

Second Edition

# Aviation Law

Cases, Laws and  
Related Sources

Paul B. Larsen

Joseph C. Sweeney

John E. Gillick

MARTINUS NIJHOFF PUBLISHERS







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## Cases, Laws and Related Sources

Second Edition

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By

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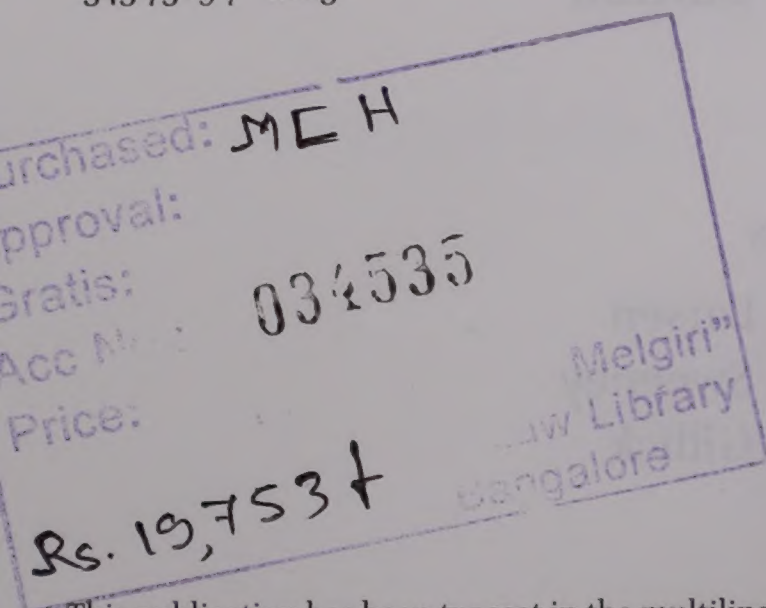
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## CONTENTS

|                                                                                      |              |
|--------------------------------------------------------------------------------------|--------------|
| <i>Preface</i> .....                                                                 | <i>xxi</i>   |
| <i>Acknowledgments</i> .....                                                         | <i>xxiii</i> |
| <b>Introduction: Evolution of the Aviation Industry</b> .....                        | <b>1</b>     |
| A. Introduction.....                                                                 | 1            |
| B. Early History of Flight .....                                                     | 1            |
| 1. Lighter Than Air (Balloons to Blimps).....                                        | 2            |
| 2. Heavier Than Air .....                                                            | 3            |
| C. The First World War Era .....                                                     | 6            |
| D. The Inter-War Years (1919–1939).....                                              | 7            |
| 1. Internationalism.....                                                             | 7            |
| 2. Imperial Air Service to Colonies.....                                             | 7            |
| 3. Airmail.....                                                                      | 8            |
| 4. The Anti-Competitive Scandal (1930–1934) .....                                    | 8            |
| 5. The Atlantic Challenge (1919–1927).....                                           | 9            |
| 6. Passenger and Cargo Services .....                                                | 11           |
| 7. Federal Regulation of the Air Transportation Industry.....                        | 12           |
| E. Aircraft Design and Manufacturers .....                                           | 13           |
| F. The Beginnings of Airlines in America and Their Competitive<br>Struggles.....     | 18           |
| G. The Second World War (1939–1945).....                                             | 23           |
| H. Total Regulation of the Aviation Industry.....                                    | 26           |
| I. Jets, Supersonic Flight and the Race into Space.....                              | 27           |
| J. Deregulation.....                                                                 | 29           |
| K. September 11, 2001 .....                                                          | 30           |
| <b>Chapter 1: International Law of Air Operations</b> .....                          | <b>33</b>    |
| A. Development.....                                                                  | 33           |
| 1. The 1919 Treaty of Paris (International Convention<br>on Air Navigation).....     | 35           |
| 2. The 1928 Pan American Convention on Commercial Aviation.....                      | 36           |
| 3. The 1944 Chicago Conference (International<br>Convention on Civil Aviation) ..... | 36           |
| B. The Chicago Convention.....                                                       | 39           |
| Preamble.....                                                                        | 39           |

|                                                                                                                                               |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----|
| Part I—Air Navigation                                                                                                                         |    |
| Chapter I—General Principles and Application<br>of the Convention, Articles 1–4 .....                                                         | 40 |
| Chapter II—Flight over Territory of Contracting States,<br>Articles 5–16.....                                                                 | 44 |
| Chapter III—Nationality of Aircraft, Articles 17–21.....                                                                                      | 49 |
| Chapter IV—Measures to Facilitate Air Navigation,<br>Articles 22–28.....                                                                      | 50 |
| Chapter V—Conditions to Be Fulfilled with Respect<br>to Aircraft, Articles 29–36 .....                                                        | 53 |
| Chapter VI—International Standards and Recommended<br>Practices, Articles 37–42.....                                                          | 56 |
| British Caledonian Airways Ltd. v. Bond .....                                                                                                 | 59 |
| Part II—The International Civil Aviation Organization                                                                                         |    |
| Chapter VII—The Organization, Articles 43–47 .....                                                                                            | 72 |
| Chapter VIII—The Assembly, Articles 48–49.....                                                                                                | 74 |
| Chapter IX—The Council, Articles 50–55 .....                                                                                                  | 75 |
| Chapter X—The Air Navigation Commission, Articles 56–57 .....                                                                                 | 77 |
| Chapter XI—Personnel, Articles 58–60.....                                                                                                     | 78 |
| Part IV—Final Provisions                                                                                                                      |    |
| Chapter XVII—Other Aeronautical Agreements<br>and Arrangements, Articles 80–83bis.....                                                        | 78 |
| Chapter XVIII—Disputes and Default, Articles 84–88 .....                                                                                      | 80 |
| Chapter XIX—War .....                                                                                                                         | 81 |
| Chapter XX—Annexes, Article 90.....                                                                                                           | 81 |
| Chapter XXI—Ratifications, Adherences, Amendments,<br>and Denunciations, Articles 91–95.....                                                  | 82 |
| Chapter XXII—Definitions, Article 96 .....                                                                                                    | 83 |
| Further Reading.....                                                                                                                          | 83 |
| <br>Chapter 2: Crimes, Torts and Rage Involving Aircraft .....                                                                                | 85 |
| A. International Crimes .....                                                                                                                 | 85 |
| 1. 1963 Convention on Offenses and Certain Other Acts<br>Committed on Board Aircraft (Tokyo Convention) .....                                 | 85 |
| Convention on Offences and Certain Other Acts Committed<br>on Board Aircraft Signed at Tokyo, on 14 September 1963<br>(Tokyo Convention)..... | 87 |
| Chapter I—Scope of the Convention, Articles 1–2 .....                                                                                         | 87 |
| Chapter II—Jurisdiction, Articles 3–4.....                                                                                                    | 87 |
| Chapter III—Powers of the Aircraft Commander, Articles 5–10.....                                                                              | 88 |
| Chapter IV—Unlawful Seizure of Aircraft, Article 11.....                                                                                      | 90 |
| Chapter V—Powers And Duties of States, Article 12–15 .....                                                                                    | 90 |
| Chapter VI—Other Provisions, Articles 16–17.....                                                                                              | 92 |

|                                                                                                                                                                            |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Chapter VII—Final Clauses, Articles 24–26 .....                                                                                                                            | 92  |
| 2. 1970 Convention for the Suppression of Unlawful<br>Seizure of Aircraft (Hague Convention on Hijacking) .....                                                            | 94  |
| Convention for the Suppression of Unlawful Seizure<br>of Aircraft Signed at the Hague, on 16 December 1970<br>(The Hague Convention 1970), Articles 1–14.....              | 95  |
| 3. 1971 Convention for the Suppression of Unlawful Acts<br>against the Safety of Civil Aviation (Montreal Convention).....                                                 | 99  |
| Convention for the Suppression of Unlawful Acts against<br>the Safety of Civil Aviation, Articles 1–16.....                                                                | 101 |
| 4. Protocol for the Suppression of Unlawful Acts of Violence<br>at Airports Serving International Civil Aviation (1971).....                                               | 106 |
| Supplementary to the Convention for the Suppression<br>of Unlawful Acts against the Safety of Civil Aviation<br>Done at Montreal on 23 September 1971, Articles I–III..... | 106 |
| B. Prosecutions of International Terrorists in the United States.....                                                                                                      | 107 |
| United States v. Yunis .....                                                                                                                                               | 108 |
| United States v. Yousef .....                                                                                                                                              | 114 |
| United States v. Rezaq .....                                                                                                                                               | 121 |
| C. Federal Crimes Aboard Aircraft in the United States.....                                                                                                                | 130 |
| 1. Substantive Criminal Laws.....                                                                                                                                          | 130 |
| 2. Criminal Prosecutions.....                                                                                                                                              | 132 |
| Title 49—Transportation                                                                                                                                                    |     |
| Sec. 46501. Definitions.....                                                                                                                                               | 132 |
| Sec. 46506. Application of Certain Criminal Laws<br>to Acts on Aircraft .....                                                                                              | 133 |
| United States v. Georgescu.....                                                                                                                                            | 134 |
| United States v. Healy.....                                                                                                                                                | 145 |
| United States v. Compton.....                                                                                                                                              | 148 |
| Title 49—Transportation                                                                                                                                                    |     |
| Sec. 46504. Interference with Flight Crew Members<br>and Attendants .....                                                                                                  | 151 |
| United States v. Hicks.....                                                                                                                                                | 151 |
| Sec. 46505. Carrying a Weapon or Explosive on an Aircraft .....                                                                                                            | 163 |
| United States v. Garrett.....                                                                                                                                              | 164 |
| Title 49—Transportation                                                                                                                                                    |     |
| Sec. 46507. False Information and Threats.....                                                                                                                             | 177 |
| United States v. Omirly .....                                                                                                                                              | 177 |
| D. Civil Liability in Tort for Criminal Offenses onboard<br>Aircraft .....                                                                                                 | 182 |
| Chumney v. Nixon.....                                                                                                                                                      | 182 |
| Stanford v. Kuwait Airways Corporation .....                                                                                                                               | 189 |
| E. Air Rage .....                                                                                                                                                          | 200 |

**Chapter 3: Economic Regulation of Domestic Aviation.....203**

- A. Domestic Air Carrier Licensing.....204
  - Skylink Airways, Inc.....204
  - Appendix: Citizenship Standards ..... 218
  - In the Matter of the Citizenship of DHL Airways, Inc..... 221
  - ATX, Inc. v. U.S. Dept. of Transportation.....224
- B. Certificate Transfers .....229
  - Joint Application of American Airlines, Inc. and Trans World Airlines, Inc.....230
- C. Suspension and Revocation of Certificates ..... 241
  - In the Matter of the Revocation of the Certificate of Public Convenience and Necessity Issued to Kiwi International Holdings, Inc. D/B/A Kiwi International Air Lines, Inc..... 241
- D. Anti-Competitive Practices ..... 251
- E. Consumer Protection and Dot Enforcement Concerning Unfair or Deceptive Practices.....252
- F. Slots And Their Allocation.....253
- G. Service to Small Communities.....255
  - 1. Essential Air Service Program.....255
    - Essential Air Service at Fort Dodge, Iowa, and Mason City, Iowa .....255
  - 2. Small Community Air Service Development Program..... 261
- H. Financial Assistance to the Airline Industry after September 11, 2001..... 261
- I. Preemption.....262

