



Reader Resources



Human Factors

Enhancing Pilot Performance

Dale Wilson

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AVIATION SUPPLIES & ACADEMICS
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Human Factors: Enhancing Pilot Performance—Reader Resources
by Dale Wilson

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Aviation Supplies & Academics, Inc.

7005 132nd Place SE

Newcastle, Washington 98059 USA

425-235-1500 | asa2fly.com

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Chapter 3: Aviation Human Factors

Helpful Resources

The FAA Human Factors Division has produced a ten-module web-based course that describes the most salient concepts of human factors research and engineering. Designed for FAA employees, the Human Factors Awareness Course is an excellent introduction to the discipline of human factors and is available for anyone to use: elmscontent.dot.gov/elms/faa/ato/to/hfwebtraining/index.htm

Even though it is written for specialists and is highly technical, lengthy, and can be expensive (even used), *Engineering Psychology and Human Performance*, written by Christopher Wickens and others (depending of the edition), is a good book for those who want to delve deeper into the cognitive aspects of human factors design.

Another excellent work of similar character as Wickens et al. that is slightly more readable for the layperson and contains a broader coverage of the discipline is the *Handbook of Aviation Human Factors*, second edition, edited by John Wise, David Hopkin, and Daniel Garland.

A very short video clip of the first “blind flight” conducted by Lieutenant James “Jimmy” Doolittle and his safety pilot on September 24, 1929: www.gettyimages.com/detail/video/james-jimmy-doolittle-performs-first-blind-flight-news-footage/145012946

Chapter 4: Hypoxia and Hyperventilation

Helpful Resources

The FAA's Civil Aerospace Medical Institute has produced several short but very informative flight physiology videos available in English, and some also in Spanish and/or Japanese, at www.faa.gov/pilots/training/airman_education/physiologyvideos/. The following relate to the contents of this chapter:

- *Physics of the Atmosphere*
- *Respiration and Circulation*
- *Flying & Hypoxia*
- *Understanding Aviation Oxygen Equipment*
- *Hyperventilation: When Flying Takes Your Breath Away*
- *The Ups and Downs of Cabin Pressurization*

The FAA has also published several helpful brochures related to the topics in this chapter available at www.faa.gov/pilots/safety/pilotsafetybrochures/.

- *Carbon Monoxide: A Deadly Menace*
- *Hypoxia: The Higher You Fly...The Less Air In The Sky*
- *Oxygen Equipment Use in General Aviation Operations*

Chapter 17, "Aeromedical Factors," in the FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25B, 2016) provides an excellent overview of hypoxia: www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/

Aeromedical Training for Flight Personnel. A great reference that provides in-depth coverage of a variety of physiological aspects related to flying, including hypoxia and DCS, published by the U.S. Department of the Army and is available to the public through booksellers and from other publishers.

Aircraft Operations at Altitudes Above 25,000 Feet Mean Sea Level or Mach Numbers Greater Than .75 (FAA AC 61-107). This updated Advisory Circular provides physiological and aerodynamic information for pilots upgrading to complex, high-performance aircraft capable of operating at high altitudes and high airspeeds: www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1020859

Chapter 5: Trapped and Evolved Gases

Helpful Resources

The FAA's Civil Aerospace Medical Institute has produced several short but insightful flight physiology videos available in English, but some also in Spanish and/or Japanese, at www.faa.gov/pilots/training/airman_education/physiologyvideos/. The following relate to the contents of this chapter:

- *Altitude-Induced Decompression Sickness*
- *Trapped Gas*
- *Physics of the Atmosphere*
- *The Ups and Downs of Cabin Pressurization*

The FAA also has published a helpful brochure titled *Altitude-Induced Decompression Sickness* (Publication AM-400-95/2) available at www.faa.gov/pilots/safety/pilotsafetybrochures/.

Chapter 17 (*Aeromedical Factors*) in the *FAA Pilot's Handbook of Aeronautical Knowledge* (FAA-H-8083-25B, 2016) provides a good overview of trapped gas issues: www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/

Aeromedical Training for Flight Personnel. A great reference providing in-depth coverage of a variety of physiological aspects related to flying, including hypoxia and DCS, is published by the U.S. Department of the Army and is available to the public through booksellers and from other publishers.

