

I. COURSE DESCRIPTION:

This is the second course involving human factors which aviation students are required to take (all AVT, AVF and AFT courses are mandatory). Human Factors in Aviation (semester 1) provided an introduction to how our body functions in the flight environment and how those functions affect our ability to operate safely.

Human Factors in Flight will continue to develop and expand those topics. You will learn how psychological and physiological factors play an important role in flight safety. After the introduction, your study will begin with pilot decision making, then the nature and sources of human error, sleep and the role it plays in the body's functions, fitness and how it affects your performance, a review of vision and its associated illusions, motivation and leadership, communications, training and training devices, displays and controls, cockpit and cabin ergonomics and concluding with safety today.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course the student will demonstrate the ability to:

- 1) Describe the development of human factors in aviation.
Potential Elements of the Performance:
 - role of human factors in aircraft accidents in recent years
 - historical perspective on the development of human factors
 - meaning of human factors
- 2) Describe the man-environment interfaces of the SHEL conceptual model.
Potential Elements of the Performance:
 - the meaning of each letter of the SHEL conceptual model
 - characteristics of liveware
 - the associated scientific disciplines of the characteristics of liveware
 - interfaces of the SHEL model
- 3) Describe and employ all aspects of the pilot decision making process.
Potential Elements of the Performance:
 - how we make decisions
 - information processing, types of decisions, human errors
 - strategies to maintain situational awareness, how to reverse a negative trend
 - factors affecting judgement
 - risk management
- 4) Describe the nature of error.
Potential Elements of the Performance:

- normal distribution of human errors
 - accident proneness
- 5) Identify the sources of error.
Potential Elements of the Performance:
- mismatches between the SHELL components
 - liveware errors during information processing
 - role of motivation in performance
 - role of arousal and alertness in performance
 - factors affecting the decision making process
 - eye witness errors
- 6) Identify errors, classify errors and propose mitigations to reduce errors.
Potential Elements of the Performance:
- four ways to classify errors
 - differences between humans and machines performing tasks
 - error reduction
- 7) Describe the role of fatigue, body rhythms, and sleep in flight performance.
Potential Elements of the Performance:
- effect of jet lag and fatigue on performance
 - role of body rhythms on performance
 - types of sleep
 - role of sleep and effects on performance
 - insomnia and sleep drugs
- 8) Be knowledgeable about the occurrence of incapacitation and explain the relationship between physical fitness, mental fitness and performance.
Potential Elements of the Performance:
- total and partial incapacitation
 - benefits of physical fitness
 - effects of smoking, drugs and alcohol on physical fitness and ultimately flight safety
 - stress
 - importance of diet
- 9) Explain how the eye functions and it's role in perception
Potential Elements of the Performance:
- measurement of light
 - terms and functions of the eye
 - visual perception
 - blind spots
 - depth and distance perception
 - effects of hypoxia and smoking
- 10) Know when and why visual illusions occur
Potential Elements of the Performance:
- optical illusions

- depth and distance illusions
 - sensory illusions
 - categorize illusions according to phase of flight
 - minimizing your susceptibility to illusions
 - meaning of design eye reference
- 11) Describe the role of motivation in our ability to perform
Potential Elements of the Performance:
- human behaviour in accident investigation
 - definition of motivation
 - theories of motivation
 - influencing motivation
- 12) Explain the meaning, qualities and role of leadership
Potential Elements of the Performance:
- role of a leader
 - characteristics and tasks of a leader
- 13) Describe communication in terms of how information is exchanged, types, intelligibility, characteristics and barriers
Potential Elements of the Performance:
- define communication
 - types of communication
 - elements of communication
 - factors which make words more understandable (intelligible)
 - the influence that expectation can have on the meaning of the message
 - parts of the vocal and auditory system
 - factors affecting hearing
- 14) Differentiate between personality, attitudes, beliefs and opinions; explain the influences on attitudes, changing attitudes and why safety doesn't sell.
Potential Elements of the Performance:
- personality, attitudes, beliefs and opinions in aviation
 - nature, function and measurement of attitudes
 - group influences on attitudes
 - attitude survey, hazardous attitudes, changing attitudes
 - selling safety

- 15) Explain how we learn, the process that is involved and examples of training aids and devices.
Potential Elements of the Performance:
- define education, training and skills
 - the cycle of training
 - the learning process
 - training aids and training equipment
- 16) Describe the links between the learning process and documentation (manuals, checklists, charts).
Potential Elements of the Performance:
- meaning of documentation
 - language , layout and text of effective documentation
 - application of human factors on charts and maps
- 17) Understand the use and limitations of displays and warnings
Potential Elements of the Performance:
- historical development of cockpit displays and controls
 - the SHEL interface between liveware and hardware
 - design aspects of displays; including classifications, markings, presentations, CRT's and HUD
 - fail-passive and fail operational concepts in automatic landing systems
 - warning, alert and advisory systems
- 18) Recognize the importance of and/or the deficiency in the type and location of controls
Potential Elements of the Performance:
- functions of controls
 - design principles for cockpit controls
 - keyboard layout and flight deck applications
 - use of autopilots
- 19) Explain why cockpit and cabin design should match the characteristics of the operator or user
Potential Elements of the Performance:
- Man's ability to adapt
 - Definition of anthropometry and biomechanics
 - Design and it's affect on emergencies
 - Cabin environment
- 20) Explain the role human factors should play in a companies safety program
Potential Elements of the Performance:
- Qualifications of a human factors specialist
 - Appropriate level of human factor training for an organization
 - Industry safety initiatives
 - Safety culture

