

Modifying Fueslage Seating Arrangement of Lear jet 45 Aircraft

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ABSTRACT: Business jet or private jet is a term describing a jet aircraft, usually of smaller size, designed for transporting group of people or wealthy individuals .The project involves the design of fuselage of Lear jet 45 such that it can accommodate 10 person at full seating layout. It is design is such way that it can be helpful during medical emergency also. It is made in such way that the seat can be converted to stretcher. And it will also provide the level of comfort that a business jet is expected to provide.

KEYWORDS: Modifying fuselage, Business jet, medical emergency, Design of fuselage, Lear jet 45.

I. INTRODUCTION

Aircraft design is separate discipline of aeronautical engineering different from the analytical discipline such as aerodynamic, structure controls, and propulsion .An aircraft designer needs to be well involved in these and many other specialties . Instead, the designer’s time in spent doing something called “design”, creating the geometric description of a thing to be built. A business jet, private jet, or bizjet, is a jet aircraft designed for transporting small groups of people. Business jet may be adapted for other roles, such as evacuation of casualties or express parcel deliveries, and some are used by public bodies, government officers or armed force. Every aircraft goes through many changes in design before it is finally built in factory. It takes lot of time to implement our imagination to our actual design. Here we are only considering the change in the actual design of fuselage of Lear jet 45. In current project we are not considering the external parameters such as stress, torque, loads. When we look at design of fuselage we may find the many common parameters such as seats and all that. But these will be something new that the seat can be change to stretcher and would be helpful for medical emergency as well, with the equal comfort that the aircraft use to provide. Lear jet 45 aircraft is a super light business jet aircraft produce by Lear jet Division of bombardier Aerospace. The Model 45 was the first all new design since the original Lear jet and significantly altered the Lear jet line .Through it’s for different variant from 1990 to 2012.The aim main aim of Lear jet is to provide the comfort.

II. LITERATURE REVIEW

1. The eight-passenger variant was used as the primary design driver given its higher payload and resulting performance impact. Multiple Class I concepts were considered; these included conventional and unconventional component configurations across a variety of weight classes. Ultimately, a canard-equipped aircraft with a maximum gross take-off weight of roughly 17,000 lbs was selected. Rigorous technical analysis was performed to validate this design choice using several commercial software packages for computational fluid dynamics, finite element analysis, trade-study-guided optimization, and computer-aided design and simulation. In addition, several custom software applications were developed in order to optimize the wing and canard size, location, and stability characteristics. Due to the highly-coupled nature of the design, all analyses were extensively iterated.

2. This paper introduces aircraft design education at the Department of Aeronautics and Astronautics, the University of Tokyo. The details of this activity are explained. The aim of the design education is to enhance students' ability to integrate engineering systems, which is one of the educational discipline and goals of our Department. To accomplish

this educational goal, the aircraft design education plays an important role. This paper describes details of the aircraft design courses both for the undergraduate and graduate students.

3. This paper discusses the design of light jet aircraft (LJA) in the university level. The design process that covers by this paper is just from conceptual approach. Current technical information of the light jet aircraft in the market will be studied for competitor analysis purpose. After that, the calculation process will take part, like initial sizing, performance sizing, and initial sizing of main component, weight breakdown, cg (centre of gravity) position and aircraft performance. It concludes with a discussion of the results and recommendations for future work. This paper will only concentrate on conceptual design, the next stage of design can be continuing in future with the data from this paper.

4. The modern jet transport is considered as one of the finest integration of technologies. Its economic success depends on performance, low maintenance costs and high passenger appeal and design plays a vital role in summing up all these factors. Conceptual design is the first step to design of an aircraft. In this paper a business jet aircraft is designed to carry 8 passengers and to cover a range of 2000 NM with maximum Mach No of 0.7 and with maximum ceiling of 29,000 ft. The conceptual design consisted of initial sizing, aerodynamics and performance analysis. Through trade studies and comparison with other business jet aircrafts a final model of the aircraft was built to achieve the requirements.