Aircraft Operations at Altitudes Above 25,000 Feet Mean Sea Level or Mach Numbers Greater Than .75 (AC 61-107). This updated Advisory Circular provides physiological and aerodynamic information for pilots upgrading to complex, high-performance aircraft capable of operating at high altitudes and high airspeeds: www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.list/parentTopicID/119

Chapter 6: Vision

Helpful Resources

The FAA's Civil Aerospace Medical Institute provides a variety of resources related to pilot vision:

- Three aeromedical safety brochures titled *Laser Hazards in Navigable Airspace* and *Laser Eye Protection (LEP) Perceptual Effects on Aviation*, with suggestions on how to mitigate a laser illumination encounter, and *Sunglasses for Pilots: Beyond the Image*, with guidance on what to look for in quality sunglasses: www.faa.gov/pilots/safety/pilotsafetybrochures/
- A 15-minute video (in English or Spanish) titled, *Vision in Aviation—To See or Not To See*: www.faa.gov/pilots/training/airman_education/physiologyvideos/

Chapter 12, “Night Operations,” in the FAA's latest *Helicopter Flying Handbook* provides excellent coverage of physiological and perceptual aspects of night flying, including practical suggestions on how overcome these limitations when flying at night: www.faa.gov/regulations_policies/handbooks_manuals/aviation/helicopter_flying_handbook/

Chapter 2, “The Big Sky Is Not So Big,” in *Managing Risk: Best Practices for Pilots*, by Dale Wilson and Gerald Binnema, explains the factors that increase the risk of a MAC and provides an extensive list of best practice strategies you can use to mitigate the risk: www.asa2fly.com/Dale-Wilson-C565.aspx

Two helpful resources from the FAA for pilots contemplating undergoing surgical procedures, such as laser eye surgery (LASIK) to improve vision: “The Eyes Have It,” by Susan Parsons, *FAA Safety Briefing* (January/February 2013), available at www.faa.gov/news/safety_briefing/2013/ and “Information for Pilots Considering Laser Eye Surgery,” FAA pamphlet OK-06-148, available at www.faa.gov/pilots/safety/pilotsafetybrochures/

Answers for Pilots: Vision—How Different Vision Issues Can Impact Your Airman Medical Certification, by Kathleen Dondzila King, published by the AOPA Air Safety Institute, provides information about a variety of vision issues as they may relate to your medical certification: www.aopa.org/news-and-media/all-news/2013/january/01/answers-for-pilots-vision

Chapter 7: Hearing and Noise

Helpful Resources

Noise and Vibration in Aviation (in English or Spanish) is an informative short video produced by the Airman Education Programs branch at the FAA's CAMI that focuses on the effects of noise and vibration in the flight environment: www.faa.gov/pilots/training/airman_education/physiologyvideos/

The Siemens Corporation has published some excellent information in two short animated videos on how hearing works, noise, and hearing loss—"How Hearing Works" and "Hearing Loss": www.signia-hearing.com/hearing-and-hearing-loss/

The FAA has several other resources that deal with noise and communication:

- Safety pamphlet, *Hearing and Noise in Aviation* (P-AM-400-98/3): www.faa.gov/pilots/safety/pilotsafetybrochures/
- Two Advisory Circulars—*Noise, Hearing Damage, and Fatigue in General Aviation Pilots* (AC 91-35); and *Cockpit Noise and Speech Interference Between Crewmembers* (AC 20-133): www.faa.gov/regulations_policies/advisory_circulars/
- "Radio Communications Phraseology and Techniques" (Chapter 4, Section 2) in the FAA AIM.

How To Buy a Headset: A Guide to Get you Started, by Elizabeth Tennyson, published by the AOPA Air Safety Institute, provides advice regarding both passive and active noise reduction aviation headsets: www.aopa.org/news-and-media/all-news/2001/april/pilot/how-to-buy-a-headset

"An Overview of Aircraft Noise Reduction Technologies," published in the June 2014 edition of the *AerospaceLab Journal*, is a fascinating article about current and future technologies used to reduce aircraft engine and airframe noise: aerospacelab.onera.fr/al7/overview-of-aircraft-noise-reduction-technologies

Chapter 8: Acceleration and Flight

Helpful Resources

Watch a short video of the automatic ground collision avoidance system (Auto-GCAS) saving an F-16 (discussed in this chapter's introduction) from LOC-I after the pilot experienced G-LOC:

www.nasa.gov/centers/armstrong/features/auto-gcas_performs_fourth_confirmed_save.html

