||Jai Sri Gurudev ||

S.J.C. Institute of Technology, Chickballapur

Department of Aeronautical Engineering

**Subject : Aircraft Material Science**

**Subject Code: 17AE45**

1. Select an Aircraft and list the functions and materials of different parts.(5marks)

Topics to be included:

- **Parts**

  1.Structure

  2.Engine Components

  3.Wings

  4.Interiors(Cabins, flooring..etc)

  5.Casings/Coverings

  6.Fastners

- **Materials**

  1.Metals/Alloys

  2.Composites

  3.Polymers/Plastics

  4.Wood

  5. Glass

***This has to submitted in the form of REPORT**

At the End of the report put the URL's which you have referred to collect the information

(V Rajan)

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S.J.C. INSTITUTE OF TECHNOLOGY
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# Case Study Report

**Subject code:** 17AE45
**Subject :** Aircraft Material Science

**Submitted by,**

| | |
|---|---|
| Name | USN |
| Name | USN |
| Name | USN |
| Name | USN |

**Mentor,**

VINAY P
Assistant Professor
Department of Aeronautical Engineering
S. J. C. Institute of Technology
Chikkaballapur

Title of the mini project

**Abstract**

Content – 12 – Calibri font

Main heading – 20 – Calibri font – bold

Sub heading – 16 -Calibri font – bold

Citation and reference in Harvard style

## Abstract

Content – 12 – Calibri font
Main heading – 16 – Calibri font – bold
Sub heading – 14- Calibri font – bold
Citation and reference in Harvard style

||JAI SRI GURUDEV||

S.J.C. INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING

# CASE STUDY REPORT

**Subject code:** 17AE45
**Subject :** AIRCRAFT MATERIAL SCIENCE

**Submitted by,**


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## INDEX



## FIGURE CONTENTS

## Introduction

The AIRBUS A350 XWB is the family of long range twin engine wide body jet airline.

It is developed by European aerospace manufacturer Airbus.

Its variants seat 280 to 366 passengers in typical three class seating layouts.

**NATIONAL ORIGIN:** Multi-national

**PRIMARY USERS:** Qatar Airways, Cathay Pacific, Singapore Airlines, China Airlines

**UNIT COST:** US$ 317.4 million

## Structures:

A350xwb has 53% composite in its structure

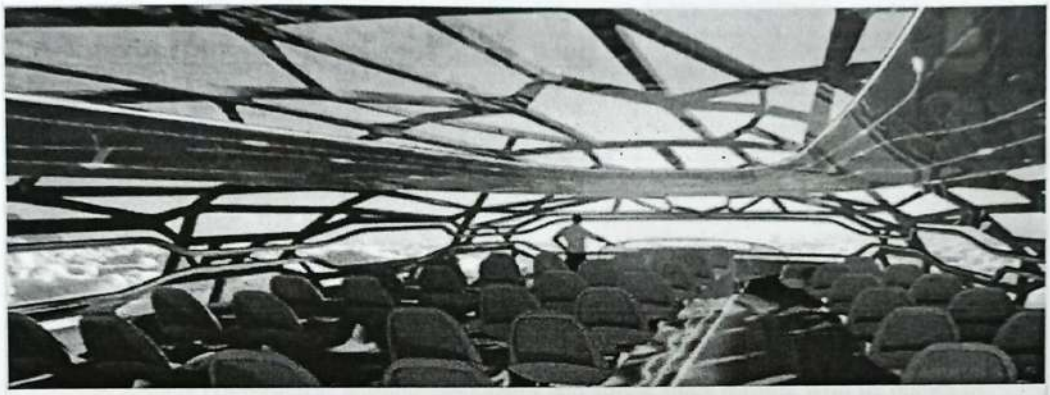
High performance composite are CFRP are used in primary structures of modern aircrafts structure by replacing classical materials like al & steel

Primary and secondary structures are made of same materials with different reinforcement

Spars attached to the aluminium-lithium ribs

"Concept cabin" which is inspired by nature {transparent with intelligent cabin membrane} this membrane is supported by bionic structure and control temp of air in cabin

## Bionic structure constructed using large scale ALMT



Cabin membrane:the lattice structure could be constructed using large-scale additive layer manufacturing techniques