**Chapter 4: Economic Regulation of International Aviation..... 265**

- A. The International Convention on Civil Aviation (Chicago Convention)..... 265
- B. Evolution of U.S. Bilateral Air Transport Agreements ..... 266
- C. Multi-Lateral Agreements..... 268
- D. Disputes under U.S. Bilaterals..... 268
  - 1. Bilateral Resolution Mechanism ..... 269
  - 2. Fair Competitive Practices Act..... 269
    - Joint Complaint of American Airlines, Inc. and United Air Lines, Inc.....270
  - 3. Part 213 .....272
- E. Grant of International Route Authority .....272
  - 1. U.S. Carrier Authority .....272
    - In the Matter of 2005/2006 U.S.-China Air Services Case and Designations.....273
  - 2. Foreign Carrier Authority ..... 281

|                                                                                                                                                                                                  |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Application of Koninklijke Luchtvaart Maatschappij<br>D/B/A Klm Royal Dutch Airlines for an Amended Foreign<br>Air Carrier Permit Under Section 402 of the Federal<br>Aviation Act of 1958 ..... | 282 |
| 3. Presidential Review .....                                                                                                                                                                     | 286 |
| Chicago & Southern Air Lines, Inc. v. Waterman<br>Steamship Corp.....                                                                                                                            | 286 |
| 4. Revocation of International Route Authority .....                                                                                                                                             | 292 |
| In the Matter of Aerolineas El Salvador, S.A. Foreign<br>Air Carrier Permit Under Section 402 of the Federal<br>Aviation Act of 1958 .....                                                       | 293 |
| F. International Code-Sharing and Airline Alliances .....                                                                                                                                        | 293 |
| Joint Application of American Airlines, Inc., and Delta<br>Air Transport, NV.....                                                                                                                | 295 |
| G. Slots for International Operations.....                                                                                                                                                       | 308 |
| H. Enforcement Action against Foreign Air Carriers.....                                                                                                                                          | 309 |

|                                                               |            |
|---------------------------------------------------------------|------------|
| <b>Chapter 5: International Transport of Passengers.....</b>  | <b>311</b> |
| A. The 1999 Montreal Convention .....                         | 311        |
| B. History of the Warsaw Convention (1929–1999).....          | 313        |
| 1. The 1929 Warsaw Convention .....                           | 313        |
| 2. International Efforts to Amend the Warsaw Convention.....  | 315        |
| C. Montreal Convention 1999.....                              | 320        |
| 1. Changes from the Warsaw System .....                       | 320        |
| Senate Executive Report 108–08 (July 29, 2003) .....          | 321        |
| 2. Direct Application of the Montreal Convention.....         | 323        |
| 3. Exclusivity of Treaty Remedy: Preemption of State Law..... | 324        |
| El-Al Israel Airlines Ltd. v. Tseng.....                      | 324        |
| Paradis v. Ghana Airways, Ltd.....                            | 335        |
| 4. Scope of the Convention .....                              | 342        |
| Jones v. USA 3000 Airlines.....                               | 342        |
| 5. The Contract of Carriage.....                              | 346        |
| Baah v. Virgin Atlantic Airways.....                          | 346        |
| 6. Substantive Law of the Convention.....                     | 351        |
| a. Accident .....                                             | 351        |
| Warsaw (1929), article 17 .....                               | 351        |
| Montreal (1999), article 17.....                              | 351        |
| Air France v. Saks.....                                       | 352        |
| Salerno v. Pan American World Airways, Inc.....               | 361        |
| Wallace v. Korean Air Lines Co., Ltd.....                     | 363        |
| Olympic Airways v. Husain .....                               | 371        |
| Blansett v. Continental Airlines, Inc.....                    | 379        |

|                                                                           |     |
|---------------------------------------------------------------------------|-----|
| b. Bodily Injury—Mental Distress.....                                     | 384 |
| Ehrlich v. American Airlines, Inc. ....                                   | 385 |
| c. Location of Accident.....                                              | 419 |
| Magan v. Lufthansa German Airlines .....                                  | 419 |
| Day v. Trans World Airlines, Inc.....                                     | 427 |
| Martinez Hernandez v. Air France.....                                     | 436 |
| Rabinowitz v. Scandinavian Airlines.....                                  | 441 |
| d. Servants and Agents of Carriers .....                                  | 448 |
| Lathigra v. British Airways .....                                         | 448 |
| D. Jurisdiction and Venue.....                                            | 454 |
| Warsaw Convention (1929), Article 28.....                                 | 454 |
| 1. Plaintiffs.....                                                        | 455 |
| Berner v. United Airlines, Inc. ....                                      | 455 |
| Montreal Convention (1999), Article 33 .....                              | 457 |
| 2. Corporate Domicile .....                                               | 457 |
| Wyler v. Korean Air Lines Co., Ltd.....                                   | 457 |
| 3. Place of Business .....                                                | 459 |
| Gutierrez v. Avianca.....                                                 | 459 |
| E. Monetary Damages .....                                                 | 462 |
| Montreal Convention (1999), Article 21.....                               | 462 |
| Montreal Convention (1999), Article 23 .....                              | 464 |
| Montreal Protocol (1975), Article 25.....                                 | 465 |
| Hague Protocol (1955), Article 25A.....                                   | 465 |
| Montreal Protocol (1975), Article 25A.....                                | 466 |
| Piamba Cortes v. American Airlines, Inc.....                              | 466 |
| Montreal Convention (1999), Article 20 .....                              | 486 |
| F Interest.....                                                           | 487 |
| Domangue v. Eastern Air Lines, Inc.....                                   | 487 |
| G. Non-Treaty Limits on Damages (The Death on the<br>High Seas Act) ..... | 494 |
| Title 46, Chapter 303—Death on High Seas                                  |     |
| Sec. 30302. Cause of Action .....                                         | 496 |
| Sec. 30303. Amount and Apportionment of Recovery.....                     | 497 |
| Sec. 30307. Commercial Aviation Accidents.....                            | 497 |
| 1. Survivors' Damages.....                                                | 497 |
| Zicherman v. Korean Air Lines Co., Ltd.....                               | 497 |
| 2. Decedents' Pain and Suffering .....                                    | 505 |
| Dooley v. Korean Air Lines Co., Ltd.....                                  | 505 |
| Chapter 6: Domestic Flights.....                                          | 511 |
| A. Applicable Law .....                                                   | 511 |
| 1. Federal Preemption of Substantive Law.....                             | 511 |
| 2. Rules of the Road for Air Navigation and Safety.....                   | 513 |

|                                                                               |            |
|-------------------------------------------------------------------------------|------------|
| Abdullah v. American Airlines, Inc.....                                       | 517        |
| Bennett v. Southwest Airlines Co. ....                                        | 525        |
| 3. Federal Preemption of Carrier Business Operations .....                    | 530        |
| <b>Title 49—Transportation</b>                                                |            |
| Sec. 41713. Preemption of Authority over Prices,<br>Routes, and Service ..... | 530        |
| American Airlines, Inc. v. Wolens.....                                        | 531        |
| Air Transport Association of America, Inc. v. Cuomo .....                     | 539        |
| 4. Personal Injuries.....                                                     | 547        |
| Charas v. Trans World Airlines, Inc. ....                                     | 547        |
| 5. Alcohol Problems .....                                                     | 555        |
| US Airways, Inc. v. O'Donnell .....                                           | 556        |
| 6. Federal Common Law .....                                                   | 567        |
| a. Contribution and Indemnity .....                                           | 567        |
| Kohr v. Allegheny Airlines, Inc.....                                          | 567        |
| b. Punitive Damages.....                                                      | 573        |
| 7. State Common Law .....                                                     | 574        |
| a. <i>Res Ipsa Loquitur</i> .....                                             | 574        |
| Abbott v. Page Airways, Inc.....                                              | 574        |
| b. Collateral Estoppel .....                                                  | 579        |
| Colditz v. Eastern Airlines, Inc.....                                         | 579        |
| c. Duty of Care.....                                                          | 583        |
| Andrews v. United Airlines, Inc.....                                          | 583        |
| B. Conflict of Laws.....                                                      | 586        |
| 1. <i>Lex Locus Delictus</i> .....                                            | 586        |
| Pearson v. Northeast Airlines, Inc.....                                       | 586        |
| 2. Maximum Significant Contacts and Center of Gravity .....                   | 595        |
| Long v. Pan American Airways, Inc.....                                        | 595        |
| 3. Governmental Interest.....                                                 | 598        |
| Tramontana v. S. A. Empresa De Viacao Aerea Rio Grandense....                 | 598        |
| 4. <i>Dépeçage</i> .....                                                      | 605        |
| Manos v. Trans World Airlines, Inc.....                                       | 605        |
| <b>Chapter 7: Aircraft Manufacturers' Product Liability .....</b>             | <b>611</b> |
| A. Personal Injury and Death Claims .....                                     | 611        |
| 1. Negligence and Breach of Warranty.....                                     | 611        |
| Hurley v. Beech Aircraft Corporation.....                                     | 611        |
| 2. Strict Liability .....                                                     | 617        |
| <b>Sec. 402A Special Liability of Seller of Product</b>                       |            |
| for Physical Harm to User or Consumer.....                                    | 617        |
| Wilson v. Piper Aircraft Corporation.....                                     | 617        |
| <b>Restatement of the Law Third, Torts:</b>                                   |            |
| Products Liability (1998), Chapters 1–4.....                                  | 626        |

|                                                                                                 |     |
|-------------------------------------------------------------------------------------------------|-----|
| 3. Federal Preemption of State Law.....                                                         | 630 |
| Midwest Express Holdings, Inc. v. Braun.....                                                    | 630 |
| 4. Government Contractor Defense .....                                                          | 636 |
| Boyle v. United Technologies Corporation.....                                                   | 636 |
| B. Commercial Warranties.....                                                                   | 645 |
| Delta Air Lines, Inc. v. McDonnell Douglas Corporation.....                                     | 645 |
| C. Statute of Repose .....                                                                      | 653 |
| Sec. 1. Short Title. ....                                                                       | 653 |
| Sec. 2. Time Limitatons .....                                                                   | 653 |
| Sec. 3. Other Definitions.....                                                                  | 654 |
| Sec. 4. Effective Date; Application of Act .....                                                | 654 |
| Southside Trust and Savings Bank of Peoria v. Mitsubishi<br>Heavy Industries, Ltd.....          | 655 |
| <br>Chapter 8: Air Carrier Liability for Cargo Damage and Ground Damage.....                    | 675 |
| Part One: Cargo Damage .....                                                                    | 675 |
| A. International Carriage.....                                                                  | 675 |
| 1. Introduction .....                                                                           | 675 |
| 2. History of the 1929 Warsaw Convention.....                                                   | 675 |
| B. The Cause of Action for Cargo Damage.....                                                    | 676 |
| 1. Presumption of Liability for an “Event” .....                                                | 676 |
| Montreal Convention (1999), Articles 18–20 .....                                                | 677 |
| 2. Proper Parties.....                                                                          | 679 |
| Commercial Union Insurance Co. v. Alitalia Airlines, S.p.A. ....                                | 679 |
| C. Legal Issues.....                                                                            | 697 |
| 1. Use of Other Modes of Transportation.....                                                    | 697 |
| 2. Damage Outside the Aircraft .....                                                            | 698 |
| Victoria Sales Corporation v. Emery Air Freight, Inc. ....                                      | 698 |
| 3. Documentation .....                                                                          | 705 |
| Montreal Convention (1999), Articles 4–11 .....                                                 | 705 |
| Resolution 600b Air Waybill – Conditions Of Contract.....                                       | 707 |
| 4. Documentation of Shipments .....                                                             | 711 |
| 5. Requirement of Documentation .....                                                           | 711 |
| Fujitsu Limited v. Federal Express Corporation.....                                             | 711 |
| 6. Limitation of Liability.....                                                                 | 722 |
| Montreal Convention (1999), Article 22 .....                                                    | 722 |
| 7. General Damages .....                                                                        | 723 |
| Eli Lilly Co. v. Air Express International USA, Inc. ....                                       | 724 |
| 8. Notice to the Carrier.....                                                                   | 735 |
| Montreal Convention (1999), Article 31.....                                                     | 735 |
| Warsaw Convention (1929), Article 26.....                                                       | 736 |
| Highlands Insurance Co. v. Trinidad and Tobago<br>(BWIA International) Airways Corporation..... | 736 |

|                                                                                           |            |
|-------------------------------------------------------------------------------------------|------------|
| Dalton v. Delta Airlines, Inc.....                                                        | 739        |
| 9. Disposition of the Cargo .....                                                         | 742        |
| Montreal Convention (1999), Articles 12–14.....                                           | 743        |
| 10. Arbitration .....                                                                     | 744        |
| D. International Baggage .....                                                            | 745        |
| Montreal Convention (1999), Article 17 .....                                              | 745        |
| Hutchinson v. British Airways PLC.....                                                    | 746        |
| E. Domestic and Non-International Transport<br>of Cargo and Baggage.....                  | 755        |
| 1. Domestic Carriage of Goods by Air.....                                                 | 755        |
| Title 49                                                                                  |            |
| Sec. 41707. Incorporating Contract Terms into Written<br>Instrument.....                  | 756        |
| a. Federal Common Law.....                                                                | 756        |
| King Jewelry, Inc. v. Federal Express Corporation.....                                    | 756        |
| b. Tariff Provisions .....                                                                | 762        |
| Ing v. American Airlines .....                                                            | 762        |
| c. Material Deviation Doctrine.....                                                       | 771        |
| d. Domestic Baggage.....                                                                  | 771        |
| Part Two: Ground Damage By Aircraft .....                                                 | 771        |
| A. State Law.....                                                                         | 772        |
| 1. Common Law .....                                                                       | 772        |
| 2. Uniform Law and Restatements .....                                                     | 773        |
| §502 A—Ground Damage from Aircraft.....                                                   | 774        |
| 3. Cases.....                                                                             | 774        |
| a. Trespass.....                                                                          | 774        |
| Wood v. United Air Lines, Inc. ....                                                       | 774        |
| b. Negligence.....                                                                        | 778        |
| In Re Air Crash Disaster at Cove Neck, Long Island,<br>New York on January 25, 1990 ..... | 778        |
| B. International Law .....                                                                | 784        |
| 1. International Convention on Surface Damage<br>by Foreign Aircraft.....                 | 784        |
| 2. Ground Damage by Objects From Outer Space .....                                        | 785        |
| <b>Chapter 9: Lessors, Successors, Actual Carriers and Code-Sharers.....</b>              | <b>787</b> |
| A. Lessors .....                                                                          | 787        |
| 49 U.S.C. § 44112 .....                                                                   | 788        |
| Retzler v. Pratt & Whitney Co.....                                                        | 789        |
| Mangini v. Cessna Aircraft Co. ....                                                       | 794        |
| B. Successors and Actual Carriers.....                                                    | 800        |
| 1. Successive Carriage .....                                                              | 800        |
| Warsaw, Articles 1(3), 30.....                                                            | 800        |