Acceleration in Aviation is 23-minute FAA CAMI video in English or Spanish that illustrates various aspects of the G environment and G-induced incapacitation. There are some nice fighter jet shots, too! www.faa.gov/pilots/training/airman_education/physiologyvideos/

The FAA also has two helpful publications regarding addressing this topic:

- *A Hazard in Aerobatics: Effects of G-Forces on Pilots* (FAA AC 91-61). This advisory circular provides physiological information for pilots who desire to engage in aerobatic flying: www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/22429
- *Acceleration in Aviation: G-Force* (AM-400-09/4). This brochure provides a concise summary of the physiological effects of positive and negative vertical accelerations: www.faa.gov/pilots/safety/pilotsafetybrochures/

Chapter 9: Spatial Disorientation

Helpful Resources

The FAA's Civil Aerospace Medical Institute provides several free videos that graphically illustrate various aspects of spatial disorientation. Available in English and Japanese, *Spatial Disorientation Part 1: Vestibular Illusions* is available at www.faa.gov/pilots/training/airman_education/physiologyvideos/

The following short USAF aerospace physiology videos are available at www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/cami/library/online_libraries/aerospace_medicine/sd/videos/

- *G-Excess Effect*
- *Grave Yard Spiral*
- *Inversion Illusion*
- *Otolith Illusions*
- *Pitch-Up Illusion*
- *Semi-Circular Illusion*

Spatial Disorientation: Confusion That Kills is an AOPA Air Safety Institute *Safety Advisor* that can assist you in managing the threat of spatial disorientation: www.aopa.org/training-and-safety/air-safety-institute/safety-publications/safety-advisors

Aeromedical Factors, Chapter 17 in the FAA's latest *Pilot's Handbook of Aeronautical Knowledge* (FAA-H-8083-25), provides an excellent overview of spatial disorientation: www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/

The Art of Aeronautical Decision-Making is an online FAA Safety Team tutorial that draws upon the collective wisdom and expertise of VFR pilots and instructors who have learned from the mistakes of others. It provides invaluable information to help you determine your own minimums and avoid inadvertent flight into IMC: www.faasafety.gov/gslac/ALC/course_content.aspx?pf=1&preview=true&CID=28

Chapter 10: Fatigue on the Flight Deck

Helpful Resources

Fatigue Countermeasure Training, an online course developed by the FAA Safety Team, presents practical fatigue risk management tools to improve your health, get better sleep, and be safer on the job. Designed primarily for aviation maintenance crews, the principles apply to pilots and other aviators as well. One of the best parts is the informative and enjoyable 20-minute course introduction video, *Grounded*. This is not your typical FAA training video: www.faaSafety.gov/gslac/ALC/CourseLanding.aspx?CID=174

Fatigue in Aviation. A 16-minute award-winning video produced by the Airman Education Programs branch at the FAA CAMI that describes the symptoms of fatigue and suggested countermeasures to mitigate it: www.faa.gov/pilots/training/airman_education/physiologyvideos/

Fighting Fatigue. AOPA Air Safety Institute's *Safety Advisor* can assist you in understanding and reducing the threat of fatigue. Includes short videos: www.aopa.org/training-and-safety/online-learning/safety-advisors-and-safety-briefs/fighting-fatigue

Chapter 11: Health Maintenance and Lifestyle

Helpful Resources

The Airman Education Programs branch at the FAA's Civil Aerospace Medical Institute has produced two helpful videos that are germane to this chapter: *Self-Imposed Stress and Aviation*, and *Fit for Flight*, both available at www.faa.gov/pilots/training/airman_education/physiologyvideos/.

Fitness to Fly: A Medical Guide for Pilots is a preventive maintenance handbook designed to help you maintain your fitness to fly and live a balanced lifestyle. A 22-page version of the book is available for download free from the International Federation of Air Line Pilots' Associations (IFALPA) at www.ifalpa.org/publications/library/fitness-to-fly--2684. The complete book is available for purchase at the ICAO website at store.icao.int/.

