

**The University of Western Ontario
Commercial Aviation Management Program**

**Human Factors in Aviation
Management and Organizational Studies 305a**

Instructor: Professor Suzanne Kearns
Class Time: Tuesdays 12:30-3:30 Class Location: SH 3317
Office: SSC 2244 Office Hours: Tu 11-12 & Th 11-12
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Required Text

Wickens, C.D., Lee, J.D., Gordon, S.E., & Liu, Y. (2003). *An introduction to human factors engineering*. New York: Longman.

Optional Texts

Casey, S. (2006). *The atomic chef: And other true tales of design, technology, and human error*. Santa Barbara, CA: Aegean.

Casey, S. (1998). *Set phasers on stun: And other true tales of design, technology, and human error*. Santa Barbara, CA: Aegean.

Course Description

The goal of the human factors discipline is to understand how human/system interaction can reduce error, increase productivity, maximize safety and enhance comfort. To accomplish this goal, knowledge of human physiology and psychology must be coupled with a good understanding of the system in question and an appropriate analysis must be performed to identify problems. This process will be evaluated and expanded upon throughout the duration of the course. The emphasis of this course will be the application of human factors theory to the aviation industry. In addition, the ability to locate and understand aviation-related research will be fostered throughout the course's writing assignment.

Objectives

1. To become aware of the capabilities and limitations of humans with respect to:
 - making machines and devices do what is intended
 - responding appropriately to machines and devices
 - the environment they operate in
 - designing better systems
 - maximizing safe and efficient operations
2. To become familiar with aviation research.

Evaluation Profile

1. Class Participation		25%
• Attendance & Participation	10%	
• Human Error Presentation	15%	
2. Research Project		40%
• Final Report	25%	
• Class Presentation	15%	
3. Final Examination		35%

1. Class Participation: A crucial element of this course is the sharing of ideas and opinions. Since each of us brings a unique background of experiences, much can be learned from class debate and discussion. Your participation grade will be dependent on your involvement in class discussions, questioning of other student's presentations, and attendance. Participation will account for 10% of your final grade.

Human Error Presentation: You will each be required to present a real-world example of human error and its impact on the individuals involved. The two optional texts for this course provide 40 such examples that are appropriate to use in class. You may choose to present an example from outside of this text but it must be approved by the instructor to ensure that it qualifies as an example of human error. In the presentation you are expected to describe what went wrong in the incident and, after doing some research outside of what is contained in the optional texts, how things have changed as a result of the incident. For the presentation, you will have access to a computer and projector, an overhead projector, and DVD/VCR. You may use any or all of these devices to enhance your presentation. The length of the presentation must be between 8 and 10 minutes. Your presentation detailing a human error incident will account for 15% of your final grade.

2. Research Project: This assignment is intended to get you to think about a human factors research topic that is of interest to you. You must have your research topic approved by **October 16th**. All final projects are **due November 20th**. Additional instructions will be provided in class. Although this is an individual assignment, you will work in groups of three to identify a topic. Within this group, you will each choose a different focus within the chosen topic and write an independent paper. Your performance on this project will be evaluated in the following manner:

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|----------------------|-----|
| • Final Report | 25% |
| • Class Presentation | 15% |
- **Find a Topic:** The textbook and articles from *Ergonomics*, *Ergonomics in Design*, *Human Factors*, *The International Journal of Aviation Psychology and Aviation*, *Space and Environmental Medicine* are full of relevant topics if you are searching for ideas. If you are having trouble or are unsure if your topic is appropriate visit the professor during office hours for suggestions.
 - **Get it Approved:** Once you have a topic that interests you, submit it to the professor either by e-mail, WebCT, or during office hours. The professor will either approve your topic or give you suggestions to refine your subject area.

Each topic may only be researched by one group per course, so if you are especially interested in a specific topic get it approved early in the semester. Once your group has chosen a topic you will work together to find a way to break down the topic into three sections – one for each member of the group. Once this has been done you will work independently to complete the paper. The professor has the final say whether your topic is appropriate for the course. If there are

- Find Relevant Articles: After gaining approval, dig further into the research and find at least 5 peer-reviewed journal articles that are relevant to your topic and combine to create a clear picture of the current research in that area.
- Format a Paper: Using the APA style guide, format your work into a cohesive paper including a title page, abstract, body (which contains an introduction, subsections and discussion) and references. The body of your paper should be 5 pages long.
- Style: Make sure you use proper grammar, spelling, and punctuation. Remember to follow APA guidelines when formatting your text and references page.
- Late Policy: Papers are due at the beginning of the class period. Papers will be considered late if they have not been turned in within the first 15 minutes of class. Late papers are subject to a 10% grade penalty per day.
- Presentation: At the end of the semester each group will be required to present their research to the rest of the class. Presentations must be at least 15 and **not more than** 20 minutes long and will be followed by a question period. The 20 minute guideline is very strict, as it is necessary to ensure that every group has sufficient time. Be creative in your presentation. You will have access to an overhead projector, PowerPoint projector, and a television with a VCR. When creating the presentation pretend that you are a human factors expert who is presenting the importance of your topic to a local flight school. Therefore, avoid highly technical jargon in the presentation and try to make it interesting and relevant to the average pilot. Your entire group will receive a single grade for the presentation.
- Plagiarism: Students must write their papers and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).
- Plagiarism Checking: All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