Montreal Article 36 ..... 801

Best v. BWIA West Indies Airways, Ltd. .... 802

2. Actual Carriers..... 806

Chapter V Carriage by Air Performed by a Person Other  
than the Contracting Carrier, Articles 39–48..... 807

In Re West Caribbean Airways, S.A..... 809

C. Codeshare ..... 818

Chapter 10: Litigation Management ..... 821

A. Introduction..... 821

B. Fora Available in the United States..... 822

1. The Federal Multiparty, Multiforum Trial Jurisdiction  
Act (MMTJA)..... 822

Title 28

Sec. 1369. Multiparty, Multiforum Jurisdiction..... 823

2. Class Action Fairness Act of 2005 (Pub. L. 109–2) ..... 824

3. Multidistrict Litigation: Transfer for Discovery ..... 826

Title 28—Judiciary and Judicial Procedure

Sec. 1407. Multidistrict Litigation..... 828

4. Removal..... 830

Title 28

§ 1441. Removal of civil actions ..... 831

§ 1442. Federal Officers or Agencies Sued or Prosecuted ..... 833

§ 1446. Procedure for Removal of Civil Actions..... 833

§ 1447. Procedure after Removal Generally ..... 835

Laugelle v. Bell Helicopter Textron, Inc, ..... 836

5. *Forum Non Conveniens*..... 840

In re Air Crash near Peixoto De Azeveda  
on September 29, 2006..... 842

C. Evidence ..... 860

1. Official Investigations and Reports..... 860

2. The “Daubert” Rule on Expert Witnesses ..... 862

Vadala v. Teledyne Industries, Inc..... 863

Chapter 11: Aviation Security and Airline Travel Restrictions..... 867

A. Air Transport Security for Passengers and Baggage ..... 867

B. ICAO Annex 17 ..... 870

C. Airport Screening and Searches ..... 871

United States v. Davis..... 872

United States v. Herzbrun..... 875

United States v. Pulido-Baquerizo ..... 881

United States v. Hartwell..... 884

|                                                  |     |
|--------------------------------------------------|-----|
| United States v. Aukai .....                     | 889 |
| Ibrahim v. Department of Homeland Security ..... | 895 |
| D. Cargo Security .....                          | 900 |
| E. Discrimination .....                          | 900 |
| Austin v. Delta Air Lines, Inc. ....             | 901 |
| Nader v. Allegheny Airlines .....                | 904 |
| Further Reading .....                            | 914 |

|                                                              |            |
|--------------------------------------------------------------|------------|
| <b>Chapter 12: Airport Law .....</b>                         | <b>915</b> |
| A. Airport Operation .....                                   | 915        |
| Title 49                                                     |            |
| Sec. 40117. Passenger Facility Fees .....                    | 916        |
| Sec. 44706. Airport Operating Certificates .....             | 922        |
| Board of County Commissioners of Dade County                 |            |
| v. Aerolineas Peruanasa .....                                | 929        |
| Northwest Airlines v. Country of Kent .....                  | 934        |
| Air Canada, et al. v. Department of Transportation .....     | 942        |
| Griggs v. County of Allegheny .....                          | 955        |
| City of Burbank v. Lockheed Air Terminal .....               | 958        |
| B. Private Activities at Public Airports .....               | 965        |
| International Society for Krishna Consciousness v. Lee ..... | 966        |
| Further Reading .....                                        | 970        |

|                                                                   |            |
|-------------------------------------------------------------------|------------|
| <b>Chapter 13: The U.S. Federal Aviation Administration .....</b> | <b>971</b> |
| A. Air Space Control .....                                        | 975        |
| Federal Aviation Act, 49 U.S.C. § 40102 .....                     | 976        |
| 49 U.S.C. § 40103 .....                                           | 981        |
| 49 U.S.C. § 40105 .....                                           | 983        |
| 49 U.S.C. § 44701 .....                                           | 984        |
| B. Aircraft Registration .....                                    | 986        |
| Air One Helicopters, Inc. v. FAA .....                            | 986        |
| C. Airmen Certification and Revocation .....                      | 989        |
| 49 U.S.C. § 44702 .....                                           | 989        |
| 49 U.S.C. § 44703 .....                                           | 990        |
| Thomas v. Hinson .....                                            | 998        |
| Hinson v. NTSB and Rolund .....                                   | 999        |
| United States v. Emerson .....                                    | 999        |
| D. Aircraft Safety Certification .....                            | 1005       |
| 49 U.S.C. § 44704 .....                                           | 1006       |
| E. Air Carrier Operating Certification and Revocation .....       | 1008       |
| Title 49                                                          |            |
| Sec. 44705. Air Carrier Operating Certificates .....              | 1008       |

The Changing Face of Passenger Air Transportation:  
    The Blurry Line between Part 121 and 135 Operators.....1009  
    FAA Enforcement Emergency Cease and Desist Order  
        to Platinum Jet Management.....1019  
    Kiwi International Air Lines, Emergency Order of Revocation ..... 1024  
F. Foreign Air Carriers in U.S. Air Space ..... 1034  
    Safety Oversight: Federal Aviation Administration,  
        International Civil Aviation Organization, and Central  
        American Aviation Safety Agency..... 1034  
G. Global Navigation Satellite Systems (GNSS)..... 1043  
    Issues Relating to Civilian and Military Dual Uses of GNSS .....1044  
    The Reorganized National Space-Based Positioning, Navigation,  
        and Timing Committee (PNT) ..... 1057  
Further Reading ..... 1058

**Chapter 14: National Transportation Safety Board (NTSB).....1059**

A. Safety Investigation.....1059  
    NTSB Statute (49 U.S. Code)  
    Sec. 1101. Definitions.....1061  
    Sec. 1111. General Organization.....1062  
    Sec. 1112. Special Boards of Inquiry on Air Transportation  
        Safety.....1063  
    Sec. 1113. Administrative .....1063  
    Sec. 1114. Disclosure, Availability, and Use of Information .....1065  
    Sec. 1132. Civil Aircraft Accident Investigations.....1066  
    Sec. 1154. Discovery and Use of Cockpit and Surface Vehicle  
        Recordings and Transcripts..... 1067  
    NTSB Regulations  
        49 CFR § 835.3 .....1068  
        49 CFR § 835.4 .....1069  
        49 CFR § 835.5 ..... 1070  
        49 CFR § 835.6 ..... 1070  
        49 CFR § 835.7 .....1071  
        49 CFR § 835.8 .....1071  
B. Miscellaneous Functions.....1071  
    Sec. 1133. Review of Other Agency Action..... 1072  
    Sec. 1136. Assistance to Families of Passengers Involved  
        in Aircraft Accidents ..... 1072  
    Sec. 41113. Plans to Address Needs of Families of Passengers  
        Involved in Aircraft Accidents..... 1075  
    Hinson v. National Transportation Safety Board..... 1077  
Further Reading .....1084

|                                                                   |      |
|-------------------------------------------------------------------|------|
| <b>Chapter 15: Governmental Immunity from Liability For Torts</b> | 1087 |
| A. State Law on Sovereign Immunity                                | 1087 |
| Knoxville v. Bailey                                               | 1088 |
| B. Federal Law on Sovereign Immunity                              | 1094 |
| 1. Requirements Precedent to Suits                                | 1094 |
| 28 USC § 2674                                                     | 1094 |
| 28 § USC 2675                                                     | 1095 |
| 28 § USC 2679                                                     | 1095 |
| 28 USC § 2680                                                     | 1095 |
| 2. Exceptions to Waiver of Immunity                               | 1097 |
| Eastern Air Lines, Inc. v. Union Trust Co.                        | 1099 |
| Ingham v. Eastern Airlines and the United States                  | 1104 |
| Hartz v. United States                                            | 1107 |
| West v. Federal Aviation Administration                           | 1111 |
| 3. The FTCA and FAA Aircraft Certification                        | 1116 |
| United States v. Varig Airlines                                   | 1116 |
| Berkovitz v. United States                                        | 1120 |
| 4. Suits by Military Personnel                                    | 1124 |
| Feres v. United States                                            | 1125 |
| Jeanette McMAHON v. Presidential Airways, Inc.                    | 1128 |
| 5. Federal Employees Compensation Act                             | 1139 |
| Lockheed v. United States                                         | 1139 |
| 6. FTCA Suits for Claims Arising in Foreign Countries             | 1143 |
| Smith v. United States                                            | 1143 |
| 7. Suits in Admiralty under the FTCA are Mutually Exclusive       | 1146 |
| Miller v. United States                                           | 1146 |
| C. Foreign Sovereign Immunities Act                               | 1150 |
| Hartford Insurance Company V. Libya                               | 1151 |
| Kramer v. The Boeing Company                                      | 1157 |
| Nazarian v. Compagnie Nationale Air France                        | 1160 |
| Gould v. Aerospatiale Helicopter Corp.                            | 1164 |
| D. Government Contractor Defense                                  | 1167 |
| Further Reading                                                   | 1167 |

|                                                                                |      |
|--------------------------------------------------------------------------------|------|
| <b>Chapter 16: Aircraft Ownership, Registration, Financing, and Bankruptcy</b> | 1169 |
| A. U.S. Law on Registration and Recordation of Aircraft Assets                 | 1169 |
| 49 U.S.C. § 44101                                                              | 1170 |
| 49 USC § 44102                                                                 | 1171 |
| 49 U.S.C. § 44103                                                              | 1171 |

49 U.S.C. § 44106 ..... 1172

49 U.S.C. § 44107..... 1174

49 U.S.C. § 46110 ..... 1175

Philko Aviation v. Shacket ..... 1176

B. Geneva Convention on International Recognition of Rights  
in Aircraft, 310 UNTS 5152 (1948)..... 1180

C. Aviation Protocol to the 2001 Cape Town Convention on  
International Interests in Mobile Equipment  
(www.unidroit.org) ..... 1180

Future Protocol on Security Interests in Space Assets

67 J. AIR L. & COM. 1071..... 1181

Cape Town Convention on International Interests In Mobile  
Equipment..... 1183

Chapter I – Sphere of Application and General Provisions,  
Articles 1–6 ..... 1183

Chapter II – Constitution of an International Interest,  
Articles 7 ..... 1188

Chapter III – Default Remedies, Articles 8–15..... 1188

Chapter IV – The International Registration System,  
Articles 16–17..... 1191

Chapter V – Other Matters Relating to Registration,  
Articles 18–26..... 1193

Chapter IX – Assignments of Associated Rights and  
International Interests; Rights of Subrogation,  
Articles 31–38 ..... 1196

Aviation Protocol

Chapter I – Sphere of Application  
and General Provisions, Articles I–VIII ..... 1199

Chapter II – Default Remedies, Priorities and Assignments,  
Articles IX–XVI..... 1203

Chapter III – Registry Provisions Relating to International  
Interests in Aircraft Objects, Articles XVII–XX..... 1209

Chapter IV – Jurisdiction, Articles XXI–XXII ..... 1210

Chapter V – Relationship with Other Conventions,  
Articles XXIII–XXV ..... 1211

D. Bankruptcy..... 1212

11 U.S.C. § 1110 ..... 1213

11 U.S.C. § 365..... 1215

Further Reading ..... 1216

**Chapter 17: Aviation Insurance ..... 1217**

A. Air Carrier’s Minimum Insurance Coverage ..... 1218

|                                                                   |      |
|-------------------------------------------------------------------|------|
| Title 49                                                          |      |
| Sec. 4112. Liability Insurance and Financial Responsibility ..... | 1218 |
| B. Aircraft Hull Insurance and War Insurance .....                | 1219 |
| Pan American World Airways v. Aetna.....                          | 1220 |
| Further Reading .....                                             | 1248 |

