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MAAE 4903 – Introduction to Aircraft Accident Safety Investigations Lecture Schedule and Marking Scheme – Fall 2021

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Course Overview and Learning Objectives

This course will introduce the principles and practice of air safety investigations. Upon completion of this course, students will be able to:

- Demonstrate an understanding of the air safety investigation process, including national and international regulations, on-site investigation procedures, analysis methods, and reporting techniques.
- Identify and communicate findings, safety statements and recommendations.

IMPORTANT: Aircraft accidents are traumatic events and the content of this course may depict such. Students may experience vicarious trauma, triggering stress, anxiety and unwelcomed thoughts. This is normal, yet it ought not to be disregarded. As always, please be mindful of your mental wellbeing, and seek professional assistance when required.

Grading Scheme

Deliverable	Description	Weight
1. Weekly quizzes	12 weekly quizzes, covering content of the previous week's lecture and readings	25%
2. Term project	Mock-accident investigation group report	25%
3. Final Exam	3 hour exam, covering content of the all lectures and readings	50%

Lecture Schedule

15 September (01) Introduction and History

- Instructor introduction
- Description of course and learning objectives
- Course administration
- Principles of safety investigations
- History of aviation accident investigation (International and Canadian)
- The Transportation Safety Board
- Aviation safety trends

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- 22 September (02) International and Canadian Regulations, Standards and Methodologies
- ICAO, Annex 13 standards and recommended practices (continued)
 - Canadian regulations
 - Investigation methodology
- 29 September (03) Field Phase – Notification and Deployment
- Reportable events, incidents and accidents
 - Initial notification, factual information and communications
 - Preliminary classification and scoping
 - Deployment decision
 - Deployment and site logistics
 - Site safety assessment and PPE
- 06 October (04) Field phase – Data collection (Physical wreckage and site)
- Preliminary site survey
 - Perishable data
 - Identification of major components
 - Witness marks and impact location
 - Wreckage distribution
 - Detailed site survey and wreckage cataloguing
 - Identifying potential data sources and components of interest
 - Final disposition of wreckage
- 13 October (05) Field phase – Data Collection (Witnesses, Operations and Organizational)
- Interviewing witnesses
 - Meteorological conditions
 - Operational data (dispatch records, operational flight plan, performance charts etc.)
 - Organizational data (Manuals, maintenance records, Safety Management System, etc).
- 20 October (06) Report writing & Introducing the mock investigation
- Safety significant events
 - Unsafe acts or conditions (hazards)
 - Risk assessment
 - Defenses
 - Risk control
 - Safety statements
 - Mock Investigation
 - o Present initial factual information
 - o Project instructions and logistics

----- Fall Break -----

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- 03 November (07) Analysis phase – Flight Data
- Sources and types of flight data
 - History of Flight Recorders
 - Data recovery, interpretation and presentation
 - Limitations of flight data
 - Proactive applications of flight data
- 10 November (08) Analysis phase – Reconstruction and simulation
- **Project Milestone 1 due**
 - Reconstructing the trajectory
 - Visual representation of the sequence of events
 - Aerodynamic simulation of performance metrics
 - Sources of error and fidelity of results
- 17 November (09) Analysis phase – Human performance and factors
- Limitations of the human physiology in aviation
 - Aviation physiological phenomena
 - Human error (cognitive psychological model)
 - Human error (Joint cognitive systems model)
- 24 November (10) Analysis phase – Structures and propulsion
- **Project Milestone 2 due**
 - Metallurgy and composites
 - Fracture analysis
 - Engine failures (piston/turbine)
 - Propeller failures
- 01 December (11) Analysis phase – Systems, in-flight breakup and fires
- Failure mode and effects analysis
 - Debris drift-down analysis
 - Flame propagation and soot patterns
 - Post/Pre-impact fire
- 08 December (12) Case Studies
- **Project Milestone 3 due**
 - Presentation of a notable accident

Office Hours

The instructor will be available to respond to Brightspace discussion posts, emails and calls during the following hours.

Monday, Tuesday and Thursday; 20:00 – 22:00

Please consider the Brightspace discussion forum as the primary means of communication, so that other students may benefit from the question, answer and discussion.

Academic Integrity

It is recognized that collaboration among students takes place. However, any evidence of plagiarism or other academic offences (**including improperly cited references**) noted by the instructor will be immediately forwarded to the Office of the Dean of Engineering as per the Academic Integrity Policy (<http://www1.carleton.ca/studentaffairs/academic-integrity/>).

Brightspace Usage and Course Content

The instructor will post relevant course content, assignments, announcements and other supplementary materials on the Brightspace course site. This is the principle means of providing this information to the students and any items posted there are considered to have been delivered 24 hours after they are posted. Students are responsible for logging in to Brightspace on a regular basis.

As per University Privacy Policies (<http://www.carleton.ca/fippa/>) and Provincial Privacy Legislation, the instructor will **not** respond to email messages sent from non-University email accounts (e.g. Hotmail, Gmail). Please use Cmail/CUnet email for all course related email communications.

All content posted by the instructor on Brightspace is provided for the personal use of the students enrolled in this course. Further distribution, copying or duplication is not permitted.

Live activities and open office hours may be recorded by the instructor for educational purposes. These recordings will be shared only with students enrolled in the course. Recordings will be posted on Brightspace. Unauthorized student recording is prohibited. Students requesting the use of assistive technology as an accommodation should direct such requests to the Paul Menton Centre as discussed below.

Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

- **Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>
- **Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>
- **Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting

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accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at <http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/>

- You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www2.carleton.ca/equity/>