III. TOPICS:

1. Background to Human Factors
2. The SHELL Conceptual Model
3. Pilot Decision Making
4. The Nature of Error
5. Sources of Error
6. Error Classification and Reduction
7. Fatigue, Body Rhythms
8. Fitness and Performance
9. Vision
10. Visual Illusions
11. Motivation and Safety
12. Communication
13. Attitudes and Persuasion
14. Training and Training Devices
15. Documentation
16. Displays
17. Controls
18. Ergonomics of the cockpit and cabin
19. Safety programs

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

1. Human Factors in Flight – Frank H Hawkins

V. OTHER RESOURCES/TEXTS/MATERIALS:

1. From the Ground Up
2. [A.I.M. – aeronautical information manual](#)
3. Basic Flight Physiology – Richard O Reinhart McGraw -Hill
4. Human Factors for General Aviation – Stanley Trollip & Richard Jensen
Jeppesen Sanderson
5. Aviation Safety Programs – Jeppesen Sanderson
6. Human Factors in Aviation – Earl L Wiener, David C Nagel
7. Pilot Judgement and Crew Resource Management – Richard S Jensen
8. Human Factors in Multi Crew Operations – Harry W Orlady
9. Flight Safety – A Primer for General Aviation Pilots Alexander T Wells
10. Human Factors for Aviation – Basic Handbook – Transport Canada
11. Pilot – Mental and Physical Performance – David C Edwards
12. Beyond Aviation Safety Human Factors – Daniel E Maurino, James Reason, Neil
Johnston, Rob B Lee
13. Flightdeck Performance – Stanley Roscoe
14. Redefining Airmanship – Tony Kern
15. Flight Discipline – Tony Kern

Web Links:

<http://www.tc.gc.ca/civilaviation/aviationsafety/menu.htm>

<http://www.faa.gov/pilots/safety/pilotsafetybrochures/>

<http://flightsafety.org/>

<http://www.airforce.forces.gc.ca/dfs-dsv/index-eng.asp>

VI. EVALUATION PROCESS/GRADING SYSTEM:

The student will be assessed by a combination of attendance and deportment, quizzes, tests, a research essay and a final exam. Weighting of each will be as follows: 20% for quizzes, 20% for all tests prior to the final exam, 30% for the research essay and 30% for the final exam. A minimum mark of 70% is required to pass the course. Make-up tests are not permitted except in accordance with section VII of this outline.

- Unexcused absences will result in 2% deduction of the final mark for each occurrence, arriving for class late will result in a 1% deduction of the final mark for each occurrence, and violations of the dress code will result in a 1% deduction of the final mark for each occurrence. Refer to the SOP GEN 1.3.1.8 for dress code policies and SOP GEN 1.3.1.13 for the policy regarding absence or tardiness.
- Quizzes will be given without prior notice.
- If it is necessary to write a second final exam in order to pass the course, the highest grade achievable will be a "C". (See make-up policy in section VII)
- Students may request a deferment of a test for compassionate reasons. Compassionate Grounds for deferment will include but not be limited to death of an immediate family member, personal illness, or recent diagnosis of a serious illness of a family member. **Make-ups will not be permitted after the fact for compassionate reasons.**
- "F" grades in any subject at the end of a semester will result in termination from the Aviation program.
- Although attitude, co-operation, etc., are not graded, students may be terminated based on their performance in this area (see section VII). These attributes are also considered in the selection of the Air Canada Award and other scholarships.
- Dates of tests will be announced at least 1 week in advance.
- A classroom code of conduct can be found in the SOP General section, and will be adhered to.

The following semester grades will be assigned to students in this course:

Grade	Definition	Grade Point <u>Equivalent</u>
A+	90 -100%	4.00
A	80 - 89%	

B	70 - 79%	3.00
C	assigned if a make-up exam was required to complete the course	2.00
F (Fail)	below 70%	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in non-graded subject area or flight training.	
U	Unsatisfactory achievement in non-graded subject area or flight training.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

VII. SPECIAL NOTES:

Attitude and Conduct:

Attitude plays an important role in your ability to exercise good judgment. Although attitude is not being graded, it affects your ability to learn as well as your safety as a student and future as a professional pilot. Students who display a strong tendency towards any of the five hazardous attitudes pose a grave risk to themselves and others. For this reason these students will be counseled and may be placed on probation. If this is ineffective, then sanctions or involuntary withdrawal may be the only recourse.

The five hazardous attitudes are identified as Anti-authority, Impulsivity, Invulnerability, Machismo, and Resignation. These hazardous attitudes are described in "Human Factors for Aviation – Basic Handbook" on pages 151 and 152.

Make-up Policy:

- No make-ups on tests occurring prior to final exams.
- No make-ups on quizzes.
- If the final grade achieved for this course is less than 70%, a second final exam may be written at the discretion of the professor for this course. The second exam will be averaged with the first exam to determine the resulting exam mark, and the final grade will then be calculated.
- In the event that a second final exam is required, the highest achievable overall grade for this course will be a C
- Any student that requires 100% or greater on a make-up exam to pass the course will not be allowed to write a make-up exam.

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session. *Refer to section VI Evaluation Process/Grading System of this course outline for further details on specific attendance requirements for this course.*

VIII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.