5. The aim of this design project is to analysis an 8 Seater Short Range Executive Aircraft by a structural analysis of Shear force and bending moment. Have to design a more strength aircraft by give the support of stringer, ribs, spar in Wing section and to give the support of Stinger, bulkhead, longer in Fuselage. The flying strength of aircraft is analysis by Vn diagram Then the Design of Miscellaneous Members of Wing Fuel Tank, Rib location and direction Empennage Design. Auxiliary Surfaces, wing Fuselage Intersection, Flutter, Aileron Buzz and Buffeting. Then the necessary graphs have to be plotted for further performance calculation required diagrams are also drawn.

III. METHODOLOGY

The process composed in three phases: (i) modification of fuselage, (ii) calculation of changed parameters & analysis of the fuselage, (iii) make a RC model of the aircraft. In fuselage modification we design fuselage with capacity of 11 instead of capacity of 9; we also included addition future of emergency convert able stretcher seats & emergency door. Then we will calculate the parameters like stress, load & torque which applying on the fuselage by analyse it in the ANSYS. Then from the gain of the new values of the parameters we will make a scaled RC model of the aircraft.

SPECIFICATION OF LEARJET45

- Crew:2
- Capacity:9 passenger
- Length:17.68m
- Wingspan:14..58m
- Height:4.30m
- Wing area:28.95m²
- Empty weight:5829kg
- Max. take-off weight:9752kg
- Powerplant:2× Honeywell TFE731-20 turbofan(15.57kN each)
- Maximum speed:0.81mach
- Cruise speed:0.76mach
- Range:1710nmi(4 passengers)
- Service ceiling:51000ft



Fig.1: Seating arrangement of Lear Jet-45 with 9 seating capacity

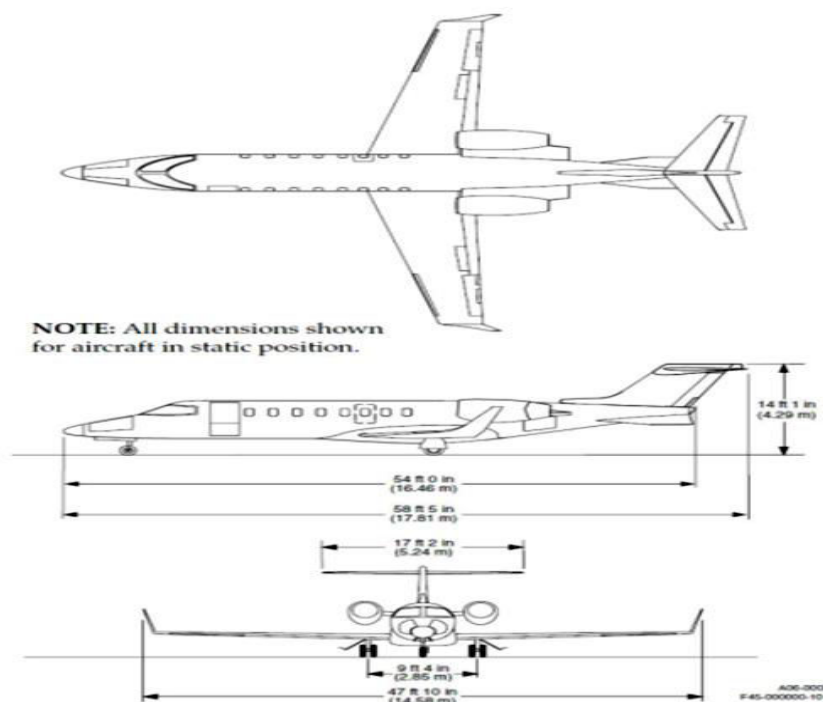


Fig. 2: Dimensions of Lear Jet-45

IV. DESIGN MODIFICATION

In fuselage modification we design fuselage with capacity of 11 instead of capacity of 9; we also included addition future of emergency convert able stretcher seats & emergency door. We rearrange the fuselage seating and add 2 seats in the same design and more comfortable than the original one. Also inspired from current situation of the world we designed convertible stretcher seats which are front four seats and also include emergency exit door for carry patient, the modified design parameters are shown in following figure.