## Chapter 18: Airline Labor Relations and the Airline Pensions

|                                                                                                                                                                |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| and Benefit Guaranty Corp. (PBGC).....                                                                                                                         | 1249 |
| A. Background: The Railway Labor Act .....                                                                                                                     | 1251 |
| The 1926 Railway Labor Act and the Modern American Airline Industry: Changes and “Chaos” Outline the Need for Revised Legislation 69 J. Air L. & Com. 615..... | 1251 |
| B. Application of the Railway Labor Act .....                                                                                                                  | 1263 |
| International Association of Machinists v. Central Airlines, Inc.....                                                                                          | 1263 |
| C. Scope of Federal Preemption under the Railway Labor Act.....                                                                                                | 1267 |
| Hawaiian Airlines, Inc. v. Norris.....                                                                                                                         | 1267 |
| D. Conflicts between the Railroad Labor Act and Other Federal Laws .....                                                                                       | 1276 |
| Gilmer v. Interstate/Johnson Lane Corporation.....                                                                                                             | 1277 |
| E. Airline Employee Pensions and the Pension Benefit Guaranty Corporation (PBGC) .....                                                                         | 1281 |
| 29 U.S.C. § 1341.....                                                                                                                                          | 1282 |
| Further Reading .....                                                                                                                                          | 1289 |

## Chapter 19: Environmental Regulation of Aviation: Noise and Emissions.....1291

|                                                            |      |
|------------------------------------------------------------|------|
| A. International Regulation of Aircraft Noise.....         | 1291 |
| B. U.S. Aviation Noise Regulation.....                     | 1292 |
| 49 U.S.C. § 47521 .....                                    | 1292 |
| 49 U.S.C. § 47522 .....                                    | 1293 |
| 49 U.S.C. § 47523 .....                                    | 1293 |
| 49 U.S.C. § 47524 .....                                    | 1293 |
| 49 U.S.C. § 47525 .....                                    | 1296 |
| 49 U.S.C. § 47526 .....                                    | 1296 |
| Griggs v. County of Allegheny .....                        | 1297 |
| City of Burbank v. Lockheed Air Terminal.....              | 1297 |
| City of Naples Airport Authority v. Federal Aviation ..... | 1297 |
| 49 U.S.C. § 47527 .....                                    | 1302 |
| 49 U.S.C. § 47528 .....                                    | 1302 |
| 49 U.S.C. § 47529 .....                                    | 1304 |
| 49 U.S.C. § 47530 .....                                    | 1305 |
| 49 U.S.C. § 47531.....                                     | 1305 |

49 U.S.C. § 47532 ..... 1305

C. International Aircraft Emissions..... 1305

2008 ICAO Environment (ENV) Section Report

Aircraft Engine Emissions ..... 1307

2009 High-Level ICAO Meeting on International Aviation

and Climate Change–Summary of Discussions ..... 1312

E.U. Commission Sets First Emissions Cap for Aviation Sector ..... 1316

D. U.S. Aircraft Emissions Regulation by the Environmental

Protection Administration (EPA)..... 1317

42 USC § 7571..... 1318

National Association of Clean Air Agencies v. EPA ..... 1319

References..... 1329

**Appendix 1: 1999 Montreal Convention for the Unification of Certain**

**Rules for International Carriage by Air..... 1331**

Chapter 1. General Provisions, Articles 1–2 ..... 1331

Chapter II. Documentation and Duties of the Parties Relating

to the Carriage of Passengers, Baggage and Cargo,

Articles 3–16 ..... 1332

Chapter III. Liability of the Carrier and Extent of Compensation for

Damage, Articles 17–37 ..... 1336

Chapter IV. Combined Carriage, Article 38..... 1345

Chapter V. Carriage by Air Performed by a Person Other Than the

Contracting Carrier, Articles 39–48..... 1345

Chapter VI. Other Provisions, Articles 49–52 ..... 1347

Chapter VII. Final Clauses, Articles 53–57..... 1348

**Appendix 2: Suggested Books on Aviation Law and Other Aviation**

**Themes for Further Reading..... 1351**

1. Legal Treatises..... 1351

2. Biographies ..... 1352

3. Aviation Industry and Operations..... 1352

**Appendix 3: Newspapers and Other Journals ..... 1357**

**Appendix 4: Motion Pictures with Aviation Themes ..... 1359**

*List of Principal Cases* ..... 1363

*Index* ..... 1367

## PREFACE

The flying public, airlines, and governments will all agree on one date that changed commercial flying: that was September 11, 2001. The first edition of AVIATION LAW: Cases, Laws and Related Sources described early consequences of that event, particularly compensation of victims and early tightening of aviation security. Subsequently, laws and regulations affecting all aspects of aviation changed so rapidly that it became difficult to set a cut-off date for the second edition. Nevertheless, the rapid flow of events made an update urgent.

Several gaps in the materials of the first edition became evident as we used the book. We have filled those gaps. We have pruned much old material and added much new material describing not only the later developments, but also evolving economics and flight technology.

The objective of the case book is to offer a basic handbook for air law practitioners providing them with a starting point for almost any subject they may encounter. For example, a lawyer specializing in liability law will quickly be able to find basic materials on the International Civil Aviation Organization (ICAO), air carrier licensing, FAA certification, and labor law.

The book continues to present aviation law from the American point of view. Thus, the book will be valuable for foreign air lawyers who are guiding foreign airlines in service to the very important North American pool of air traffic. The book also explains the international scene to American air lawyers so that they may guide their clients who provide foreign service.

We have added new chapters on liability for cargo damage and for ground damages and new materials on the legal rights of lessors, successors, actual carriers and code-shares. We have also added a new chapter on environmental regulation of aviation noise and emissions. All the main subjects listed in the first edition are significantly updated.



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## INTRODUCTION

### EVOLUTION OF THE AVIATION INDUSTRY

#### A. INTRODUCTION

Contemporary American civilization is defined by the air and space industries. These industries have lifted the nation beyond its historic industrial boundaries to a position of global preeminence. In the 100 years since the Wright Brothers demonstrated the possibilities of powered flight, our country has changed as regional differences have diminished with the rapid movement of goods and people around the nation and around the world.

Aviation, as we know it today, is a new industry whose operations and legal doctrines can be studied closely because they have not yet been obscured by the cobwebs of time. We shall observe the stages in the development of the industry: (1) novelty flights at fairgrounds; (2) wartime use, first as observers then as warriors; (3) airmail; (4) carriage of passengers; (5) carriage of cargo; and (6) destroyer of civilization.

The aviation industry's technical progress, unlike other modes of transport, was often propelled by government financial aid and protection during war, cold war and the race to outer space. Furthermore, the aviation industry rapidly moved beyond national borders so that international legislation by the treaty process was absolutely essential. Nevertheless, despite the remarkable progress of aviation since 1903, the publication of this book occurs at a time when bankruptcy, downsizing, unemployment and terrorism have made it a very troubled industry.

#### B. EARLY HISTORY OF FLIGHT

Observation of birds in flight, the upward spiral of smoke and steam or the movement of the clouds—graceful or terrifying—surely induced thinkers like Archimedes (third century B.C.) or Leonardo da Vinci (15th century A.D.) to speculate on the possibilities of human flight. By the 18th century, theory turned into practical developments in two differing modes, identified by the Italian Jesuit, Francesco de Lana (1631–1687) as: lighter than air (LTA) and heavier than air (HTA). Another Jesuit scientist demonstrated the possibilities of lighter than air when Bartolomeo de Gusmão entertained the Portuguese court with his LTA models in 1769.

### 1. *Lighter Than Air (Balloons to Blimps)*

The Montgolfier Brothers (Joseph and Etienne) experimented with hot-air linen balloons in Avignon, France, using sheep, ducks and roosters as passengers, before moving to Paris in 1783; their ascents increasing from 75 feet to 500 feet as the time aloft increased from eight minutes to 25 minutes. The ascent of August 24, 1783, in the Tuileries Gardens of Paris was observed by Benjamin Franklin who reported it to Congress. On September 19, 1783, the ascent was repeated at Versailles before the King and Queen. Their pilot, Jean-Francois Pilatre de Rozier, made the first manned flight on November 21, 1783; he also became the first victim of aviation disaster on June 15, 1785, when he crashed in flames after his balloon caught on fire from the live coals used to provide hot air for lift.

The first international flight by balloon occurred on January 7, 1785, when Jean-Pierre Blanchard and Doctor John Jeffries crossed from Dover to Calais. The first American balloon flight occurred on January 9, 1793, when Jean-Pierre Blanchard traveled by balloon from Philadelphia to Woodbury, New Jersey (12 miles or 18 kilometers). President Washington was in the crowd to witness the ascent. Thereafter, balloon ascensions became popular circus attractions while armies used secured or “captive” balloons for observations; thus, the Union balloons in the battle for Richmond, Virginia, in the Civil War were observed from the ground by officers of several European armies who recommended their use to their superiors.

Travel by balloon became prominent in popular imagination during the Franco- Prussian War of 1870–1871 when Paris was besieged on all sides by the Prussians. A French government passenger balloon service moved 155 passengers and nine tons of mail in 66 night flights out of Paris. Its most notable escapee was Leon Gambetta, Minister of War and effective head of government. Inability to change direction, with dependence on favorable wind direction, deterred commercial development after the war; six of the Parisian balloons having been captured by the Prussians because of wind shift.

Directed balloons—called dirigible airships—as passenger movers began in France in 1852 when Henri Giffard installed a three horsepower steam engine in an airship to move a three-armed propeller with a steering oar. The weight and size of the steam engines, however, deterred further development. After 1900, Count Ferdinand von Zeppelin (1838–1917) experimented with balloons powered by the new smaller gasoline engines over Lake Constance (the Bodensee). Commercial use of rigid airships by the Zeppelin Company began in 1910 and provided passenger services connecting Düsseldorf, Frankfurt, Hamburg, Potsdam (Berlin) and Baden Baden. While there were occasional flights over the ocean after 1919, transatlantic passenger service did not begin until 1935 and was short-lived due to the first disaster in the company's history when the hydrogen-filled zeppelin “Hindenburg” burned while being moored at Lakehurst, New Jersey, on

May 6, 1937, taking the lives of 13 of the 97 passengers and 23 on the ground. Military uses of rigid airships in Great Britain and the United States had also been plagued with disasters involving loss of lives (the U.S. ships *Shenandoah* (1925), *Akron* (1933) and *Macon* (1935)). Nevertheless, non-rigid airships (nicknamed blimps) proved their usefulness in anti-submarine warfare during the Second World War and the Cold War until 1960. Return of airships as cargo carriers has been speculated upon but not realized.

Sportsmen continued to attempt round-the-world flights by balloon until the American Steve Fossett (1944–2007) finally achieved this goal on July 2, 2002. Another goal of balloonists was height. An ascension by Capt. Joseph W. Kittinger, USAF, reached 102,800 feet on August 16, 1960, over New Mexico; he also parachuted from his balloon on that day for a free-fall of 16 miles. Steve Fossett, the intrepid balloonist of 2002, became the first solo pilot to fly around the world without stops or refueling in 67 hours on March 4, 2005.

## 2. *Heavier Than Air*

Practical application of the theory of flight had begun in the mid-19th century with gliders in America, England, Germany, France, Italy and Russia, but the inadequacy of propulsion methods frustrated all efforts to turn gliders into aircraft. In the United States, extensive government support of research into powered flight was extended to Samuel Pierpont Langley, Secretary of the Smithsonian Institute, but full-scale versions of his successful models failed in several public attempts over the Potomac River in Washington in 1903.

Success in the race for manned and powered flight required the coalescence of theory, testing and the development of a small-size internal combustion engine. This occurred in the first successful powered flight on December 17, 1903, by the Wright Brothers at Kitty Hawk, North Carolina (a location suggested by the Weather Bureau and witnessed by members of the U.S. Coast Guard).

