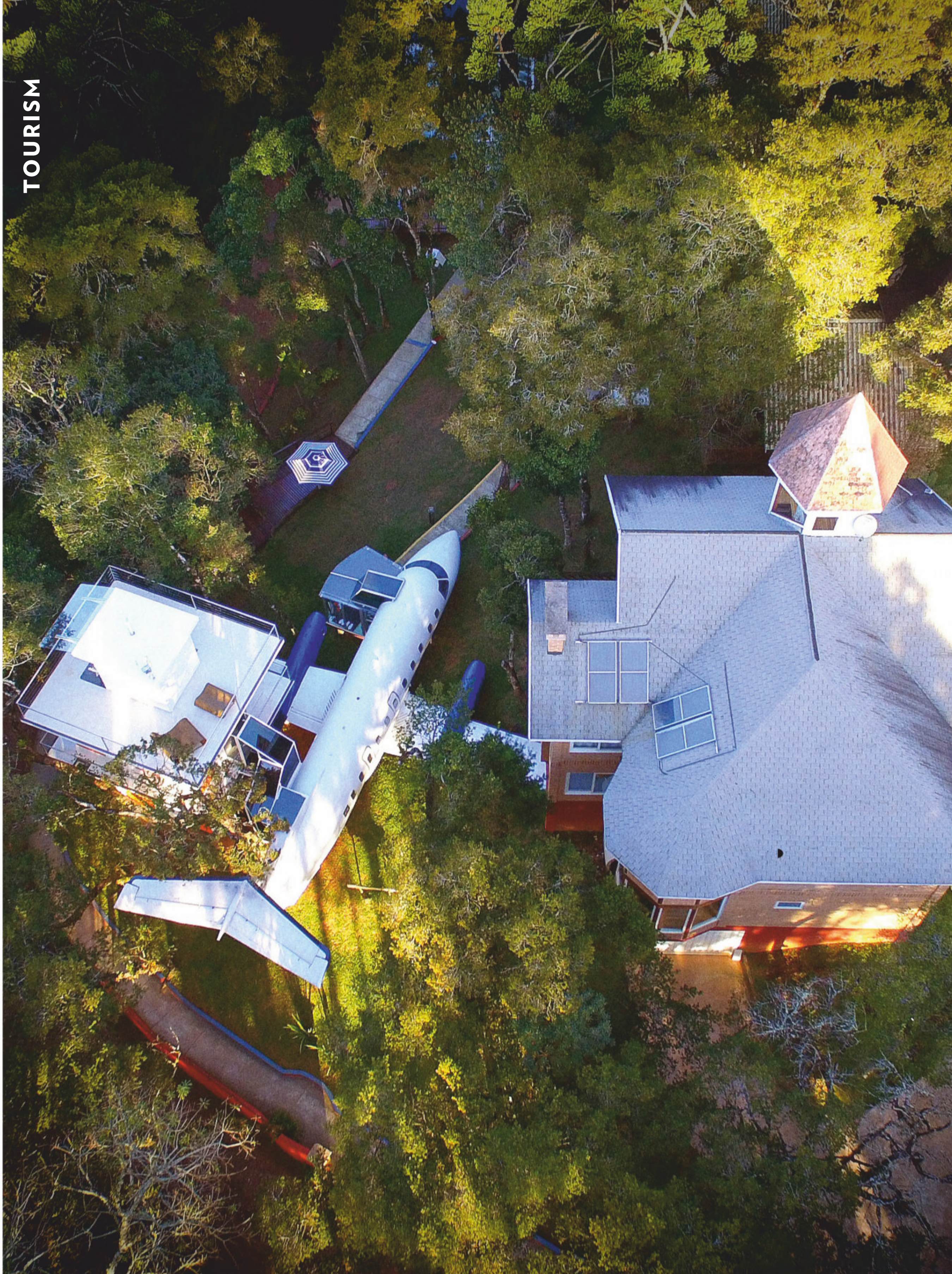


THE UAV MQ-9 REAPER

The General Atomics MQ-9 Reaper is an unmanned aircraft capable to be remotely piloted or to be operated in an autonomous way. The model was designed to meet the operating requirements of the American Air Force.

