

# To Modify Pilatus PC-24 Business Aircraft to Medical Emergency Purpose Aircraft

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**Abstract**— *The Pilatus PC-24 is a versatile and capable business aircraft that has gained popularity in the aviation industry. In recent years, there has been a growing need for aircraft that can be readily adapted for medical emergency purposes, especially in remote areas or during disaster response operations. This abstract explores the concept of modifying the Pilatus PC-24 to serve as a medical emergency purpose aircraft, the proposed modification aims to transform the Pilatus PC-24 aircraft by re-imagining its interior to serve dual functions - a versatile business jet and a state-of-the-art air ambulance. This innovative design incorporates adjustable seats that seamlessly transition into comfortable beds, maximizing the space within the aircraft to accommodate critical medical emergencies while ensuring a luxurious experience during non-emergency flights.*

**Keywords:** *Pilatus PC-24, Business aircraft, medical emergence, passengers' treatments, stretcher.*

## I. INTRODUCTION

The Pilatus PC-24, the world's first and only Super Versatile Jet, is an ideal ambulance aircraft. Benefits include low operating costs and the ability to operate in and out of short and even unmade runways. Providing access to over 21,000 airports worldwide. The Pilatus PC-24 interior configuration will be modified to serve both the purposes of a business jet and an emergency air ambulance [1]. The aircraft will be able to provide medical services by installing specialized medical equipment. The focus of this research paper is to improvise seats that can be adjusted to stretcher beds to accommodate both business trips and emergencies [2]. This approach gives an edge to the aircraft as it can generate some revenue in times when not needed for medical emergency purposes.

## II. LITERATURE REVIEW

1. This research emphasizes on the use of the internal cabin configuration to modify the Pilatus PC-24 into an emergency Air Ambulance while serving the purpose of business flight. This modification enhances maximum patient care and support (GE Aviation, 2022)[1].
2. The present research aimed to identify factors affecting the development of air ambulance bases to provide the opportunity for planning to improve the quality of emergency medical services. ( Ahmad Alibabaei, 2021) [2].
3. This research paper aims to pioneer a new paradigm in aircraft versatility. By integrating specialized medical equipment and amenities tailored for executive travel within the same airframe, our thesis asserts that this innovative modification not only addresses the critical and time-sensitive needs of emergency medical

- transport but also optimizes the utilization of the aircraft for non-emergency missions. ( Flight Global, 2020 ) [3].
4. This research gives a proper idea of future aircraft cabins and design thinking (especially optimization vs. win-win scenarios). This paper shows the challenges of designing the aircraft cabin of the future that will deliver on the multiple requirements using experiences from the A350 XWB and future cabin design concepts [4].
  5. This research gives an idea of recent advances in engineering design optimization, challenges, and future trends. Here we can see an overview of different approaches for design optimization [5]. The study identifies scalability as the major challenge for design optimization techniques. Large-scale optimization requires significant computing power and efficient algorithms [6].

## III. METHODOLOGY

There are different ways to increase efficiency for air ambulance purposes

- (1) Upgraded seating arrangement
- (2) Change in seat design
- (3) Same Weight ratio strategy
- (4) Enhanced Comfort
- (5) High-Altitude Stable Operation
- (6) Efficient Air Ambulance

So, we have selected the same weight ratio strategy to maintain the structural seat weight of the Pilatus PC-24 airplane. By maintaining the same weight we can maintain the the original center of gravity and overall balance of the airplane.

**Material selection**

Because it's a business jet that can also serve as an emergency air ambulance, seat material and its structural material selection based on some factors,

**Purpose:** The main purpose of the seat selection is to satisfy the condition of comfort, look elegant, and a proper air emergency air ambulance when necessary. So, we have specially selected a seat design that can change into a stretcher when necessary while maintaining the same CG for airplane balance.

**Weight:** When it comes to aircraft seats, it's important to make sure they don't add too much weight to the airplane [7]. Too much weight can harm fuel economy, performance, and the amount of cargo you can carry. That's why it's common to use lightweight materials like carbon fiber or high-tech lightweight alloys.

**Fire Resistance:** In order to comply with safety regulations, aircraft seats must possess fire-resistant properties. Materials such as Nomex are widely utilized in aviation due to their fire-repellent properties.

**Durability:** It is essential for airplane seats to be able to withstand the effects of flight, such as vibrations and impacts. To ensure the seat remains in good condition, It is advised to utilize materials that are extremely robust, such as plastics, metals or composite materials[10].

**Comfort:** Helicopters are used for a variety of purposes, including transportation, medical evacuations, and other missions. When it comes to passenger comfort in Pilatus PC-24 airplane, there are a number of factors to consider, such as the type of padding, the material used for cushioning, and the ergonomic design of Pilatus PC-24 [12].

**Maintenance and Cleanliness:** In order to maintain and maintain the cleanliness of airplane seats, it is important to select materials and fabrics that are easy to clean. This will ensure that the seat remains in good condition and meets hygiene and posh standards.

**Regulations and Certification:** Aviation safety and certification requirements for seat materials must be met by the relevant regulatory bodies, including the FAA in the US and EASA in Europe.

**Cost:** The selection of seat materials is based on comfort and posh materials for looking and satisfying it's crystal standards and also can also be used for medical emergency purpose.

**Aesthetics:** For using as business class jet we have maintain the standards of comfort and aesthetics.

**IV. CALCULATION**

**Payload weight:** The quantity of cargo, passenger and medical equipment that can be stored on board and transported safely.