Wilbur Wright (1867–1912) and Orville Wright (1871–1948) were brought up in Dayton, Ohio, the sons of Bishop Milton Wright of the United Brethren Church. They lived in Dayton most of their lives. While running their bicycle shop, they became interested in aeronautical theory, devouring all the books and articles offered by the Smithsonian Institute, especially the work in Germany on gliders of Otto Lilienthal (1848–1896) who perished in the crash of his glider, powered by compressed gas. By 1900 the Wrights began to test their designs, conducting 200 different design tests in their home-made wind tunnel. In 1902 they acquired a 170-pound 12-horsepower, four-cylinder gasoline engine that they installed in a wooden biplane (an upper and lower wing to provide lift) with two pusher propellers, a wing span of 40 feet and a total weight of 750 pounds, which they called “The Flyer.”

The Wrights' experiments were always joint efforts. On December 17, 1903, in their fourth year at Kitty Hawk, Wilbur won the coin toss for the first flight but the machine stalled, so that Orville Wright made the next, the first successful flight of 120 feet (37 meters) for 12 seconds at 31 m.p.h. There would be four successful flights on that first day, the longest being 59 seconds over 852 feet (260 meters). They returned in 1904, having tested a tail mechanism for maneuvers. By 1905, the flying machine was ready for a public test in Dayton where it flew a 24-mile (39 kilometers) course for 33 minutes. Their first patent was granted on May 22, 1906, but this was merely the prelude to years of lengthy and expensive litigation to preserve their patent rights against competing inventors.

In 1908 Wilbur Wright demonstrated the flying machine in France, causing a great sensation and stimulating French interest in powered flight. Orville persuaded the U.S. Army to buy an airplane for \$25,000. These events led to the decision of the brothers in 1909 to form a company to manufacture aircraft and to found a school to train pilots. The company prospered greatly in the European War that began in 1914. After Wilbur's death in 1912, Orville gradually withdrew from the company in order to found the Wright Aeronautical Laboratory that he directed until his death in 1948.

Just a few years younger than the Wrights, Glenn H. Curtiss (1878–1930) from Hammondsport, New York, was like them, filled with curiosity about motion, speed and flight. His formal education ended in the eighth grade, and he started to work for the Eastman Kodak Company, where he developed a stencil machine. During his years at Kodak, he began to compete in bicycle races; racing led him to open a bicycle shop, where he also built and raced motorcycles, setting world records in 1903 and 1907. In 1906, he traveled in Tom Baldwin's airship, which used a Curtiss engine, to visit the Wright Brothers in Dayton, Ohio for a discussion of gasoline engines and propellers. Unhappily, Curtiss' relations with the Wrights deteriorated after the Reims international air meet in August 1909 (*infra*), where Curtiss' triumph led to a patent infringement suit by the Wright Brothers that would continue for the next ten years. The litigation ended in a settlement, and in 1929, the Curtiss and the Wright companies merged, forming the Curtiss-Wright Company to manufacture aircraft, parts and weapons.

In 1907, Curtiss joined with several others in a venture sponsored by Alexander Graham Bell (1847–1922), the Aerial Experiment Association. Bell was already famous for the invention of the telephone (1876), and by March 12, 1908, their "Red Wing," a bamboo glider with an air-cooled engine, enclosed cockpit, ailerons (the movable part of the wing) and a tail rudder, made a public flight over Keuka Lake, New York (near Hammondsport). There followed 150 more experimental flights in the "White Wing" and "June Bug" versions. By February 1909, the group had produced the "Silver Dart," which made the first heavier-than-air flight in the British Empire at Baddeck, Nova Scotia (Bell's summer home). Six months later, Curtiss won the Gordon-Bennett Cup for speed at the Reims air meet, and in May 1910, he

won a \$10,000 prize for his Albany to New York City flight of 150 miles in 153 minutes.

Glenn Curtiss then moved to San Diego to work with the United States Navy, building an aircraft for take-off from a large warship (1910) and the first seaplane to take off and land in the water (1911). He had founded the Curtiss Aeroplane and Motor Company in 1909, which became extremely profitable as a result of the First World War. With 21,000 employees in upstate New York, Curtiss turned out thousands of two-seat trainers, the *Jenny* or JN-4 for the United States Army and a number of different sizes of seaplanes for the United States Navy. After the sudden end of the war, he continued to produce the seaplanes essential for passenger carriage before aircraft landing fields became common.

Alberto Santos-Dumont (1873–1932), a Brazilian, had flown his dirigible airship around Paris in 1903, but switched to HTA and flew an aircraft 722 feet at Paris on November 17, 1906. The successful demonstrations by Wright and Santos-Dumont encouraged inventors throughout France to experiment in flying machines. Louis Blériot (1872–1936) flew his 25-horsepower monoplane (single wing) from Calais to Dover in 37 minutes on July 25, 1909. While the Wright model biplane continued in use for another 12 to 15 years, Blériot's success with the monoplane in 1909 persuaded designers to search for stronger materials for the single wing aircraft.

By August 1909 there was the first international air meet at Reims, France, sponsored by President Armand Fallières, with 35 airplanes. Glenn Curtiss was victorious in a speed contest. This meet confirmed the fascination with flying that had already captured France before the First World War. The first Air Meeting in America took place in January 1910 at Los Angeles where the French aviator Louis Paulhan won the altitude prize at 4,164 feet. The second American meet followed in September 1910 at the Harvard-Boston Aero Meet that attracted the Wright Brothers, Glenn Curtiss and a daring English pilot, Claude Grahame-White, who won the \$10,000 speed prize offered by the Boston Globe for a time of 34.1 minutes over the 33-mile course. The meet took place at Squantum in Boston Harbor and was witnessed by a million spectators including President William H. Taft.

An American woman, Harriet Quimby (1884–1912), a journalist, made her solo flight in 1911, flew across the English Channel, and returned to enter the 1912 Boston Aero Meet where she sought to break the 1910 speed record. She was thrown from her aircraft and killed at the Meet, but this tragedy did not discourage courageous women.

In Russia, Igor Sikorsky (1889–1972) began to experiment with multi-engine aircraft developing a 16-passenger two-engine aircraft by 1912 and a four-engine aircraft ("Ilya Mourometz") that he flew from St. Petersburg to Kiev and return on August 20, 1914 (1,600 miles). Its days as a passenger carrier were soon ended as it was turned into a mass-produced bomber for the First World War. Sikorsky fled the Russian Revolution in 1917, eventually coming to the United States where his

engineering skills produced important designs in helicopters and multi-engine aircraft.

During the war, the German, Hugo Junkers (1859–1935), designed the first all-metal monoplane and after the war the Dutch, Anthony Fokker (1890–1939), began the production of all-metal monoplanes of greater strength, superior lift capacity and less drag (the force of resistance opposing forward motion and parallel to the air stream). Manufacture of aircraft began in 1908 in Italy under Count Gianni Caproni (1886–1957). The company led in the development of multi-engine strategic bombers, used first against the Libyans in 1911. Caproni built the first monster aircraft to carry 100 passengers in 1921, but the eight-engine triplane crashed on its initial flight and was never rebuilt.

### C. THE FIRST WORLD WAR ERA

After 1910, aircraft in America became major attractions at circuses and county fairs but were held back by inadequate engines for machines large enough to carry passengers or cargo.

The first transcontinental flight from New York to Pasadena began in September 1910 in a Wright biplane, named the Vin-Fiz, and flown by Calbraith P. Rodgers (1879–1912). The flight took 49 days but only 82 hours and four minutes airborne with 69 stops for fuel and repairs. Rodgers was killed the next year when his aircraft encountered a flock of seagulls over Long Beach, California.

The First World War (June 28, 1914—November 11, 1918) brought about the development of more powerful engines and more flexible uses of larger aircraft as well as the development of ground facilities that would eventually be useful for commercial aviation. Single-seater aircraft were originally used for observation only, but after pilots armed themselves with personal weapons, machine guns were added and single combat began after April, 1915 on the Western Front (France), the beginning of an age of legendary exploits by gallant warriors of the sky. The development of fighter aircraft and bombers soon followed; Great Britain had 12 warplanes in 1914, and 22,000 by 1918. Aerial bombardment of England from German zeppelins was introduced in 1915; there would eventually be 159 night air raids by zeppelins and 28 day-time raids by bomber aircraft. Initially the targets were solely military but the idea of defeating enemy civilian morale by indiscriminate raids on cities emerged at the end of this long war. Also, by the end of the war the British and American navies were developing the aircraft carrier for a type of warfare that would dominate the Pacific sector in the Second World War.

The United States entered the First World War in April, 1917. U.S. factories had been building planes for the British, French and Russian military and Congress decided to build a large army air force, with an initial appropriation of \$640,000,000 for aircraft, but the war ended suddenly and unexpectedly in November 1918 after

the United States had spent \$1,250,000,000 for thousands of aircraft, most of which were not delivered until after the end of the war, leaving the U.S. government desperate to find uses for these surplus aircraft.

## D. THE INTER-WAR YEARS (1919–1939)

### 1. *Internationalism*

The Conference to bring an end to the First World War assembled in Paris two months after the armistice, in January 1919. After dealing with Germany and creating the League of Nations in the Treaty of Versailles, there were additional peace treaties with Austria, Hungary, Bulgaria and Turkey. A number of other international agreements were prepared, including the Treaty on the International Labour Organization, the Permanent Court of International Justice and the Treaty of Paris (International Convention on Air Navigation) of October 13, 1919, predecessor of the 1944 Chicago Convention (see Chapter 1). Two Committees of experts, one on technical issues, Comité International de Navigation Aérienne (CINA), and one on legal issues, Comité International Technique d'Experts Juridiques Aériens (CITEJA), remained. CITEJA drafted the basic agreement on Carrier Liability—the Warsaw Convention of 1929 (see Chapter 5), and the Rome Convention of 1933 on Ground Damage (see Chapter 8).

### 2. *Imperial Air Service to Colonies*

By the end of the First World War, aircraft had moved beyond tactical uses as observers, fighters and bombers to strategic considerations, the first of which was the need to tie far-distant colonial possessions to the mother country. France began mail and cargo service to its African empire in 1918, from Toulouse to Algiers, Casablanca and eventually Dakar in Senegal. The French services would become Air France in 1933.

In 1919 Australia offered a £20,000 prize for a London to Australia flight in 30 days or less. The prize was won by the brothers Ross and Keith Smith for a 28-day flight from London to Darwin. Australians organized the Queensland and Northern Territories Air Service (QANTAS) in 1922. Imperial Airways was developed by the British in 1924 with subsidized passenger, mail and cargo service to Asian and African colonies. Belgium had begun its air service (SABENA) to its colony in the Congo in 1920 and the Netherlands began its air service (KLM) to its colony in the Dutch East Indies in 1926. Absence of airport facilities in the Caribbean and Latin America did not inhibit the entrepreneurial genius of Juan T. Trippe (see pages 18–19), who had learned to fly in the Navy in 1918. Trippe bought surplus planes to begin an airline, Colonial Air Transport, to carry mail from New York to Boston. In 1927 he began to carry mail between Key West and Havana.

Trippe then used Sikorsky sea planes to carry passengers to the Caribbean islands and the Panama Canal Zone. In 1934 Trippe planned to apply the island-jumping techniques of his Caribbean operations to the Pacific, made possible by new longer-ranging seaplanes. The 8,000-mile flight was to be accomplished by means of refueling stops at Hawaii, Midway Island, a new island called Wake created from a coral reef, Guam and Manila, all controlled by the United States. Trippe's China Clipper began service from San Francisco to Hong Kong on October 13, 1936.

The Pan-Am Atlantic Clipper began service by way of Bermuda, the Azores, Lisbon and Southampton in 1939, after lengthy negotiations with the British and Portuguese governments for refueling stops.

### 3. *Airmail*

The U.S. Post Office began sustained airmail service with planes and pilots of the U.S. Army Air Corps on May 15, 1918, attended by President Wilson. The huge surplus of aircraft built for the First World War was seen by a hostile public as evidence of waste and extravagance. So a productive use had to be found quickly—initially New York to Washington, then New York to Cleveland and Chicago, by 1920 Chicago to Omaha and by 1921 to Salt Lake City and Sacramento. These were all-day flights following rivers and railroad tracks across the country, and by night the mail was transferred to trains for on-carriage to the next airport. By 1923, however, the government began to install a system of beacons for night flying. Airmail was a dangerous business, however, with 32 of the first 40 pilots being killed in the performance of their duty from 1918 to 1927. See B. Rosenberg & C. Macaulay, *Mavericks of the Sky: The First Daring Pilots of the U.S. AirMail* (2006).

