

CHAPTER 4

AIRCRAFT BASIC CONSTRUCTION

INTRODUCTION

Naval aircraft are built to meet certain specified requirements. These requirements must be selected so they can be built into one aircraft. It is not possible for one aircraft to possess all characteristics; just as it isn't possible for an aircraft to have the comfort of a passenger transport and the maneuverability of a fighter. The type and class of the aircraft determine how strong it must be built. A Navy fighter must be fast, maneuverable, and equipped for attack and defense. To meet these requirements, the aircraft is highly powered and has a very strong structure.

The airframe of a fixed-wing aircraft consists of the following five major units:

1. Fuselage
2. Wings
3. Stabilizers
4. Flight controls surfaces
5. Landing gear

A rotary-wing aircraft consists of the following four major units:

1. Fuselage
2. Landing gear
3. Main rotor assembly
4. Tail rotor assembly

You need to be familiar with the terms used for aircraft construction to work in an aviation rating.

STRUCTURAL STRESS

LEARNING OBJECTIVE: Identify the five basic stresses acting on an aircraft.

The primary factors to consider in aircraft structures are strength, weight, and reliability. These factors determine the requirements to be met by any material used to construct or repair the aircraft. Airframes must be strong and light in weight. An aircraft built so heavy that it couldn't support more than a few hundred pounds of additional weight would be

useless. All materials used to construct an aircraft must be reliable. Reliability minimizes the possibility of dangerous and unexpected failures.

Many forces and structural stresses act on an aircraft when it is flying and when it is static. When it is static, the force of gravity produces weight, which is supported by the landing gear. The landing gear absorbs the forces imposed on the aircraft by takeoffs and landings.

During flight, any maneuver that causes acceleration or deceleration increases the forces and stresses on the wings and fuselage.

Stresses on the wings, fuselage, and landing gear of aircraft are tension, compression, shear, bending, and torsion. These stresses are absorbed by each component of the wing structure and transmitted to the fuselage structure. The empennage (tail section) absorbs the same stresses and transmits them to the fuselage. These stresses are known as *loads*, and the study of loads is called a *stress analysis*. Stresses are analyzed and considered when an aircraft is designed. The stresses acting on an aircraft are shown in figure 4-1.

TENSION

Tension (fig. 4-1, view A) is defined as *pull*. It is the stress of stretching an object or pulling at its ends. Tension is the resistance to pulling apart or stretching produced by two forces pulling in opposite directions along the same straight line. For example, an elevator control cable is in additional tension when the pilot moves the control column.

COMPRESSION

If forces acting on an aircraft move toward each other to squeeze the material, the stress is called *compression*. Compression (fig. 4-1, view B) is the opposite of tension. Tension is **pull**, and compression is **push**. Compression is the resistance to crushing produced by two forces pushing toward each other in the same straight line. For example, when an airplane is on the ground, the landing gear struts are under a constant compression stress.

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Transactions of the Indian Institute of Metals, 1958 Materials and Processes Used in Aircraft Construction Johannes Karl Fink, 2025-05-23 *Materials and Processes Used in Aircraft Construction* focuses on issues involving the use of plastics in the aerospace industry A detailed discussion of their various applications is included along with the innovations presented in the literature over the past decade A wide range of important topics are discussed in the 13 chapters Following a brief presentation of the evolution of aircraft design aircraft design standards and the simulation of aircraft models individual chapters focus on The basic and special materials used in aircraft construction Lightweight materials for aircraft applications Polymers used in the aerospace industry Laminated materials used in the aerospace industry Wing helicopter and balloon designs Issues concerning the monitoring and management of the health of flight crews and passengers The benefit of information acquired in real time leading to an increased understanding of the fracture mechanics of composites improving confidence in their use and broadening their applications Since the cost of inspecting aircraft is approximately one third of the cost of acquiring and operating composite structures to compete in the increasingly demanding area of aircraft structures the cost effective techniques that need to be developed are discussed Audience This book will serve the needs of those working in the aerospace industry both those with only a passing knowledge of the field and specialists who need to increase their knowledge of any particular area **Military Construction Appropriations** United States. Congress. Senate. Committee on Appropriations, 1975 **Journal of the Indian Institute of Science** Indian Institute of Science, Bangalore, 1955 *The English Catalogue of Books [annual]* Sampson Low, 1929 Vols for 1898 1968 include a directory of publishers Russian Aviation and Air Power in the Twentieth Century John Greenwood, Von Hardesty, Robin Higham, 2014-06-11 In the light of new archival material the editors take a fresh look at Russian aviation in the twentieth century Presenting a comprehensive view of Russian aviation from its genesis in the late czarist period to the present era the approach is essentially chronological with a major emphasis on the evolution of military aviation The contributions are diverse with appropriate attention to civilian and institutional themes **Indian Skyways; the Aviation Journal of Asia**, 1954 **To Grant a Quota to Eastern Hemisphere Indians and to Make Them Racially Eligible for Naturalization** United States. Congress. House. Committee on Immigration and Naturalization, 1945 **Hearings** United States. Congress. Senate. Committee on Appropriations, 1967 Hearings United States. Congress Senate, 1967 *Elements of Map Projection with Applications to Map and Chart Construction* U.S. Coast and Geodetic Survey, Charles Henry Deetz, Oscar Sherman Adams, 1921 *Combined Statement of Receipts, Expenditures and Balances of the United States Government* United States. Department of the Treasury. Bureau of Government Financial Operations, 1951 **Military Construction and Veterans Affairs, and Related Agencies Appropriations for Fiscal Year 2012** United States. Congress. Senate. Committee on Appropriations. Subcommittee on Military Construction and Veterans Affairs, and Related Agencies, 2013