Manufacturer	General Atomics Aeronautical Systems, Inc.
Unit cost	US\$ 16 million (2013)
Beginning of operations	May 1st 2007
Primary function	Locating, precisely marking position and hitting targets
Propulsion	TPE331-10GD Honeywell Turboprop
Power	900 SHP
Maximum speed	260 knots (482 km/h)
Cruising speed	169 knots (313 km/h)
Span	20 m
Length	11 m
Height	3,8 m
Empty weight	2,223 kg
Maximum takeoff weight	4,760 kg
Fuel capacity	1,800 kg (2,279 lb.)
Payload	1,700 kg
Range	1,000 nm (1.852 km)
Operating ceiling:	50.000 ft (15.240 m)
Weapon system	Missiles AGM-114 Hellfire, GBU-12 Paveway II and GBU-38 Joint Direct Attack Munitions (JDAM)
Crew (remote)	1 pilot and 1 sensor operator
Tripulación (remota)	1 piloto y 1 operador de sensores

TOURISM



HOST IN AN AIRCRAFT

A selection of different hotel levels for who wishes to enjoy his stay on board of a classic aircraft

BY | MARCELO MIGUERES

PHOTOS | DIVULGAÇÃO

Try to imagine yourself inside an aircraft for one week. Sleeping and waking up day after day after day taking bath and brushing teeth! Don't tell me, you have certainly thought about a luxurious business jet during a trip around the world. You are wrong... believe me, and still better, mainly for who has kerosene circulating through his veins. In different lo-

cations there are hotels where you are hosted inside varied aircrafts, all of them with a history of good rendered services each one with a peculiar characteristic. They are cargo and commercial aircrafts, turboprops and jets. There is also a helicopter. There are alternatives for different tastes and pockets, from a practical and economic hostel to five-star establishments. See the options a make your program.



NEW ZEALAND
BRISTOL FREIGHTER 170
WOODLYN PARK, WAICACO



IN NEW ZEALAND, THE LAND OF ADVENTURE, near Waitomo caverns, in the region of Waicaco, is Woodlyn park located. Think on a remote place, where hosting units are recycled and perfectly integrated to nature. Between a patrol ship, retired from the New Zealander Navy, and a wagon of the steam trains - all adapted for hosting units - there is the few known Bristol Freighter 170, a British air transport aircraft designed by Bristol Aeroplane Company between 1945 and 1958.

During this 14-year interval, only 214 units were produced of the robust twin-engine turboprop, one of the first commercial aircrafts to fly in Great Britain after the end of Second World War. The Bristol has become known as wayfarer, making flights over the Channel

between Lympne, in England and Le Touquet, in France. It was so successful that, in less than six months, over 10,000 passengers were transported between the two cities. There Silver City Airways has successfully used the Freighter 170 to carry passengers and their cars, creating the term "air ferry" alluding the ferryboats. In the military aviation, the 170 was used by various Air Forces: Argentina, Australia, Canada, and Pakistan and, of course, New Zealand.

In the Woodlyn Park, there are two comfortable bedrooms, one in the front part, including the cockpit, and another in the aircraft rear part, A case of harmony between man and nature.