- **Final Examination:** A comprehensive final examination will be given at the end of the semester. Final exam review will be provided prior to the exam. The exam format may include multiple choice, fill-in-the-blanks, short answer, and/or essay questions. Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Lecture Outline

Please note: In some cases, lectures may run long and carry over into the next class session. If this happens the professor will indicate which readings are required for the next class. Also, the library session is subject to availability and the date may change.

Tuesday, September 11th

Course Introduction	Ch. 1
• What is human factors?	
• The scope of human factors science	
Research Methods	Ch. 2
• Introduction to Research Methods	
• Experimental Research Methods	
• Descriptive Methods	
• Measuring Variables	
• Qualities of Good Research	

Tuesday, September 18th

Visual System	Ch. 4
• The Stimulus: Light	
• The Receptor System: The Visual System	
• Sensory Processing Limitations	
• Bottom-Up Versus Top-Down Processing	
• Visual Search and Detection	
• Spatial Topic: Midair Target Detection	
Auditory, Tactile and Vestibular Systems	Ch. 5
• Sound: The Auditory Stimulus	
• The Ear: The Sensory Transducer	
• The Auditory Experience	
• The Sound Transmission Problem	
• Noise	
• The Other Senses	

Tuesday, September 25th

Cognition	Ch. 6
• Information Processing Models	
• Object and Pattern Perception	
• Working Memory	
• A Design Example	
• Long-Term Memory	
• Attention and Mental Resources	
Decision Making	Ch. 7
• Definition of Decision Making	

- Classical Decision Theory
- Heuristics and Biases
- Naturalistic Decision Making
- Real-World Decision Making Model
- Improving Human Decision Making
- Problem Solving

Tuesday, October 2nd

- Displays Ch. 8
- Ways of Classifying Displays
 - Thirteen Principles of Display Design
 - Alerting Displays
 - Labels
 - Monitoring
 - Multiple Displays
 - Navigation Displays and Maps
 - Quantitative Information Displays: Tables and Graphs
- Control Ch. 9
- Principles of Response Selection
 - Discrete Control Activation
 - Positioning Control Devices
 - Verbal and Symbolic Input Devices
 - Voice Input
 - Continuous Control and Tracking

Tuesday, October 9th

- Engineering Anthropometry and Workspace Design Ch. 10
- Human Variability and Statistics
 - Anthropometric Data
 - General Principles for Work-Space Design
 - Design for Standing and Seated Work Areas

Tuesday, October 16th

- Biomechanics of Work Ch. 11
- The Musculoskeletal System
 - Biomechanical Models
 - Low-Back Problems
 - Upper-Extremity Cumulative Trauma Disorders (CTD)
- Work Physiology Ch. 12
- Muscle Structure and Metabolism
 - The Circulatory and Respiratory Systems
 - Energy Cost of Work and Workload Assessment

- Physical Work Capacity and Whole-Body Fatigue

Tuesday, October 23rd

Stress and Workload Ch. 13

- Environmental Stressors
- Psychological Stressors
- Life Stress
- Work Overload, Underload, and Sleep Disruption

Safety, Accidents and Human Error Ch. 14

- Safety Legislation
- Factors That Cause or Contribute to Accidents
- Approaches to Hazard Control
- Safety Analysis for Products and Equipment
- Facility Safety
- Risk-Taking and Warnings
- Risk-Taking as a Decision Process

Tuesday, October 30th

Automation Ch. 16

- Classes of Automation
- Problems of Automation
- Human-Centered Automation
- Automation-Based Complex Systems

Transportation Human Factors Ch. 17

- Automotive Human Factors
- Public Ground Transportation
- Aviation Human Factors

Tuesday, November 6th

Library Session

- A D. B. Weldon librarian will demonstrate how to find appropriate research articles for your paper and how to properly use APA formatting.

Tuesday, November 13th

Selection and Training Ch. 18

- Personnel Selection
- Performance Support and Job Aids
- Types of Performance Support and Job Aids
- Training Program Design
- Training Concepts and Issues

Social Factors Ch. 19

- Groups and Teams
- Computer-Supported Cooperative Work

- Macroergonomics and Industrial Interventions

Tuesday, November 20th

Research Papers Due

- Team survey
- Escape video in-class group exercise

Tuesday, November 27th

Research Project Presentations
Final Exam Review – Part 1

Tuesday, December 4th

Research Project Presentations
Final Exam Review – Part 2
Class Critique