Aviation Medicals

Answers to questions about medical certification—obtaining a medical, disqualifying medicine or medical conditions, etc.—can be obtained from the following sources:

- AOPA: www.aopa.org/go-fly/medical-resources
- FAA: www.faa.gov/licenses_certificates/medical_certification/faq/
- Canada: tc.canada.ca/en/aviation/medical-fitness-aviation

Medication

Both AOPA and the Aviation Medical Advisory Service provide a list of FAA allowed/disallowed medications for pilots who hold FAA-issued medical certificates: www.aopa.org/go-fly/medical-resources/medications-database and www.aviationmedicine.com/medication-database/

Alcohol

Rethink Your Drinking is an informative web site created by the Ontario government that includes quizzes, videos and other resources to help you rethink the role of alcohol in your life: www.rethinkyourdrinking.ca/information/

Smoking

Want to quit smoking? Smoking cessation counselors are available to help at 1-800-QUITNOW or 1-877-44U-QUIT (National Cancer Institute) or via a live online chat line at livehelp.cancer.gov/app/chat/chat_launch. Canadians should go to Health Canada's interactive and very creative website at www.breakitoff.ca.

Chapter 12: Visual Perception

Helpful Resources

Spatial Disorientation—Visual Illusions (Part 2) is an informative 15-minute video, in English and Japanese, produced by the Airman Education Programs branch at the FAA’s Civil Aerospace Medical Institute that focuses on visual illusions that can lead to spatial disorientation: www.faa.gov/pilots/training/airman_education/physiologyvideos/

Controlled Flight Into Terrain in Visual Conditions: Nighttime Visual Flight Operations Are Resulting in Avoidable Accidents is an NTSB Safety Alert (SA-013) that lists some notable accidents in which aircraft were flown into terrain in VFR weather conditions at night, and summarizes countermeasures you can take to prevent such an accident from happening to you: www.nts.gov/safety/safety-alerts/pages/default.aspx

Several articles on night flying are published in the FAA’s magazine for GA safety, the *FAA Safety Briefing* (formerly the *FAA Aviation News*). They can be found at www.faa.gov/news/safety_briefing/archive/

- *Good N.I.G.H.T.*, November/December 2015
- *[N] = Nightlights*, November/December 2015
- *[I] = Illusions*, November/December 2015
- *Shedding Light on Night Flight*, November/December 2008
- *N.I.G.H.T.*, November/December 2005
- *Be Aware of What Lurks in the Night*, November/December 2003

Chapter 12, “Night Operations,” in the latest *FAA Helicopter Flying Handbook* (2019) provides excellent coverage of physiological and perceptual aspects of night flying, including practical suggestions on how to overcome these limitations when flying at night: www.faa.gov/regulations_policies/handbooks_manuals/aviation/helicopter_flying_handbook/

The AOPA Air Safety Institute provides several resources on night flying, including safety articles, briefings, advisors, quizzes and videos: www.aopa.org/training-and-safety/technique/night-flying

Weather to Fly—Rain on Windshield is short video produced Transport Canada that explains the effect of rain on the windshield of an aircraft: www.youtube.com/watch?v=0HwsDtA6Kxw

Flying in Flat Light and White Out Conditions, produced by the FAA, is available in HTML format at the FAASTeam Learning Center Library: www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=6844

An informative FAA “Back to Basics” video by the same name is also available from YouTube: www.youtube.com/watch?v=dptvV9u8nNQ

Much of the latter half of this chapter is based on information found in Chapter 7, “Don’t Be Caught in the Dark,” and Chapter 8, “What You See Is Not Always What You Get,” in *Managing Risk: Best Practices for Pilots* (by Dale Wilson and Gerald Binnema). These two chapters explore many of the challenges involved in night flying and the deceptive nature of visual landing illusions: www.asa2fly.com/Managing-Risk-Best-Practices-for-Pilots-eBook-PD-P2031.aspx

Chapter 13: Auditory Perception

Helpful Resources

Radio Communications Phraseology and Techniques, an online course developed by the FAA Safety Team (FAASTeam)—based on a safety pamphlet of the same name (P-8740-47)—presents best practices for radio technique and communication with ATC: www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=17272

Standard Phraseology, an article on Skybrary, an electronic repository of aviation safety knowledge, contains links to a number of articles, manuals, studies and other documents related to communication in the flight environment, including the IATA *Phraseology Study* referred to in this chapter and *Air Ground Communications Briefing Note: 5–Radio Discipline*, produced by Eurocontrol (the European Organization for the Safety of Air Navigation): www.skybrary.aero/index.php/Standard_Phraseology

The AOPA Air Safety Institute has several resources on communication, including safety articles, briefings, advisors, quizzes and videos: www.aopa.org/training-and-safety/air-safety-institute/safety-spotlights/radio-communications-and-atc

“Radio Communications Phraseology and Techniques” (Chapter 4, Section 2) in the FAA AIM is very helpful, especially for new pilots. So is the *Pilot/Controller Glossary*: www.faa.gov/air_traffic/publications/#manuals