Fig 1

## Structure and composite material in pi diagram with structural members

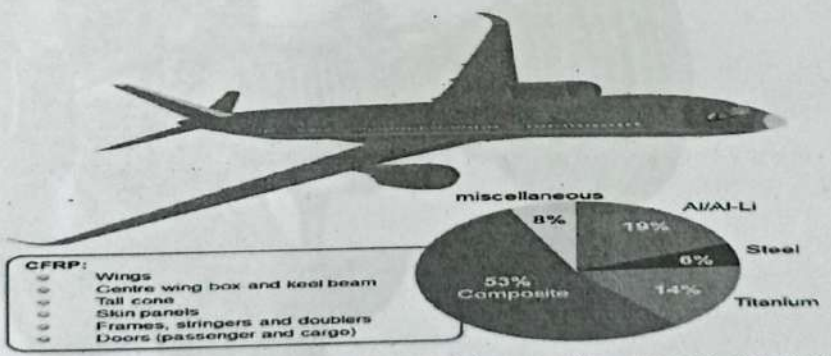



**Figure 1** (Color online) Materials used in a modern aircraft, the Airbus A350 XWB [6].

Fig 2

## Engine components and materials used

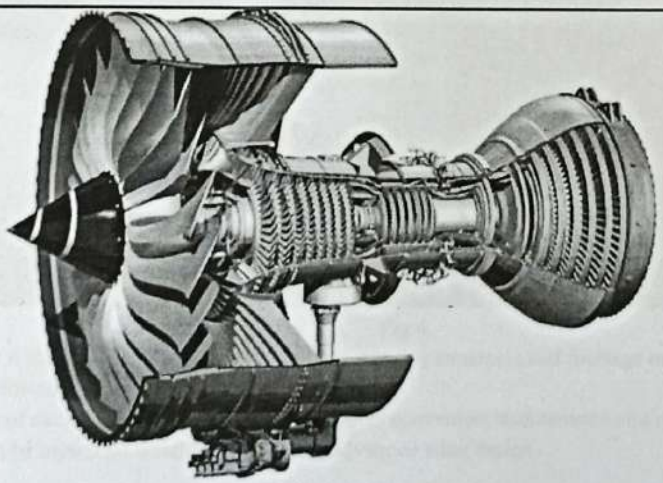
It includes heat resistant materials, which enhances efficiency, and larger bearings able to handle greater load

It's a 3 shaft turbofan, lighter than previous family of Trent which owes blisks (rotor disc &blade)

It has thicker titanium fan blades and a stronger fan casing with an internal warren girder structure

It includes 8 stage compressor, annular combustor and single stage turbine with its blades of single crystal nickel alloy

## Engine components:



Engine: the main fan for the Rolls-Royce Trent XWB is 3m across, and it also incorporates one-piece bladed discs

Fig 3

## Engine components and its materials:

CMC is used for turbine because of high temperature capability in the first stage seal segments and cast bound first stage vanes; hybrid ball bearings with ceramic rollers running on metallic races required to manage high loads.
Exhaust nozzle: nickel and stainless steel alloys.
Combustion chamber: super alloys with refractory metals.

## Wings:

Fig 4

The A350 XWB is the first airbus to have its wing structures and fuselage made of carbon-fibre reinforced plastic.
Use of carbon fibre reinforced plastic ensures convenient maintenance and results in lower fuel burn by minimum weight and allowing advanced wing design.

## Interiors and cabins:

**Fig 5**

Composites for interior (cabin side walls & furnishes) need good time properties combined with a very low weight as it is realised by currently used glass fibre reinforced phenolic resin sandwich panel

## Covering and casing:

The covers are single piece rather than multiple parts
The skins for the wings are bonded rather than bolted into place
14% of airframe is titanium (light weight, high corrosion resistance, strong)

## Fasteners:

Fasteners are used to assemble the structural parts of a aircraft.
The purpose of the fasteners is to connect all the different parts together in primary and secondary structural areas, pressurised and non-pressurised applications and to transfer loads from one part to another in both production and repair applications.
EN6114 AND EN6115 SERIES FASTNERS.

## Bibliography:

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**CASE STUDY RUBRICS**

Subject: AIRCRAFT MATERIAL SCIENCE

Subject Code: 17AE45

| Sl.No | USN | Name of the Student | A | B | C | TOTAL |
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|---|---|---|
| A | All the relevant information is obtained and information source is valid | 1 |
| B | Explanation with diagrams(Pictures) | 2 |
| C | Presentation | 2 |

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