BRISTOL FREIGHTER 170

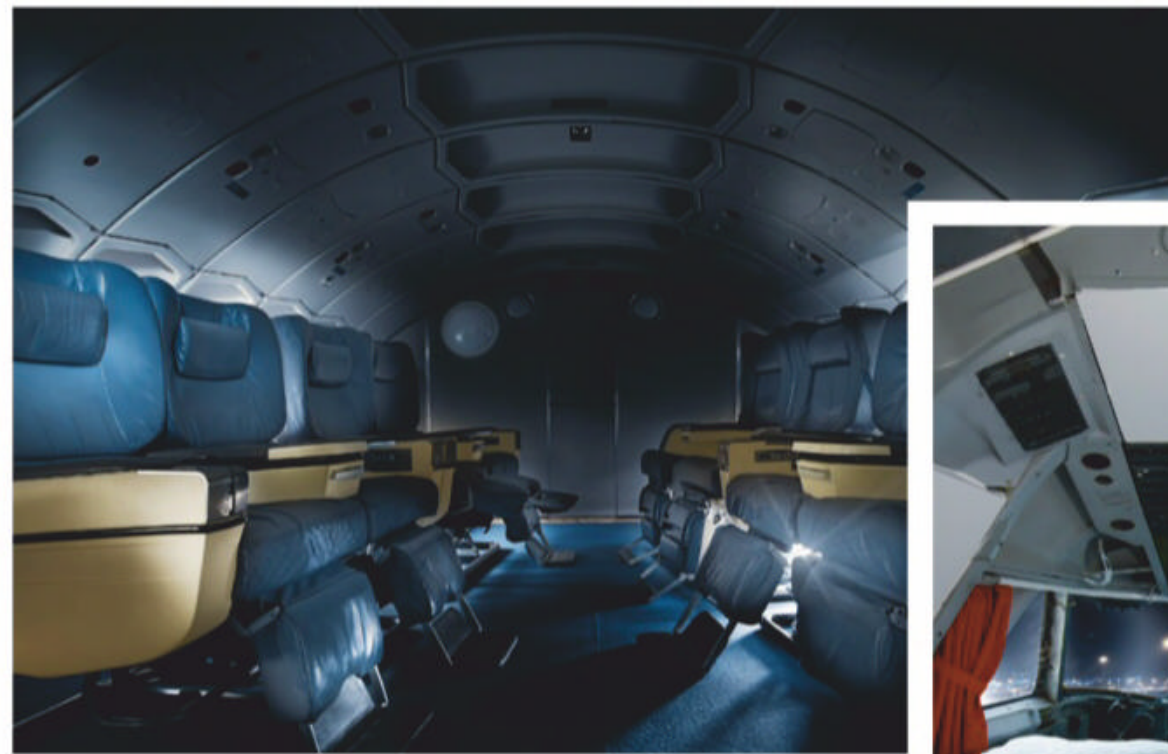
Engines	2 Bristol Hercules 734 (radial)
Length	20,83 m
Span	32,92 m
Height	6,56 m
Empty weight	12.247 Kg (27.000 lb)
Maximum takeoff weight	19.958 Kg (44.000 lb)
Speed	361 km/h att 10.000 ft
Endurance	1.320 Km.

SWEDEN
BOEING 747-200B
JUMBO STAY HOSTEL, ESTOCOLMO



WHEN THINKING ABOUT the size of an aircraft-hotel, the unit located at Arlanda airport in Stockholm, Sweden, reveals as insuperable. The aircraft is an iconic 747-200B Jumbo Jet, originally constructed in 1976 for Singapore Airlines that ended its days in the Swedish airline Transjet in 2002, after having flown for several airlines, including the legendary Pan Am. The idea of transforming the world's largest passenger aircraft (a title that has hold for 37 years), the businessman Oscar Diös in 2006 decided to purchase the 174-ton scrap practically abandoned in the apron of the Swedish terminal. After nearly three years of complete reforms, which included removing the 450 seats, full cleaning, thermal Insulation and painting, finally in January 2009, the Jumbo Stay has received its first hosts.

There are 44 rooms and 36 beds, and the cockpit suite stands out, installed in the aircraft cockpit with access to the original instrument = panel and aircraft command, all in perfect conditions. There are also rooms installed in the turbines, under the wings of the 747, and that are so narrow that they magnetic resonance chambers. Obviously, in this option, there is only room for the bed. When asked about his business model, Oscar Diös does not admit contradictions: "This is the low-cost alternative that Arlanda was in



need some time ago, but it is also a different experience for the hosts" says the owner of the unusual undertaking. "We had some people entering just for having a look. They should be hosted in a near hotel, but when they have seen what we were offering, they have cancelled their reservation to stay here", says Sebastian Sandler, service manager of Jumbo Stay,

Created in the 1960's to substitute the Boeing 707, due to the increasing passenger demand in commercial aviation, the "queen of the skies", as the 747, was known, has come to revolutionize the market, mainly due to the number of passengers it could transport, nearly three times of its predecessor. The then Boeing president Bill Allen and the CEO of Pan Am, Juan Trippe, were friends many times ago. During a fishing tour, Trippe would have asked Allen about the plans for a big passenger air-

craft. "If you make it, I purchase it". And the reply could not have been more direct: "If you make it, I purchase it".

The fame of the new 747 was not only due to its innovations, but, also for its glamour. With a lunge where cocktails were served, the aircraft was a promise of an elegant and relaxed travel experience. The Jumbo measures ere (and still they are) superlative: With over 70 meter length and nearly 70 meter span, the aircraft was able to hold between 366 and 550 passengers depending on seat layout.