India's Great Power Politics Jo Inge Bekkevold, S. Kalyanaraman, 2020-12-22 This book examines India's foreign and defence policy changes in response to China's growing economic and military power and increased footprint across the Indo Pacific. It further explores India's role in the rivalry between China and the United States. The book looks at the strategic importance of the Indian Ocean Region in the Indo Pacific geopolitical landscape and how India is managing China's rise by combining economic cooperation with a wide set of balancing strategies. The authors in this book critically analyse the various tools of Indian foreign policy including defence posture, security alignments and soft power diplomacy among others and discuss the future trajectory of India's foreign policy and the factors which will determine the balance of power in the region and the potential risks involved. The book provides detailed insights into the multifaceted and complex relationship between India and China and will be of great interest to researchers and students of international relations, Asian studies, political science and economics. It will also be useful for policymakers, journalists and think tanks interested in the India-China relationship. Hearings, Reports and Prints of the Senate Committee on Armed Services United States. Congress. Senate. Committee on Armed Services, 1967 **Military Construction Appropriations for 2000: Overview** United States. Congress. House. Committee on Appropriations. Subcommittee on Military Construction Appropriations, 1999 **Appendix, Budget of the U.S. Government, Fiscal Year 2018** Government Publishing Office, 2017-06 Appendix Budget of the U.S. Government Fiscal Year 2018 presents detailed information on individual programs and appropriation accounts that constitutes the budget. It includes for each Government department and agency the text of proposed appropriations, language budget schedules for each account, new legislative proposals, explanations of the work to be performed and the funds needed and proposed general provisions applicable to the appropriations of entire agencies or groups of agencies. *Engineering Journal*, 1919 Vol 7 no 7 July 1924 contains papers prepared by Canadian engineers for the first World power conference July 1924 Military Construction Authorization Fiscal Year 1969 United States. Congress. House. Committee on Armed Services. Subcommittee on Military Construction, 1968 *Military Construction Appropriations for 1986* United States. Congress. House. Committee on Appropriations. Subcommittee on Military Construction Appropriations, 1985

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Table of Contents Aircraft Basic Construction Indian Institute Of

1. Understanding the eBook Aircraft Basic Construction Indian Institute Of
 - The Rise of Digital Reading Aircraft Basic Construction Indian Institute Of
 - Advantages of eBooks Over Traditional Books
2. Identifying Aircraft Basic Construction Indian Institute Of
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Aircraft Basic Construction Indian Institute Of
 - User-Friendly Interface
4. Exploring eBook Recommendations from Aircraft Basic Construction Indian Institute Of
 - Personalized Recommendations

- Aircraft Basic Construction Indian Institute Of User Reviews and Ratings
- Aircraft Basic Construction Indian Institute Of and Bestseller Lists
- 5. Accessing Aircraft Basic Construction Indian Institute Of Free and Paid eBooks
 - Aircraft Basic Construction Indian Institute Of Public Domain eBooks
 - Aircraft Basic Construction Indian Institute Of eBook Subscription Services
 - Aircraft Basic Construction Indian Institute Of Budget-Friendly Options
- 6. Navigating Aircraft Basic Construction Indian Institute Of eBook Formats
 - ePub, PDF, MOBI, and More
 - Aircraft Basic Construction Indian Institute Of Compatibility with Devices
 - Aircraft Basic Construction Indian Institute Of Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Aircraft Basic Construction Indian Institute Of
 - Highlighting and Note-Taking Aircraft Basic Construction Indian Institute Of
 - Interactive Elements Aircraft Basic Construction Indian Institute Of
- 8. Staying Engaged with Aircraft Basic Construction Indian Institute Of
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Aircraft Basic Construction Indian Institute Of
- 9. Balancing eBooks and Physical Books Aircraft Basic Construction Indian Institute Of
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Aircraft Basic Construction Indian Institute Of
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Aircraft Basic Construction Indian Institute Of
 - Setting Reading Goals Aircraft Basic Construction Indian Institute Of
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Aircraft Basic Construction Indian Institute Of
 - Fact-Checking eBook Content of Aircraft Basic Construction Indian Institute Of

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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