

AERONAUTICAL ENGINEER'S DATA BOOK



CLIFFORD MATTHEWS



Aeronautical Engineer's Data Book

Clifford Matthews BSc, CEng, MBA, FIMechE

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Preface

The objective of this *Aeronautical Engineer's Data book* is to provide a concise and useful source of up-to-date information for the student or practising aeronautical engineer. Despite the proliferation of specialized information sources, there is still a need for basic data on established engineering rules, conversions, modern aircraft and engines to be available in an easily assimilated format.

An aeronautical engineer cannot afford to ignore the importance of engineering data and rules. Basic theoretical principles underlie the design of all the hardware of aeronautics. The practical processes of fluid mechanics, aircraft design, material choice, and basic engineering design form the foundation of the subject. Technical standards, directives and regulations are also important – they represent accumulated knowledge and form invaluable guidelines for the industry.

The purpose of the book is to provide a basic set of technical data that you will find useful. It is divided into 13 sections, each containing specific 'discipline' information. Units and conversions are covered in Section 2; a mixture of metric and imperial units are still in use in the aeronautical industry. Information on FAA regulations is summarized in Section 1 – these develop rapidly and affect us all. The book contains cross-references to other standards systems and data sources. You will find these essential if you need to find more detailed information on a particular subject. There is always a limit to the amount

of information that you can carry with you – the secret is knowing where to look for the rest.

More and more engineering information is now available in electronic form and many engineering students now use the Internet as their first source of reference information for technical information. This new *Aeronautical Engineer's Data Book* contains details of a wide range of engineering-related websites, including general 'gateway' sites such as the Edinburgh Engineering Virtual Library (EEVL) which contains links to tens of thousands of others containing technical information, product/company data and aeronautical-related technical journals and newsgroups.

You will find various pages in the book contain 'quick guidelines' and 'rules of thumb'. Don't expect these all to have robust theoretical backing – they are included simply because I have found that they *work*. I have tried to make this book a practical source of aeronautics-related technical information that you can use in the day-to-day activities of an aeronautical career.

Finally, it is important that the content of this data book continues to reflect the information that is needed and used by student and experienced engineers. If you have any suggestions for future content (or indeed observations or comment on the existing content) please submit them to me at the following e-mail address: aerodatabook@aol.com

Clifford Matthews

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Special thanks are due to Stephanie Evans, Sarah Pask and John King for their excellent work in typing and proof reading this book.

Disclaimer

This book is intended to assist engineers and designers in understanding and fulfilling their obligations and responsibilities. All interpretation contained in this publication – concerning technical, regulatory and design information and data, unless specifically otherwise identified, carries no authority. The information given here is not intended to be used for the design, manufacture, repair, inspection or certification of aircraft systems and equipment, whether or not that equipment is subject to design codes and statutory requirements. Engineers and designers dealing with aircraft design and manufacture should not use the information in this book to demonstrate compliance with any code, standard or regulatory requirement. While great care has been taken in the preparation of this publication, neither the author nor the publishers do warrant, guarantee, or make any representation regarding the use of this publication in terms of correctness, accuracy, reliability, currentness, comprehensiveness, or otherwise. Neither the publisher, author, nor anyone, nor anybody who has been involved in the creation, production, or delivery of this product shall be liable for any direct, indirect, consequential, or incidental damages arising from its use.

Section 1

Important regulations and directives

A fundamental body of information is contained in the US Federal Aviation Regulations (FAR). A general index is shown below:

Federal Aviation Regulations

Chapters I and III

Subchapter A – definitions and abbreviations

Part 1: Definitions and abbreviations

Subchapter B – procedural rules

Part 11: General rule-making procedures

Part 13: Investigative and enforcement procedures

Part 14: Rules implementing the Equal Access to Justice Act of 1980

Part 15: Administrative claims under Federal Tort Claims Act

Part 16: Rules of practice for federally-assisted airport enforcement proceedings

Part 17: Procedures for protests and contracts disputes

Subchapter C – aircraft

Part 21: Certification procedures for products and parts

Part 23: Airworthiness standards: normal, utility, acrobatic, and commuter category airplanes

Part 25: Airworthiness standards: transport category airplanes

- Part 27: Airworthiness standards: normal category rotorcraft
- Part 29: Airworthiness standards: transport category rotorcraft
- Part 31: Airworthiness standards: manned free balloons
- Part 33: Airworthiness standards: aircraft engines
- Part 34: Fuel venting and exhaust emission requirements for turbine engine powered airplanes
- Part 35: Airworthiness standards: propellers
- Part 36: Noise standards: aircraft type and airworthiness certification
- Part 39: Airworthiness directives
- Part 43: Maintenance, preventive maintenance, rebuilding, and alteration
- Part 45: Identification and registration marking
- Part 47: Aircraft registration
- Part 49: Recording of aircraft titles and security documents
- Subchapter D – airmen
- Part 61: Certification: pilots and flight instructors
- Part 63: Certification: flight crewmembers other than pilots
- Part 65: Certification: airmen other than flight crewmembers
- Part 67: Medical standards and certification
- Subchapter E – airspace
- Part 71: Designation of class a, class b, class c, class d, and class e airspace areas; airways; routes; and reporting points
- Part 73: Special use airspace
- Part 77: Objects affecting navigable airspace
- Subchapter F – air traffic and

general operation rules

- Part 91: General operating and flight rules
- Part 93: Special air traffic rules and airport traffic patterns
- Part 95: IFR altitudes
- Part 97: Standard instrument approach procedures
- Part 99: Security control of air traffic
- Part 101: Moored balloons, kites, unmanned rockets and unmanned free balloons
- Part 103: Ultralight vehicles
- Part 105: Parachute jumping
- Part 107: Airport security
- Part 108: Airplane operator security
- Part 109: Indirect air carrier security

Subchapter G – air carriers and operators for compensation or hire: certification and operations

- Part 119: Certification: air carriers and commercial operators
- Part 121: Operating requirements: domestic, flag, and supplemental operations
- Part 125: Certification and operations: airplanes having a seating capacity of 20 or more passengers or a maximum payload capacity of 6000 pounds or more
- Part 129: Operations: foreign air carriers and foreign operators of US – registered aircraft engaged in common carriage
- Part 133: Rotorcraft external-load operations
- Part 135: Operating requirements: commuter and on-demand operations
- Part 137: Agricultural aircraft operations
- Part 139: Certification and operations: land airports serving certain air carriers

Subchapter H – schools and other certificated agencies

Part 141: Pilot schools

Part 142: Training centers

Part 145: Repair stations

Part 147: Aviation maintenance technician schools

Subchapter I – airports

Part 150: Airport noise compatibility planning

Part 151: Federal aid to airports

Part 152: Airport aid program

Part 155: Release of airport property from surplus property disposal restrictions

Part 156: State block grant pilot program

Part 157: Notice of construction, alteration, activation, and deactivation of airports

Part 158: Passenger Facility Charges (PFCs)

Part 161: Notice and approval of airport noise and access restrictions

Part 169: Expenditure of federal funds for nonmilitary airports or air navigation facilities thereon

Subchapter J – navigational facilities

Part 170: Establishment and discontinuance criteria for air traffic control services and navigational facilities

Part 171: Non-federal navigation facilities

Subchapter K – administrative regulations

Part 183: Representatives of the administrator

Part 185: Testimony by employees and production of records in legal proceedings, and service of legal process and pleadings

Part 187: Fees

Part 189: Use of federal aviation administration communications system