BOEING 747-200B

Engines	4 Pratt & Whitney JT9D-7
Length	70,60m
Span	59,60 m
Height	19,30 m
Empty weight	174.000 Kg (383.604 lb)
Maximum takeoff weight	377.842 Kg (833.000 lb)
Speed	893 km/h at 33.000 ft
Endurance	12.690 Km.



COSTA RICA BOEING 727 SUITE FUSELAJE, QUEPOS

AT FIRST SIGHT, IT SEEMS TO BE an aircraft that has have an accident in the jungle of Costa Rica. And this was exactly the idea of the owners of Hotel Costa Verde when they have acquired a Boeing 727, manufactured in 1965: creating the most exclusive hotel suite in Costa Rica in the middle of the jungle. The aircraft had served to South Africa Air and the Colombian airline Avianca before being abandoned in San Jose Airport. From there, the 727 was carefully transported, disassembled and carried in five large trucks to Manuel Antonio jungle, where it was reassembled in the configuration of the hotel's exclusive aerosuite.

Like a gigantic maquette, the classis aircraft was supported by a 15-m pedestal, and the height favor the contemplation of the beautiful view of Manuel Antonio National Park and the Pacific Ocean. The aircraft interior is fully coated with wood and the furniture was hand sculpted, and was brought directly from Indonesia. The 727 has two air-conditioned rooms, fully equipped with everything a five-star hotel should have, each one with private bathroom. A terrace with sea view makes the host imagine he is flying.

The Boeing 727 has emerged when, in June 1956, the American manufacturer has begun the studies for an aircraft indented for operating short and medium distances, in airports with reduced runways (minimum 1,500 meters) with low operating cost per seat, When consulting the market - which

at time considered the 4-engine jet aircrafts the safest option - Eastern Airlines, operating several routes to Central America and the Caribbean, has proposed an intermediate model, with three engine, which would provide the aircraft with high reliability, allowing flights without Extended Twin Engine Operations (ETOPS), limiting the flight to a maximum distance in time from an alternative airport, which at that time was 60 minutes. Also positioning engines in the tail has allowed the manufacturer to exploit to the maximum the Boeing 727 wings, with configurable slats and flats in a great number of positions and deselection. Ensuring a good maneuverability to the aircraft at low speed.

Being a sales success over the 23 years that remained in the assembly line (from 1962 to 1984), the model has had over 1,800 units crossing the skies all over the world. In January 2019,

the Boeing 727 has made its last commercial passenger flight. Operated by Iran Aseman Airlines, flight EP851 has departed from Zahedan, Iran, with destination Teheran, the capital city of that country, finishing the path of the more important representative of commercial aviation of all times. However, In the cargo version the 727 is very much used in the cargo version, because it can transport up to 25 tons in short runways, and it is homologated for non-paved runways,



BOEING 727

Engines	3 Pratt & Whitney JT8D-17R
Length	46,69 m
Span	32,92 m
Height	10,36 m
Empty weight	44.330 Kg (97.700 lb)
Maximum takeoff weight	78.100 Kg (172.000 lb)
Speed	952 km/h at 42.000 ft
Endurance	4.509 Km.



FOR EATING AND DRINKING

A Fairchild C-123 has served as platform for the construction of El Avión bar and restaurant in the hotel

The Costa Rican hotel complex has a fashionable restaurant and bar installed inside a historic C-123 Fairchild Provider. It is El Avión, which has a history. In October 1986, the CIA (American intelligence agency), under the command of Oliver Nort, was directly acting against dictatorship in Central America, having two C-123 aircrafts in the airport of San Salvador, capital city of El Salvador. One of them has departed for a mission, loaded with 70 AK-47 rifles and 100,000 munition cartridges, rocket-propelled grenades and other supplies for the oppositionists. It has flown along the coastal region, entered the air space of Nicaragua and, near the frontier of Costa Rica, was shoot down by a pro-Sandinista government soldier. The wreckages of the shoot down Fairchild remain until

today in the tropical Nicaraguan forest and the other model identical to the C-123 was left abandoned for many time in San Jose International Airport, and then purchased for only three thousand dollars. This cargo aircraft, which was disassembled into seven pieces, transported by ship to Quepos, in Costa Rica and carefully reassembled. now houses a two-floor pub and restaurant, where, judging from the host's reports, cocktails are excellent and the sunset is breathtaking. Exclusively designed for military use, the C-123 was broadly used by the USAF during Vietnam War, for troop transportation, parachutist launching, and spraying of the polemic orange agent. The aircraft



was also used by the US Coast Guard and air forces of other 12 countries.