- Baseline Payload Capacity: 2,500 kg
- Medical Payload: 500 kg
- Executive Payload: 1,000 kg

Total Payload Requirement = 2,500 kg (baseline) + 500 kg (medical) + 1,000 kg (executive) = 4,000 kg

- If the maximum certified payload capacity of the Pilatus PC-24 is 4,500 kg, then the calculated total payload requirement (4,000 kg) is within the allowable limits. This ensures that the aircraft can effectively carry the necessary payload for both air ambulance and business jet missions without exceeding its certified capacity [8] [10].

**Weight and Balance Analysis**

Baseline Empty Weight: 8,000 kg

Baseline CG: 30% MAC (Mean Aerodynamic Chord)

Added Weight for Air Ambulance: 1,000 kg (distributed as per design)

Added Weight for Business Jet: 500 kg (distributed as per design)

Total Weight = 8,000 kg (baseline) + 1,000 kg (air ambulance) + 500 kg (business jet) = 9,500 kg

New Center of Gravity = (Baseline CG \* Baseline Weight + Air Ambulance CG \* Air Ambulance Weight + Business Jet CG \* Business Jet Weight) / Total Weight

Fuel tank Capacity = 5384 lbs  
= 3079 lit

Specific fuel Capacity (SFC): is the amount of fuel burned per unit time needed to generate a given engine power.

$$SFC = \text{Fuel Flow (lbs/hr)} / \text{Thrust (lbs)}$$

$$= 0.545$$

**Cabin Configuration**

Length of Cabin:

$$L_c = 7000\text{mm (7m)}$$

Width of Cabin:

$$W_c = 1650\text{mm (1.65m)}$$

Nose Length:

$$L_n = 1260\text{mm (1.26m)}$$

**V. DESIGN**

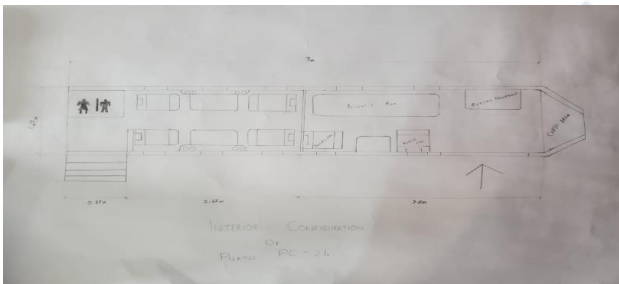
1. First of all take measurement of interior of Pilatus PC-24
2. Then take proper 2d-design of seat arrangement on sketch [9]
3. Make proper 2d-design on Catia to understand the layout of seat arrangement as top view.

Give the proper dimension of different part of object which are taking space in fuselage.



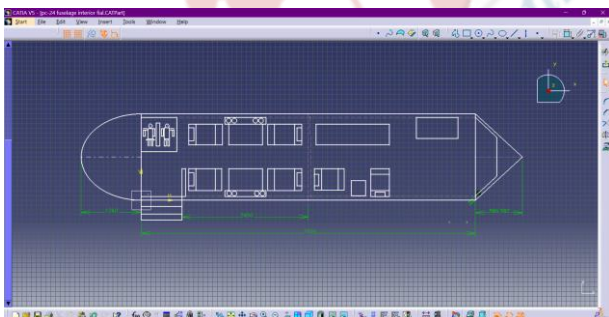
**Fig.1.** Seat model selected for Pilatus pC-24

1. This seat is specially selected for fitting in for business class.
2. This seat can turn into bed for maximum comfort.
3. This seat can be use as a stretcher bed after some tuning.



**Fig.2.** Seat configuration sketch

1. This sketch drawing was made on paper on a scale of 1m to 6cm.
2. This design allows flexible interior layout that allows for quick conversion between Business class seating and medical emergency mode.



**Fig.3.** 2d-design of seat configuration

**Design steps :**

1. Choosing seat arrangement
2. Choosing seat model
3. Choosing seat material
4. Making proper sketch of layout

5. Turn sketch into 2d top view model in software
6. Give dimension to understand the layout space

**VI. CONCLUSION:**

Converting the Pilatus P-24 business jet into an air ambulance is a strategic and impactful decision that holds the potential to enhance emergency medical services. The modification brings forth a range of advantages, addressing critical needs in the realm of aeromedical transport. Firstly, the Pilatus P-24's existing features, such as its speed, range, and advanced avionics, make it an ideal platform for air ambulance services. The modification incorporates medical equipment and facilities tailored to meet the demands of emergency medical care, ensuring a seamless transition from a business jet to a life-saving air ambulance. The increased mobility of the Pilatus P-24 Air ambulance enables faster response times during medical emergencies, especially in remote or underserved areas. Furthermore, the conversion addresses the growing need for flexible and efficient air ambulance services, capable of adapting to diverse medical scenarios. The well-equipped medical cabin ensures that the aircraft can accommodate various medical conditions, offering a high standard of care during transit. In conclusion, the transformation of the Pilatus 24 business jet into an air ambulance is a forward-thinking solution that aligns with the evolving landscape of emergency medical services. This modification not only capitalizes on the aircraft's existing capabilities but also addresses critical gaps in aeromedical transport. The Pilatus P-24 air ambulance stands as a testament to innovation in the aviation industry, promising to contribute significantly to the improvement of global healthcare infrastructure.

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