ICAO’s *Aeronautical Telecommunications* (Annex 10, Volume II) is available at: www.icao.int/Meetings/anconf12/Document%20Archive/AN10_V2_cons%5B1%5D.pdf

Chapter 14: Attention, Vigilance, and Monitoring

Helpful Resources

An *Awareness Test: How Many Basketball Passes Does the Team in White Make?* If you haven't already seen this one-minute video you should. It effectively demonstrates how difficult it is to successfully focus on more than one thing at a time: www.youtube.com/watch?v=Ahg6qcgoay4

These are three informative documents that provide several best practices that airline flight departments and flight crews should use to improve the effectiveness of flight crew monitoring:

- *Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers* (FAA AC 120-71B). This recently updated Advisory Circular includes helpful chapters on checklist design and usage and on monitoring best practices: www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030486
- *Monitoring Matters: Guidance on the Development of Pilot Monitoring Skills*, published by the U.K. Civil Aviation Authority: publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=5447
- *A Practical Guide for Improving Flight Path Monitoring: Final Report of the Active Pilot Monitoring Working Group*, published by the Flight Safety Foundation: www.flightsafety.org/toolkits-resources/flight-path-monitoring/

The elimination of distractions has been on the NTSB's *Most Wanted List of Transportation Safety Improvements* since 2013. More information can be found at the *Most Wanted List* webpage at www.nts.gov/safety/mwl/Pages/default.aspx

Airbus has produced several flight operations briefing notes applicable to all aspects of safe commercial airline flight operations. An excellent overview of situational awareness on the flight deck is their *Human Performance: Enhancing Situational Awareness*, available from Skybrary's online safety library: www.skybrary.aero/index.php/Situational_Awareness

Chapter 15: Flight Deck Design and Automation

Helpful Resources

The free online FAA *Human Factors Awareness Course* has separate modules on displays (both visual and non-visual) and controls: elmscontent.dot.gov/elms/faa/ato/to/hfwebtraining/index.htm

A thorough exploration of the China Airlines A300 accident (discussed in this chapter's introduction), including an animation of the accident, can be found at the FAA's Lessons Learned library web site: lessonslearned.faa.gov/ll_main.cfm?TabID=3&LLID=64&LLTypeID=0

The FAA's 2013 SAFO 13002, *Manual Flight Operations*, encourages airlines and other operators to promote manual flight operations: www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo/all_safos/

The Flight Safety Foundation's 2014 *A Practical Guide for Improving Flight Path Monitoring: Final Report of the Active Pilot Monitoring Working Group* is very helpful: www.flightsafety.org/toolkits-resources/flight-path-monitoring/

Chapter 16: Memory

Helpful Resources

Checklist Memory Items (Research Project EASA.2013.01). This relatively short research report, sponsored by the European Aviation Safety Agency, contains a concise summary of memory and the role of checklists in aviation: www.easa.europa.eu/document-library/research-projects/easa20131

The Flight Safety Foundation (FSF) has produced several helpful *Briefing Notes* as part of their Approach and Landing Accident Reduction (ALAR) Tool Kit project. The following apply to this and other chapters in this book and are available from Skybrary, a reference for aviation safety knowledge developed by the FSF and other partners at: www.skybrary.aero/index.php/Flight_Safety_Foundation_ALAR_Toolkit

- FSF ALAR Briefing Note 1.4—Standard Calls
- FSF ALAR Briefing Note 1.5—Normal Checklists
- FSF ALAR Briefing Note 1.6—Approach Briefing
- FSF ALAR Briefing Note 2.4—Interruptions/Distractions

Chapter 17: Decision Making

Helpful Resources

If you want a fuller understanding of decision making—including heuristics and biases—*Thinking, Fast and Slow*, written by the renowned psychologist and Nobel Prize winner Daniel Kahneman, is a must read. This thought-provoking book, which has won many awards including the National Academy of Sciences Best Book Award in 2012, will challenge and enlighten you about the complexities and often irrational nature of human thinking.