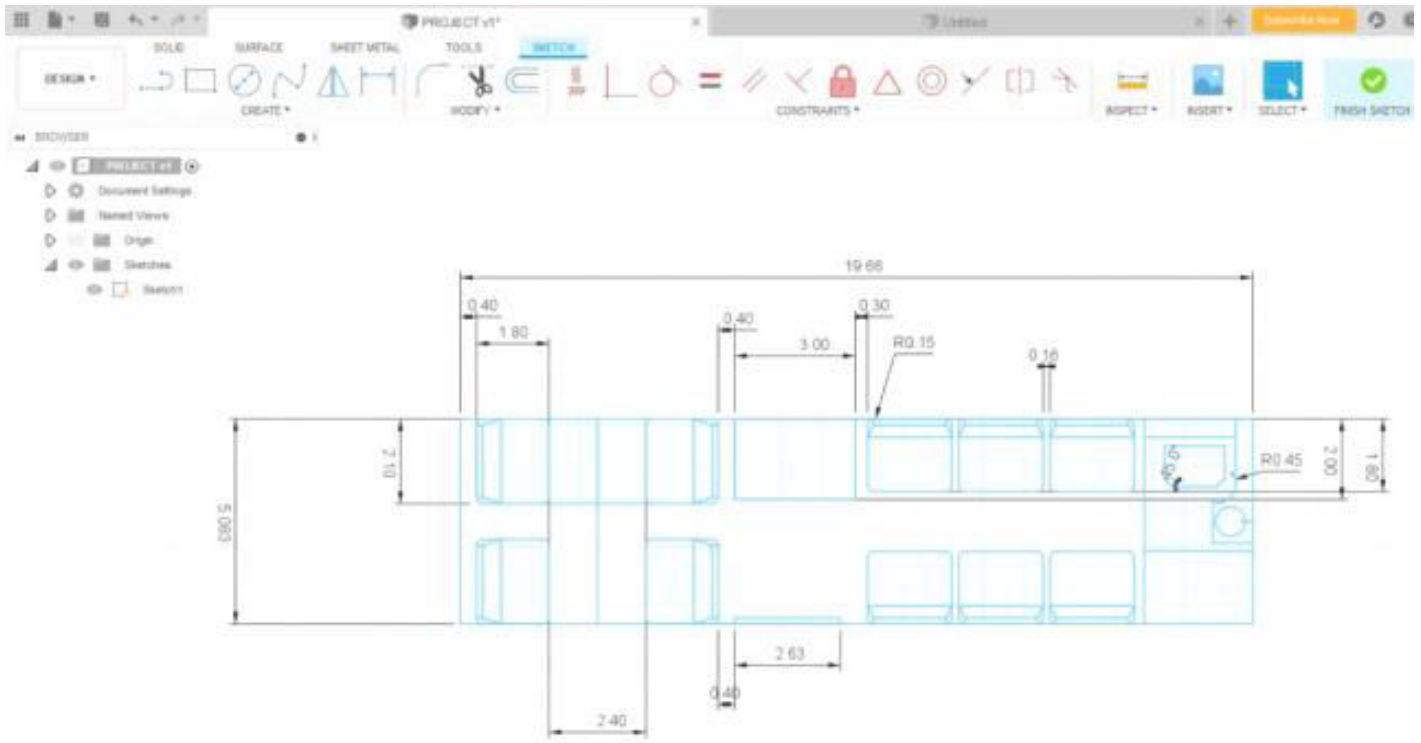


Fig.3: Fuselage design with 10+1 seating arrangement in Ansys.

V. CONCLUSION

From the current situation in the world we are inspired to make this kind of design which can use in emergency conditions to carry patient quickly. In normal conditions our design provides seating of 10 passengers, which more capacity, than the original one design.

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