In 1925, Congress decided to transfer the airmail delivery to private enterprise by the Contract Air Mail Act (1925 Acts, Ch. 128, 43 Stat. 805) called the Kelly Act; creating an industry over which there would be the introduction of government regulation in 1926. While competitive bidding was used for the award of the routes, eventually there would be substantial subsidies paid by the government for the carriage of mail, leading to scandals in the award of contracts. There were initially no passengers on these flights, but the airmail contracts of the 1920s would be the foundation of companies that later became passenger carriers, such as United Airlines, Transworld Airlines, Eastern, American and Northwest Orient Airlines. In the Great Depression (Oct. 1929–1939), it was the airmail contracts that enabled the aviation industry to survive.

### 4. *The Anti-Competitive Scandal (1930–1934)*

Evidence of government-sponsored, anti-competitive allocation of prices and territories was discovered in 1934 by Senator Black's investigation. It was revealed that there had been a "Spoils Conference" in 1930 that showed serious disregard of

the anti-trust laws in the award of airmail contracts. This conference had been presided over by President Hoover's Postmaster General, Walter F. Brown (1869–1961), a lawyer who had determined to reorganize the airline industry by revising airmail routes to produce several strong East-West or “trunk” operators with large financial resources while forcing weaker airlines out of business. Under Brown's plan, four airlines were to control regions of the country from centralized hubs: Eastern Airlines to operate in the Eastern region from the New York hub; TWA to operate in the Central region from the St. Louis hub; American Airlines to operate in the Southern region from the Dallas hub and United Airlines to operate in the Northern region from the Chicago hub.

In 1934 Congress became suspicious of corruption (never proven) and Senator Black's Committee held sensational hearings. The revelations brought a halt to airmail service on February 19, 1934, when Postmaster General James A. Farley cancelled all existing contracts. The U.S. Army Air Corps was called upon to return to the carriage of airmail on February 20, 1934, until a new system for the award of airmail contracts could be devised. The Interstate Commerce Commission was given the authority to impose fair and reasonable rates by the Air Mail Act of 1934 (1934 Acts, Ch. 466, 48 Stat. 933). During the interval, use of military pilots for the mails proved to be deadly for the pilots as 18 of the military pilots were killed in dangerous winter flights. Regular airmail service by contract carriers resumed May 14, 1934.

Threats of anti-trust prosecutions produced the break-up of holding companies controlling aircraft manufacture and airline operations. Despite the anti-trust violations and allegations of misconduct, there is no question that Walter Brown created the dynamic airline industry that the Civil Aeronautics Board would protect and defend until deregulation in 1978. Nevertheless, the way out of the depression would have to be the creation of a new market, the swift and safe carriage of passengers.

### 5. *The Atlantic Challenge (1919–1927)*

By 1923 there had been a transcontinental flight, New York to San Diego by First Lieutenant Russell Maughan, U.S.A., in 22 hours (with refueling), and in 1924 four Army Air Corps planes, built by the Douglas Co. began a trip around the world from Seattle to Seattle in 175 days, under the command of First Lieutenant Lowell Smith, U.S.A.; only two of the aircraft completed the circumnavigation, but the challenge to connect population centers in America with Europe by a non-stop flight remained.

In May 1919, a U.S. Navy flying boat (NC4) piloted by Lcdr. Albert C. Read, USN, (1887–1967) crossed the Atlantic from Newfoundland to the Azores, Lisbon and Southampton in 15 days taking advantage of the favorable west to east winds. Shortly thereafter two British Royal Air Force flyers—Capt. John Alcock (pilot)

and Lt. Arthur W. Brown (navigator)—crossed the Atlantic from Newfoundland to Clifden, Ireland, in a Vickers bomber in 16 hours on June 14, 1919, for a prize of £10,000, and knighthoods, but, thereafter, unsuccessful attempts to cross the Atlantic non-stop resulted in loss of four lives.

A prize of \$25,000 was offered for the first New York-Paris non-stop flight, a challenge accepted by Charles A. Lindbergh (1902–1974), a 25-year-old pilot, and his St. Louis backers. The plane, “The Spirit of St. Louis,” manufactured by the Ryan Aircraft Co. of San Diego, was essentially a flying fuel tank (450 gallons), 28 feet long with a 46-foot wingspan, capable of 237 m.p.h., from a 2,220 horsepower Wright engine, but without navigational aids other than a compass and with minimum visibility and no ability to combat the cold and ice of the North Atlantic. The solo flight began at Mineola, Long Island, on Friday, May 20, 1927, barely achieving take-off, at 7:52 a.m. By 7:15 p.m. he passed over St. John’s, Newfoundland, on his way across the Atlantic, fighting sleep for the next 19 hours. He crossed over Dingle Bay, County Kerry, Ireland at 1:30 pm. on Saturday. Four hours later he passed over Cherbourg and after circling Paris several times to find Le Bourget Airport, he set down at 10:24 p.m. on Saturday, May 21, 1927, to a waiting crowd of 50,000 people around the airport. The Atlantic had been conquered, non-stop: 3,610 miles (5,809 kilometers) in 33 hours and 39 minutes. Almost as significant as the Atlantic flight was the New York ticker-tape parade and national tour by Lindbergh and the Spirit of St. Louis to every state in the summer of 1927, confirming the safety and reliability of flight to American land-based travelers.

Commercial passenger flights across the Atlantic would not occur for another ten years until Pan American introduced its Clipper flights from New York to Southampton by way of the Azores. Until the arrival of commercial non-stop jet service over the Atlantic in 1958, propeller driven service would require refueling in places like Shannon, Ireland; Prestwick, Scotland; the Azores; Bermuda; Reykjavik, Iceland; Goose Bay, Labrador; or Gander, Newfoundland.

While French efforts to cross the North Atlantic had not been successful, their efforts in the South Atlantic were brilliantly successful. French colonial air service had advanced from Toulouse westward to Dakar and shortly after Lindbergh, Lts. Costes and Le Brix made the 2,100-mile flight from Dakar to Natal and Rio de Janeiro, Brazil, on October 14, 1927. Another intrepid aviator, Jean Mermoz, initiated airmail service in South America in 1927–1929; he also flew the South Atlantic route 23 times before his aircraft disappeared in December 1936. These South Atlantic and South American flights, as well as the sheer love of flying, were popularized by the works of the pilot and author, Antoine de Saint Exupéry (1900–1944), especially his books *Wind, Sand and Stars* and *Night Flight*.

This was also the time of legendary female pilots (usually called an aviatrix) successors of the late Harriet Quimby. An early Atlantic solo flight from East to West was performed by Beryl Markham (1902–1986). She flew from Abingdon, England, destination New York in September 1936, but her de Havilland gypsy

required refueling at Sydney, N.S. and she crash-landed on Cape Breton on the approach to Sydney. The most prominent of these pioneers was Amelia Earhart (1898–1937) who flew the Lindbergh Atlantic route with others a year later (June 17, 1928) but disappeared in the Pacific Ocean between New Guinea and Howland Island on a round-the-world flight in 1937. Anne Morrow Lindberg (1906–2001) learned to fly and became co-pilot and radio operator for her famous husband, Charles, in their 40,000 mile flight through five continents. She recorded her experiences in *North to the Orient* in 1931.

### 6. *Passenger and Cargo Services*

Use of aircraft for passengers or their baggage required larger aircraft and more powerful engines, not an immediate necessity in the wartime rush for observation and fighter aircraft in the First World War. Regular use of aircraft also required overcoming the fear of flight in the general public. Apparently the first regular carriage of passengers was the daily two and one-half hour flight by the Aircraft Transport & Travel Co. (A.T.&T.) between London and Paris for a maximum four passengers that began on August 25, 1919, replacing the Royal Air Force that had made 750 flights for official passengers. A.T.&T. became Imperial Airways in 1924. The first aircraft built specially for passengers was created by the German Junker Corp. in 1920.

Passenger service in America became practical with the appearance of the Ford Trimotor, generating 420 horsepower and capable of carrying ten passengers. The very first American service was an international flight, Miami to Havana, Cuba, in 1927. The second regularly scheduled service in the same year was New York to Chicago. The use of flight attendants, initially all trained nurses under age 24, was introduced by United Airlines in 1931. Ironically, as private industry developed aviation in North America, much of European aviation was nationalized and continued to be state owned until the 1980s. The state-owned airlines were usually required to fly aircraft produced in their nations and to use local crew members.

By the beginning of the Great Depression in 1929 there had already been 6,000 passengers on aircraft in the United States. Fierce competition to provide aircraft for the rapidly developing airline industry emerged in 1933 with the appearance of Boeing's "247," 550 horsepower, capable of 155 m.p.h. at 18,000 feet and the Douglas "DC-1" capable of 189 m.p.h. at 18,000 feet. The DC-1 would evolve into the DC-3 in 1935, a two-engine aircraft of 1,200 horsepower and 185–190 m.p.h., the strongest, safest and most beautiful aircraft of the pre-war period, carrying 21 passengers. The DC-3 would be the most important wartime carrier of passengers and cargo for military purposes; some 16,000 were built, 400 still flying in 2000. The DC-1 was used for the first transcontinental service, a 13-hour flight from New York to Los Angeles in 1934. It was estimated that by 1939, 75 percent of domestic passenger flights were on DC-3s. The ability of these aircraft to achieve higher

altitudes over weather turbulence produced greater passenger comfort and surely played a part in the growth of the aviation industry.

Lockheed and Douglas developed the four-engine passenger carrier at the beginning of the Second World War but adapted them for military purposes: later, the Lockheed Constellation and the Douglas DC-4 Skymaster became the workhorses of the post-war industry. In 1938, American carriers transported 1,365,706 passengers; but by 1947 the number of passengers would increase nine-fold.

Regular cargo service connecting 26 U.S. cities had begun on September 1, 1927, when the American Railway Express Co. entered into contracts for air cargo with four airlines, although the high cost was a deterrent for several years. Air cargo proved to be the salvation of blockaded Berlin in the first years of the Cold War as 2.5 million tons of cargo were airlifted into Berlin by 200,000 flights during the Soviet blockade (June 24, 1948-May 12, 1949) at the rate of 1,000 landings with 8,000 tons of cargo per day.

### *7. Federal Regulation of the Air Transportation Industry*

The U.S. government had taken no part in the research and development of aircraft for private industry, and it was only very gradually that government money became available. Probably one of the first examples of government funding was the 1924 decision to provide beacons for night-time flying from New York to Chicago and beyond. The next commitment of government money was the subsidy for carriage of airmail. Official recognition of the industry by regulation began in 1926. The fact that aircraft were regularly crossing state lines even before the development of passenger airlines—persuaded Congress to begin a program of regulation and financial aid to the infant industry by the Air Commerce Act of 1926 (Acts of 1926, Ch. 344, 44 Stat. 568). The Act established the Aeronautics Branch of the Department of Commerce. In addition to aids to air navigation and development of airports in major cities, the Act also provided for the registration of aircraft, licensing of pilots, establishing air routes and navigation and altitude restrictions for safety. Government ownership of airlines was never seriously considered.

The 1926 Act authorized the Aeronautics Branch to investigate and report the causes of aviation accidents. The 1931 air crash that killed the Notre Dame football coach, Knute Rockne, brought a strong national demand for scientific study of the causes of air disasters. (Apparently dry rot caused the loss of a wing and the plane crash.) Analysis and explanation of crashes helped to remove the public fear of flying. In 1933 the Air Safety Board of the Commerce Department was created to conduct the investigations. In 1940 the 1938 Civil Aeronautics Act was amended to create the Bureau of Safety in the Civil Aeronautics Authority (later Civil Aeronautics Board), which conducted accident investigations until the creation of the National Transportation Safety Board (NTSB) in 1967.

In 1934 Congress established the Bureau of Air Commerce to continue the work of the Aeronautics Branch, but the federal bureaucracy to protect the profitability of the industry would not begin until the creation of the Civil Aeronautics Administration in 1938 (Acts of 1938, Ch. 601, 52 Stat. 973). The Civil Aeronautics Administration was renamed the Civil Aeronautics Board (CAB) in 1940. The five-member bipartisan Board, its members serving six-year terms, was given a series of conflicting tasks in the development of air safety and the profitable operation of existing airlines. The principal regulatory procedure was the grant or withholding of a Certificate of Public Convenience and Necessity. The CAB controlled air routes, passenger fares, mergers and agreements. Having grandfathered the existing airlines in 1938, the CAB sought to protect the profitability of these airlines by restricting the entry of new carriers for the next 40 years. Protection of the public interest against monopolies and in favor of competition occurred in the prohibition of holding companies that produced aircraft and operated airlines. Airline profitability was also ensured by tight controls on the routes to be flown and the rates to be charged by existing airlines.