The free online FAA *Human Factors Awareness Course* has a separate module on decision making, including heuristics and biases: elmscontent.dot.gov/elms/faa/ato/to/hfwebtraining/Cognition/CogFinal036.htm

The Art of Aeronautical Decision-Making is an online FAA Safety Team tutorial that draws upon the collective wisdom and expertise of VFR pilots and instructors who have learned from the mistakes of others. It provides invaluable information to help you determine your own minimums and avoid inadvertent flight into IMC: www.faasafety.gov/gslac/ALC/course_content.aspx?pf=1&preview=true&cID=28

Do The Right Thing: Decision Making for Pilots is an online interactive course available from the AOPA Air Safety Institute that uses decision-making scenarios and other information to help you evaluate risk and determine your own personal weather minimums: www.aopa.org/training-and-safety/online-learning/online-courses/do-the-right-thing

Chapter 18: Social Influence

Helpful Resources

The free online FAA *Human Factors Awareness Course* has a separate module on team/group performance: elmscontent.dot.gov/elms/faa/ato/to/hfwebtraining/TeamPerform/TeamPerform1.htm

Short videos showing actual subjects participating in the Asch conformity experiments and Stanley Milgram's shocking obedience to authority experiments are available on YouTube: www.youtube.com/watch?v=NyDDyT1lDhA and www.youtube.com/watch?v=yr5cjyokVUs

More unwitting participants are caught on camera in a recent social conformity experiment demonstrated in a five-minute video from the *National Geographic Brain Games*' television show. It takes place in an eye doctor's waiting room and is a real eye opener: www.youtube.com/watch?v=o8BkzvP19v4

In 1964, Catherine "Kitty" Genovese was brutally beaten, stabbed, and killed in Queens, New York, while perhaps as many as 38 people heard her screams or saw something from their windows but did next to nothing about it, including calling the police. *The Bystander Effect: The Death of Kitty Genovese* is a seven-minute video introducing the bystander effect and diffusion of responsibility highlighting some of the work of two pioneers in this area, John Darley and Bibb Latane: www.youtube.com/watch?v=BdpdUbW8vbw

Chapter 19: Crew Resource Management

Helpful Resources

The free online FAA *Human Factors Awareness Course* has a separate module (its last) on “Team Performance,” which also includes information on the history and fundamental concepts of CRM: elmscontent.dot.gov/elms/faa/ato/to/hfwebtraining/TeamPerform/TeamPerform1.htm

The FAA has also produced three videos related to topics covered in this chapter, as well as other parts of this book:

- *The History of Crew Resource Management*, summarizes the history of CRM and some of the concepts introduced in this chapter: www.faa.gov/tv/?mediaId=447
- *Stress in The Aviation Environment*. This 20-minute video explores the topic of stress and provides keen insight into acute and chronic stress: www.faa.gov/tv/?mediaId=450
- *Self-Imposed Stress*, recommended in Chapter 11, this video examines self-imposed stresses and offers advice on how to reduce their effects on performance: www.faa.gov/pilots/training/airman_education/physiologyvideos/

Brief helpful reenactments and/or animations of the following accidents are available on the FAA's Lessons Learned website: lessonslearned.faa.gov/

- Eastern Air Lines Flight 401 (near Miami, FL): lessonslearned.faa.gov/ll_main.cfm?TabID=1&LLID=8
- United Airlines Flight 173 (Portland, OR): lessonslearned.faa.gov/ll_main.cfm?TabID=1&LLID=42
- Air Florida Flight 90 (Washington, DC): lessonslearned.faa.gov/ll_main.cfm?TabID=3&LLID=2&LLTypeID=0

Chapter 20: Threat and Error Management

Helpful Resources

A thorough coverage of ten major threats to safe flight and best practice countermeasures to combat them are presented in *Managing Risk: Best Practices for Pilots*. Topics include runway incursions, midair collisions, airframe icing, VFR flight into IMC, low-level wind shear, high altitude flight, flying at night, visual illusions, spatial disorientation, and CFIT: www.asa2fly.com/Managing-Risk-Best-Practices-for-Pilots-P2030.aspx

The seminal work on TEM is James Ray Kinect's 2005 dissertation for his doctoral degree earned at the University of Texas at Austin, titled *Line Operations Safety Audit: A Cockpit Observation Methodology for Monitoring Commercial Airline Safety Performance*: repositories.lib.utexas.edu/handle/2152/1967

Dr. Klinec also co-authored a helpful article on TEM, titled *Defensive Flying for Pilots: An Introduction to Threat and Error Management*: www.skybrary.aero/bookshelf/books/1982.pdf

A description of the TEM model upon which LOSA is based upon is found in Appendix 1 of the FAA's *Line Operations Safety Audits* advisory circular (AC 120-90): www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.information/documentNumber/120-90