FAIRCHILD C-123

Engines	2 J85 GE-17
Length	23,92 m
Span	33,53 m
Height	10,36 m
Empty weight	16.042 Kg (35.366 lb)
Maximum takeoff weight	27.000 Kg (59.500 lb)
Speed	367 km/h at 10.000 ft
Endurance	5.252 Km.



THE AIRPORT OF TEUGE, in the Netherlands, Is located in THE center of a triangle formed by the cities of Deventer, Apeldoorn and Zutphen. Famous for offering aero-sport activities, were it is possible to make panoramic, acrobatic flights or parachute jumps, the Dutch airdrome has standing out in its apron, a classic item of the Cold War: the Ilyushin Il-18 that will soon complete 60 years.

During the first years, the aircraft was used by East Germany government. After this, from 1964 to 1986, by Interflug, an airline of East Germany, which has used it in flights to counties such as Cuba, Russia, China and Vietnam? The four-engine turboprop of Soviet manufacture, in its traditional configuration received up to 120 passengers and a crew of four people in the cockpit. After German unification, in 1990, the aircraft prefix DDR-STD that has belonged to Interflug, was used as a restaurant for 15 years until being acquired by a large Dutch hotel group.

The entire aircraft was reformed and converted in one only five-star luxury suite for two hosts, normally in love (not only with aviation). Its facilities include hydro massage bathtub, shower, infrared sauna, minibar, three flat screen TV sets, microwave oven,



coffe maker, Wi-Fi internet and air conditioning, among other items. Children are not accepted.

The IlyushinIl-18 is a large four-engine turboprop aircraft that, visually very much reminds the Lockheed Electra and the Vickers Vanguard. The aircraft has performed a significant role in the development of the then Soviet Union in the 1960's and 1970's, and it was also adopted in the military version, for transport and sea patrol. The idea was meeting the demand of Aeroflot for an economic aircraft of 75 to 100 seats, together with the Antonov An-10 in domestic and international markets. When production has stopped, in 1969, over 800 Il-18 aircrafts of all the versions have been constructed,

mainly for airlines of the Soviet Union, Eastern Europe, Asia, Africa, Middle East and the Caribbean. Today, it has practically disappeared from passenger service, but it is still used in Russia, and the United Arab Emirates as cargo aircraft.

ILYUSHIN IL-18	
Engines	4 Ilyushin AI-20M (Il-18D)*
Length	35,90 m
Span	37,40 m
Height	10,17 m
Empty weight	35.000 Kg (77.162 lb)
Maximum takeoff weight	64.000 Kg (141.096 lb)
Speed	625 km/h at 26.000 ft
Endurance	6.500 Km.

**com hélices AV-68I, de 4 pás, Speed constante, reversível e embandeirável*



IN THE MIDDLE OF 45 HECTARES (equivalent to 45 football fields) of a traditional property of New England, Connecticut, USA, is the winvian resort. In 1948, the Smith family has purchased the historic property originated in 1775, and has named it as Win-Vian, a combination of the first names of Winthrop Smith and his wife Vivian. When Win had died, Vivian married Charles McVay, Coast Guard captain. Later, the property was transformed into one hotel, with the addition of 18 chalets, each one with a different theme.

One of them has a Sikorsky HH-3F helicopter of 1968 with 7 tons, inside a country house, giving the place the appearance of a hangar. Completely restored, the "Sea King Pelican", that has served the Coast Guard, house the installations of a TV room and bar, allowing hosts to enjoy a comfortable experience. Here

bedroom and bathroom are outside the aircraft.

The HH-3F was manufactured by the Sikorsky Aircraft division of United Aircraft Corporation, Stratford, Connecticut, equipped with a single main rotor, dual engine with 1,500 HP rated power per shaft each, totally retracted tricycle landing gear, amphibian resources and a hydraulically operated revertt ramp, that can be opened in flight, on the ground or on the water. The HH-3F was also used for sea environmental protection, logistic and reconnaissance support, application of laws and treaties, defense readiness and drug interdiction.