#### E. AIRCRAFT DESIGN AND MANUFACTURERS

In the 20 years after the Wright Brothers' flight, America developed a love affair with flying. Young men started aircraft manufacturing plants in their barns and garages soon after they learned to fly. Factories began to produce aircraft in many parts of the country. Some of these were the foundations of today's air and space industries but most failed outright or were merged with more successful competitors. We shall briefly look at the remarkable pioneers from the generation of the Wright Brothers: William E. Boeing (1881–1956), Glenn L. Martin (1886–1955), Allan M. Lockheed (1889–1969), John K. Northrop (1895–1981), James S. McDonnell (1899–1980) and Donald W. Douglas (1892–1981) as the prototypical entrepreneurs of aircraft design and manufacture, but the modern history of their companies follows a trail of mergers and acquisitions into a giant conglomerate.

The parents of William E. Boeing (1881–1956) came to America from Europe (father from Germany, mother from Austria) and made a fortune from investments in iron ore deposits in the Mesabi Range and in Michigan timber lands. William Boeing studied at the Sheffield Scientific School of Yale but left to go west to Washington state in 1904 before receiving a degree. He settled in the Seattle area where he invested in timber lands and became interested in the development of naval aviation. He obtained a pilot's license in 1914 and bought a seaplane in 1915. In 1916 he established a company to build aircraft at an old shipyard and soon had a government contract to build 50 seaplanes for the Navy. After the war, he won a contract to build 200 fighters for the Army. The Boeing Airplane Co. of Seattle continued to produce military aircraft in the inter-war years and began the

development of commercial aircraft, first for airmail, then for passenger carriage in the 1930s. The company introduced a four-engine, long-range passenger aircraft, the Boeing-247 in 1932. Although quickly overshadowed by the DC-3, the Boeing-247 was developed into the first of a series of long-range bombers: the B-17, B-29, B-47 and B-52, but these developments occurred after William Boeing had withdrawn from the company that continued to bear his name. His withdrawal from active management was the unfortunate result of a far-sighted move he made just before the Great Depression when he organized the United Aircraft and Transport Company, a giant trust or holding company with Boeing Aircraft Co. as the composite manufacturer, Pratt & Whitney to make the engines, design developments by Igor Sikorsky and Chance Vought and transport of mail and passengers by Boeing Air Transport Co. and United Airlines. The trust was broken up during the Depression in the course of congressional investigations of alleged financial mismanagement and oppression by trusts (see Section D.4). As a result of his early retirement, he did not participate in the spectacular successes of the wartime military production and the conquest by the Boeing 707 of the early jet age. The Boeing Co. then developed the work-horses of the early jet age, the 727 and the 737; it was almost bankrupted by the development of the Jumbo Jet, the 747 in the late 1960s, yet survived the crisis as the 747 dominated long-range aviation until competition developed from the European Airbus A300 series. In 1997 the revived Boeing Co. merged with McDonnell-Douglas, eliminating domestic competition. The Boeing Company was an early entrant into the field of supersonic transport but withdrew in 1971 to concentrate on space projects.

Glenn L. Martin (1886–1955) grew up in Kansas, but after two years of high school and work in a bicycle shop, the family moved to Santa Ana, California, where, in 1905, Martin operated an automobile dealership while experimenting with gliders. Five years after the Wright brothers, he attempted a powered flight, but it failed. On August 1, 1909, however, his first aircraft flew successfully. In the next year he established a flying school and started an aircraft factory, the Glenn L. Martin Co. of California to build biplane aircraft for observation and training. He was the foremost advertisement for his company in that he performed “barnstorming” stunts around the country and entered speed and endurance races.

In the First World War his company had military contracts and he served on a Naval Consulting Board to analyze proposed equipment. His company was merged with the Wright Brothers Co. in 1916, and he withdrew. In 1918 he formed a new Glenn L. Martin Co. of Ohio to design and build a bomber for the Air Corps, but the war ended before it could be mass-produced.

In 1931, Martin introduced a new bomber, the B-10, capable of speeds up to 200 m.p.h. and able to out-maneuver any existing fighters. The company narrowly escaped bankruptcy in 1934, but it was saved by a government loan and a large order for the B-10 bombers. After that escape, the company turned to the production of four-engine flying boats, the “China Clipper” for Pan Am.

During the Second World War the company produced the two-engine B-26 Marauder bomber, but was not ready for post-war competition. Suffering severe financial losses, Martin's company was again absorbed by Curtiss-Wright, which proceeded into the space age with rocket and space technology.

Alan H. Lockheed (originally Loughhead) (1889-1969) grew up on a farm in California where he began work as an auto mechanic, but was hired as a mechanic for two aircraft, a glider and a biplane, in 1910. He took his solo flight in that year and became a "barn-stormer" in the mid-west, flying at fairs and circuses for a year before going to San Francisco with his own design for a new seaplane. He and his older brother, Malcolm, produced a wooden biplane with a wingspan of 46 feet, with which they worked a concession for observation flights around San Francisco Bay at the 1915 International Panama-Pacific Exposition. After the close of the exposition, they moved to Santa Barbara where they found financing for the design and construction of a new seaplane, the F-1 in 1917, capable of carrying ten passengers. They worked out of a garage as auto mechanics by day and aircraft engineers at night. This aircraft was not used by the Navy, but it was redesigned as a land-based plane, the F-1A in 1919. By that time, they had a Navy contract to build two seaplanes based on the designs of Glenn Curtiss and they introduced their own design (engineered by John K. Northrop), a monoplane, the S-1, which was approved enthusiastically by Captain Hap Arnold (1886-1950) of the Army Air Corps (later the Commanding General of the Army Air Corps in the Second World War).

In the glut of surplus military aircraft after the end of the First World War, there was no demand for the S-1 and the Lockheed manufacturing company went out of business; Malcolm withdrew at that time. Allan continued to pursue his designs until 1926 when he found new financing for another aircraft venture that he established in Hollywood to produce his "Vega" monoplane with enclosed cabin. When a version of this design, manufactured by Ryan Aircraft Co. of San Diego was used by Charles A. Lindbergh for his May 1927 solo flight from New York to Paris, the future of Lockheed's Vega was assured. The Lockheed Company prospered for several years until it was acquired by a Detroit company and Allan Lockheed withdrew. This may have been a fortunate decision for him as the merged company failed in 1931 after the stock market crash. Following receivership and reorganization the Lockheed Corporation reemerged to build military aircraft.

Lockheed also cooperated with Howard Hughes, then of TWA, in the development of the Constellation Series of aircraft capable of transporting 60 passengers non-stop across the United States and the world's largest transport, the C-5 and later the successful jet passenger carrier, the L-1011. In separate ventures, Allan Lockheed made two further attempts at manufacturing aircraft after 1937 but they were unsuccessful.

John K. Northrop (1895-1981) grew up in Nebraska and California (Santa Barbara) where he graduated from high school in 1913 and began to work as an

auto mechanic, and eventually an architectural draftsman, at which point the Lockheed brothers hired him to make the engineering drawings of their new S-1 monoplane. Drafted into the Army in 1917, he was soon released to the Lockheed brothers to work on their contract for flying boats for the Navy. After the closing of the Lockheed brothers company in 1920, Northrop designed houses for three years until he was again hired as an aeronautical draftsman, this time by Douglas Aircraft Co. of Santa Monica. After three years, he rejoined Allan Lockheed in his new venture, the Vega aircraft, essentially designed by the self-taught Northrop. In 1928 he established his own company, Avion Corporation, to design "streamlined" aircraft. Avion was absorbed by Boeing's United Aircraft and Transport Corp. in 1929. Northrop withdrew in 1931 and joined Donald Douglas in 1932 in a new Douglas subsidiary, the Northrop Corporation, where he remained as designer for five years.

In 1939 the independent Northrop Aircraft, Inc. was organized and began to develop designs for military aircraft, both bombers and fighters. Of his war time designs, the flying-wing with a 172-foot wing span was not produced as a propeller driven aircraft, but, after his retirement, it reemerged as the B-2 Stealth bomber. Northrop's wartime company turned out more than 1,100 fighters. His post-war projects included the F89 Scorpion, a twin-jet fighter and an inter-continental cruise missile.

James S. McDonnell (1899–1980) was brought up in Little Rock, Arkansas, where he went from high school into the U.S. Army in 1917. After discharge from the Army he attended Princeton (B.S. 1921), followed by Massachusetts Institute of Technology (M.S. 1925), where he studied aeronautical engineering and won his pilot wings as an Army reservist in 1923. After M.I.T. he worked for eight different aircraft manufacturers as an engineer; for a brief period he had his own firm with two partners but the firm was soon bankrupt.

In 1939 he founded McDonnell Aircraft Corporation, located in St. Louis; the next year his company began to manufacture components for Boeing and Douglas. In 1943, however, the company received a Navy contract to build a jet fighter, under which he built 60 FD-1 Phantom jet fighters for carrier operations. This was followed by the Navy's F-2H Banshee jet fighter and the F-101 Voodoo jet fighter for the Air Force. The company's greatest achievement was the F-4 Phantom II, initially for the Navy as an attack aircraft in 1959, but produced for the Air Force as an interceptor in 1963; the company produced more than 5,000 of these in 20 years.

McDonnell Co. participated in the manned space program of NASA (The National Aeronautics and Space Administration) and was involved in both the early Mercury and Gemini spacecraft in the 1960s. The company's government contracts for military and space put McDonnell Aircraft into a financial position to acquire the Douglas Aircraft Co. in 1967. McDonnell's first experience with commercial aircraft was the DC-10 which competed directly with Lockheed's

L-1011 and the Boeing 747 series, but ultimately the merged McDonnell-Douglas was acquired by Boeing.

Donald W. Douglas (1892–1981) was a teen-age enthusiast, present at Fort Myers, Virginia, in 1909 to witness a demonstration by the Wright Brothers. He began his engineering studies at the Naval Academy but transferred later to Massachusetts Institute of Technology (MIT) where he graduated in 1912 in aeronautical engineering. He then worked at MIT on the development of a wind tunnel, and later worked on the Navy's first dirigible. From MIT he worked for the Glenn L. Martin Co. designing a bomber until he went to California in 1920 where he joined forces with an enthusiastic amateur, David Davis, to set up a plant in Santa Monica to design and build aircraft. Assisted by local businessmen, Douglas obtained a contract to build three planes for the Navy, followed quickly by an Army contract to build the aircraft that flew around the world in 1924.

The Douglas Company survived the depression with military contracts and entered the passenger business in 1932 with the all-aluminum twin-engine DC-1 for the predecessor of TWA; this aircraft carried 12 passengers at a speed of 170 m.p.h. The 21–28 passenger DC-3 came in 1936 and quickly became the most important carrier of passengers and cargo until the jet age. The DC-3 was developed for the military as the C47 Skytrain (also called the Dakota, the R-4D and the Gooney Bird). During the war, the Douglas Co. also developed the post-war four-engine Skymaster (DC-4) plus bombers and dive bombers. Approximately 29,000 aircraft were produced for the military by Douglas during the Second World War.

In the immediate post-war years, the Douglas Co. produced larger and faster propeller-driven aircraft, the DC-6 and DC-7, but the Company came too late to the development of the passenger jet. Faced with financial collapse in 1966, the Douglas Co. merged with the company of James S. McDonnell in 1967 and Donald Douglas retired. The merged company then produced the DC-8 and entered the jumbo jet race with the DC-10 in 1969. McDonnell-Douglas continued in space technology to produce the Saturn rocket. McDonnell-Douglas merged with Lockheed to form Lockheed McDonnell-Douglas before the merged entity was acquired by Boeing.

Two men whose names have been prominent in general aviation (small private planes), Clyde Cessna and Walter Beech, got their start at the same time as the commercial aircraft pioneers in the Kansas factory of the Travel Air Manufacturing Co. in 1924.

In order to carry passengers profitably, airlines required ever larger capacity aircraft. This became practical after 1925 when Henry Ford decided to mass-produce aircraft. Ford's Trimotor appeared in 1928, capable of carrying 16 passengers at 110 m.p.h. By 1933 the DC-3 appeared that could be configured to carry from 21 to 28 passengers operating at 180 m.p.h. and 20,000 feet altitude, above much of the ordinary weather turbulence for passenger comfort.

The development of much larger bombers and cargo carriers during the Second World War resulted in significantly larger passenger aircraft like the Constellation and super-Constellation carrying 88 passengers operating at 20,000 feet and 300 m.p.h. By the 1950s, propeller-driven aircraft had arrived at the outer limit of size and speed. The war-developed jet engine (see Section G) soon provided the speed and capacity for the increasing number of passengers. The early 707 jets could carry 200 passengers at 600 m.p.h., but as gridlock conditions paralyzed airports it became necessary to build the truly giant aircraft, beginning with the Boeing 747 capable of carrying 490 passengers in 1970 and the Airbus 380.