In November 1967, the US Coast Guard has acquired the first HH-3F Pelican. This amphibious, twin-engine and medium-range helicopter, for any weather, has extended the search and rescue capacities of the Coast Guard. The HH-

3F had a maximum speed of 142 knots, with normal cruise speed of 130 knots and a reach of 650 nautical miles. The Coast Guard has purchased 40 HH-3F and the last was delivered in 1973.

SIKORSKY HH3F

Engines	2 General Electric T58-GE-10*
Length	22,00 m
Span	19,00 m
Height	5,51 m
Empty weight	6.051 Kg (13.341 lb)
Maximum takeoff weight	10.000 Kg (22.050 lb)
Speed	265 km/h at 19.000 ft
Endurance	1.443 Km.



BRAZIL
EMB 120 BRASILIA
SUITE AERO FLYER, MINAS GERAIS



THE BUCOLIC CITY OF Monte Verde, in the district of Camanducaia, state of Minas Gerais, at 160 kilometers of the city of São Paulo, has also its "air inn" version, the only one of this style in the country. The Vivie Aero Flyer suite is the best hosting attraction, which provides luxury and satisfaction to seduce aircraft lovers in an EMB-120 Brasília model coupled to a control tower. "The idea of building a chalet inside an aircraft came out when I was watching a TV program showing an American that decided to live in an old aircraft. If it can be used as a house, why not as a hosting unit?" questions Marcel Oliveira, owner of the Vivie inn. In love with aviation since his childhood.

Preparing the place that would receive the construction, tower construction and to

reform the Brasília inside and outside were taken two years of work and an investment of 500 Brazilian reais. "The logistics to place where it is was real a war operation and we have not economized to provide the suite with all the items of refinement and comfort" adds the businessman. The target customers of Aero Flyer are couples and aviation enthusiasts; Animated by the romantic climate, some wedding proposals already were made on board,

The installations are really impressive. Aircraft access is made with a front stair. In the cockpit, instruments are fully preserved and there is an on-board computer with a flight simulator, aircraft controls and customized leather seats. The interior is decorated with LED lights, gyratory seats, executive retractable table,

sofa, toilet, luggage locker, and there is also an original trolley from when the aircraft was operating. To maintain the atmosphere, the suits receptionist, character dressed, waits for the Aero Flyer hosts at the "aircraft" entrance.

In love with aviation, Marcel tells that he has just acquired a Cessna 182, but he explains: "This will not be used as hosting. It is in perfect conditions! 'I want to get my brevet as soon as possible and to fly with it for many years', says the businessman, who has always dreamed to be a pilot.

The EMB 120 Brasília should have been given the name of Araguaia. In fact, the name of Brasília was the second option of this model of Embraer, which has flown for the first time in July 1983. Developed to meet the regional aviation segment for up to 30 places, the EMB-120 was very important for Embraer because the model has



started Brazil's participation in the American market. It is the second model of the EMB-12X family, which has had the Xingu as first representative that, in spite of being a fairly different model, it was used the pressurization experience and the "T" tail of that aircraft,

It has PW 118A and 118B, Pratt & Whitney engines with 1,800 per shaft each one. Due to having 4-blade propellers of composite material, located on the wings close to the ground, the aircraft cannot operate in non-prepared runways. The Brasília lands and takes off without problems in runways of

over 1,500 meters length. It was homologated by the FAA In 1985 and used by various regional airlines In the United States, and ASA was the first airline to use it in the leg between Gainesville and Atlanta.

The silver polished pain used by several operators has given to the Brasília the nickname of Silver Bullet. In Brazil, the model was acquired by the Brazilian Air Forde, but commercially It only has had the first model ordered by Rio Sul Linhas Aéreas. In the 1990s, it was accepted by Brazil's regional aviation. In total, Embraer has produced 359 units between 1983 and 2001.



EMB 120 BRASÍLIA

Engines	2 Pratt & Whitney PW118
Length	20,00 m
Span	19,80 m
Height	6,35 m
Empty weight	7.100 Kg (15.652 lb)
Maximum takeoff weight	11.980 Kg (26.411 lb)
Speed	552 km/h at 19.000 ft
Endurance	1.750 Km.