#### F. THE BEGINNINGS OF AIRLINES IN AMERICA AND THEIR COMPETITIVE STRUGGLES

Airlines began with the carriage of airmail (see Section D.3); only when airmail carriers were forced to bid for routes to be awarded to the lowest bidder did it become impossible to operate profitably from airmail. At that point passenger carriage became essential for airline profit. (Passenger revenues did not exceed airmail profits until 1936.) Significant factors in the growth of the aviation industry were the young pilots of the generation after the Wright Brothers for whom the magic of flight meant the profitable movement of airmail, goods and people. They had to learn on the job all the intricacies of marketing, management, labor relations, government regulation and finance. As exemplars of this new type of enterprise we shall consider seven men, four of whom came from impoverished backgrounds and three who came from wealth. They were: Thomas E. Braniff (1883–1954), Edward V. Rickenbacker (1890–1973), Cyrus R. (C.R.) Smith (1899–1990), Robert F. Six (1907–1986), Juan T. Trippe (1899–1981) and Najeeb Halaby (1915–2003); lastly we shall briefly consider the life of Howard Hughes (1905–1976), pilot, manufacturer and airline operator. The airlines established by these entrepreneurs prospered in the age of government protection under the Civil Aeronautics Board (CAB), but several of them could not survive the fierce competition introduced by deregulation in 1978.

Thomas E. Braniff (1883–1954) was born in Kansas, but the family moved to the new territory of Oklahoma when it was opened for settlement in 1900 and the teenager assisted his father in selling insurance for two years before he opened his own agency in 1902, a successful business he continued to operate until the end of the First World War when his brother Paul, a military aviator in France, returned home. Thomas then took flying lessons and joined Paul in a flying taxi that soon became an airline service around Oklahoma, a state badly served by railroads. Their initial financing came from the new “Wild Cat” oil companies. They expanded their operations to Texas before their air service was absorbed by a predecessor of American Airlines in 1929. But the burgeoning petroleum industry and

the absence of rail and road links caused them to found a new airline in 1930 to service the Southwest and by 1939 to connect with Chicago, St. Louis and Houston. The new company survived the Depression by means of a 1934 airmail contract.

During the Second World War the government requisitioned much of the carrying capacity of the nation's airlines in the Air Transport Command to ferry aircraft, men and equipment to the war zones. Braniff began service to Panama, Central America and Mexico. After the war, the airline continued to develop the Southeast and expanded further into South America in competition with Pan Am. Thomas Braniff died, a passenger, in the crash of a private plane in 1954.

Edward (Eddie) V. Rickenbacker (1890–1973), the son of Swiss immigrants, was born in Columbus, Ohio. He dropped out of school in the seventh grade after the death of his father and began work in a factory; he later became a mechanic in an automobile factory and garage. At age 18 he was moved into promotion and sales for the Firestone-Columbus Auto Co. and he traveled widely in the West. During this period he participated, usually successfully, in auto races. In 1912 he turned to full-time auto racing, and in 1916 had his first airplane ride from the champion "barnstormer," Glenn Martin. He traveled that year to England (then at war with Germany) and observed the flights of the Royal Flying Corps. His enthusiasm for the new medium was great but his experience as a driver of automobiles was more in demand. When the United States entered the First World War in April 1917, Rickenbacker enlisted and was sent to France as driver for General Pershing, commander of the American Expeditionary Force. He also drove for Colonel Billy Mitchell who procured his admission to the Army Flight School in France where he soon won his pilot's wings and an officer's commission.

Rickenbacker's first flying assignment in France was as flight instructor and student of tactics. In March 1918 he was ordered to a combat squadron where he became the "Ace of Aces," having been credited with shooting down 26 German aircraft while participating in 134 air battles before the Armistice of November 11, 1918. He was awarded the Congressional Medal of Honor and was made commanding officer of his squadron.

Returning to a triumphal reception at home, the conquering hero went into automobile manufacturing, but the business failed. He also started an airline in Florida with an airmail contract from Atlanta to Miami, but this also failed. He was then hired as vice-president to manage the troubled Eastern Airlines in 1934. Eastern returned to profitability with the new DC-3 aircraft on a route from New York to Miami with intermediate stops in Washington and Jacksonville. Rickenbacker eventually took control and became President in 1938. Rickenbacker was always fortunate in the support of wealthy New York financiers and under his expansive management style, Eastern was a financial success with a model safety record and high employee morale, eventually adding transcontinental and international flights to its domestic service.

During the Second World War, he became an advisor to the War Department and inspected Army Air Corps bases in Europe, Africa, the Mid-East, Russia, China and the Pacific. It was on a flight from Hawaii to New Guinea, on which he was a passenger, that the aircraft crashed in the mid-Pacific. The crash site was not located by rescuers, and Rickenbacker and seven others floated in open life rafts for 24 days before being rescued.

After the war Rickenbacker resumed full control of Eastern. He became Chairman of the Board and Chief Executive Officer in 1953, serving until his retirement in 1963. Eastern was an early victim of deregulation as Rickenbacker's successors fought the company's unions in a bitter struggle that destroyed the company in 1986.

Cyrus R. (C.R.) Smith (1899–1990), born in great poverty in Minerva, Texas, was the oldest of seven children in a family abandoned by the father when C.R. was nine. He became an office boy, then a bookkeeper before graduating with a business degree from the University of Texas in 1924. He then was hired by Texas Air Transport, which became part of the Southern Air Transport Co. as a bookkeeper. He learned to fly at this time. Southern Air Transport, with C.R. as vice-president and treasurer, eventually became part of American Airlines, after reorganization in 1934, and C.R. became President. C.R. Smith remained with American Airlines for his entire business career of 35 years. As President, Smith's job was to expand the airline beyond the South. Expansion would require new aircraft with greater capacity, but the Douglas Co. needed firm commitments to develop its new DC-3. Smith sought assistance from the federal government and the Reconstruction Finance Corporation (RFC, headed by another Texan, Jesse Jones) came through with a loan of \$4.5 million for new aircraft. With his new DC-3 aircraft, Smith made the decision to concentrate on the New York market, leading other airlines into two new airports, La Guardia and later Idlewild (which became J.F. Kennedy in 1964).

C.R. took a leave of absence to become Colonel Smith of the Air Transport Command, responsible for world-wide ferry service of new aircraft to the front. On his return to American Airlines after the war, Smith expanded the services and introduced computerized reservations systems and new marketing devices such as group travel plans and weekend travel discounts. He retired in 1968 to become Secretary of Commerce in the final year of the presidency of the Texan L.B. Johnson, and returned to run American for a short period in the mid-1970s. American Airlines is still a major carrier.

Robert F. Six (1907–1986) was born in California, the son of a physician, but he dropped out of high school in his second year, was soon orphaned and began his travels around the world, supporting himself as a factory mechanic and merchant seaman. Inspired by the Lindbergh flight in 1927, Six began to take flying lessons. Soon after he received his pilot's license in 1929 he bought a plane to operate a charter or taxi service, Valley Flying Services, in the San Francisco area, but this

business failed in the Depression. He traveled to Spain, France and China before returning to California where he married the daughter of a wealthy businessman, who financed a new flying venture, Varney Air Transport, with an airmail contract to serve El Paso, Texas, Denver and Pueblo, Colorado. As Varney Flying Services expanded into passenger service, it was renamed Continental Airlines in 1937.

During the Second World War, Robert Six served for two years with the Air Transport Command, and then returned to Continental Airlines, which continued its regional service until 1955 when it gained additional routes to Chicago, Kansas City, Denver and Los Angeles, a move that required borrowing \$64 million to acquire new jet aircraft and obtain further routes to expand to 36 cities. During the build-up of American forces in Vietnam, Continental operated profitable charter services to Southeast Asia. In a power struggle in 1982, Robert Six lost control of Continental to Frank Lorenzo's Texas Air. That struggle preceded the collapse of the airline as Lorenzo sought the aid of the bankruptcy court to break the union contracts. Continental remains a major carrier today.

Juan T. Trippe (1899–1981) was born in Seabright, New Jersey. His father was a banker and member of the New York Stock Exchange. At age ten he watched Wilbur Wright's flight over New York City. He entered Yale University in Fall 1917 but soon left to undergo Navy flight training. He won his wings and was commissioned in 1918, but the war ended before he was in combat. He returned to Yale in 1919 and graduated in 1921, just after the death of his father and the collapse of the family bank. He became a bond salesman on Wall St. for two years, but gave that up in 1923 to start a commuter airline, Long Island Airways, financed by former Wall St. associates.

With the aid of powerful and wealthy friends in New York and Boston, Trippe was awarded an airmail contract between New York and Boston for his Colonial Air Transport, but was ousted by his partners because of his plan for an airmail route to Havana from Key West. In 1927 he was awarded another contract to Havana and he organized Pan American Airways taking over the name of a defunct competitor. Trippe would later form a subsidiary, Panagra, in combination with the Grace Shipping Company to serve the West Coast of South America. Trippe next obtained airmail contracts to and from Latin America and the Caribbean. He concentrated on eliminating rivals and consolidating his position in Latin America and the Caribbean, ignoring domestic routes completely.

By 1935, having absorbed the lessons of Latin American diplomacy, he planned to begin air services across both the Atlantic and Pacific Oceans from the United States. Trippe soon realized that the Atlantic crossing required refueling in Canada, Newfoundland, the Azores and Lisbon before landing in the United Kingdom, which meant a series of bilateral landing rights agreements. A Pacific crossing, however, could be accomplished without foreign negotiations by refueling only at U.S. possessions Hawaii, Midway, Wake, Guam and the Philippines.

He sought advice from Igor Sikorsky and Charles Lindbergh and initiated the Pan Am China Clipper services in the Pacific in 1936. By 1939 his problems with the competitor British Imperial Airways were resolved by the agreement for equal services, and Pan Am's Atlantic Clipper service began in 1939. Pan Am had a monopoly on international services as the "chosen instrument" of U.S. foreign policy; but during the Second World War, Pan American's monopoly status in international flights diminished as the emergency required the use of all available aircraft for military purposes. Trippe's response was an effort to organize a trust or cartel, but this did not succeed and other American airlines successfully challenged Pan Am after the war. Under Trippe's leadership Pan Am pushed the development of passenger jet aircraft, beginning in 1955 with Boeing 707s and in 1969 the introduction of the Boeing 747. Just before the introduction of these huge aircraft, he retired in 1968, leaving enormous financial problems to his eventual successor, Najeeb Halaby.

The parents of Najeeb Halaby (1915–2003) had emigrated from Aleppo, Syria, to New York and soon became importers of rugs, damasks and jewelry after moving from New York to Dallas where they prospered. Halaby graduated from Stanford (A.B. 1937) and Yale Law School (LL.B. 1940). After two years of private practice, he became a Navy pilot in the Second World War. He was a test pilot of more than 50 types of military aircraft. As a Navy pilot, he broke the existing altitude record with an early jet fighter, the YP-59. After the war, as an employee of the Department of State (later the Defense Department), he advised the Saudis on civil aviation matters. His many foreign connections brought his first job in passenger-carrying aviation with Eastern Airlines in 1951. He was an adviser to the Defense Department 1948–1952, and Assistant Secretary of Defense, 1952–1954. He became Administrator of the Federal Aviation Agency in the new Kennedy Administration in 1961. In 1965 he left government service to join Juan Trippe in Pan American World Airways. During Halaby's years as second in command at Pan Am, Juan Trippe greatly, even recklessly, expanded Pan Am's fleet of aircraft and ground structures; thus when Halaby became president in 1968, the airline was already in grave financial difficulties, which greatly increased until he was forced out in 1972. Purchase of National Airlines to provide domestic routes combined with the new fleet of 747s crippled the airline that soon became another victim of deregulation. Pan Am disappeared from its world-wide services in 1993.

We end this brief survey with the remarkable career of Howard Hughes (1905–1976). Born in Houston, Texas, he was the son of a wealthy mining engineer who invented the conical drilling bit, essential equipment for drilling for crude oil. The Hughes Tool Co. became extraordinarily profitable and provided every luxury for the family, which moved to Southern California when Howard Hughes was 16. His uncle, Rupert Hughes, was a famous playwright, author of popular fiction and director of dozens of movies in Hollywood. Howard attended private schools and entered Rice Institute in Houston but dropped out of college at the death of his