



ROYAL CANADIAN AIR CADETS
PROFICIENCY LEVEL FIVE
INSTRUCTIONAL GUIDE



SECTION 1

EO C560.01 – EXAMINE ASPECTS OF FLIGHT SAFETY (FS)

Total Time:	90 min
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PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-805/PG-001, *Proficiency Level Five Qualification Standard and Plan*, Chapter 4. Specific uses for said resources are identified throughout the self-study package within the section for which they are required.

Review the self-study package located at Attachment A and become familiar with the material prior to facilitating this lesson.

Self-study packages are intended to be completed by the cadet independently. More information about self-study packages can be found in the foreword and preface.

Photocopy the self-study package for each cadet.

Photocopy the answer key located at Attachment B but **do not** provide it to the cadets.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

A self study was chosen for this lesson as it allows the cadet to examine FS at their own learning pace. This encourages the cadet to become more self-reliant and independent by focusing on their own learning instead of learning directed by the instructor.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have examined aspects of FS.

IMPORTANCE

It is important for cadets to examine aspects of FS as each cadet, while participating in the Air Cadet Flying Program, must be aware of safety on the flight line. It is important that cadets understand the roles and responsibilities of the Flight Safety Officer (FSO) and how each individual can contribute to the safety of this program.

SELF-STUDY PACKAGE INSTRUCTIONS

OBJECTIVE

The objective of this self-study package is to have the cadet examine aspects of FS.

RESOURCES

- Self-study package, and
- Pen / pencil.

ACTIVITY LAYOUT

Provide the cadet with a classroom or training area suitable to complete the self-study package.

ACTIVITY INSTRUCTIONS

1. Provide the cadet with a copy of the self-study package located at Attachment A and a pen / pencil.
2. Allow the cadet 90 minutes to complete the self-study package.
3. Provide assistance as required to the cadet.
4. Collect the self-study package once the cadet has finished.
5. Correct the self-study package with the self-study package answer key located at Attachment B.
6. Provide feedback to the cadet and indicate whether or not they have completed the Enabling Objective (EO).
7. Return the completed self-study package to the cadet for their future reference.
8. Upon completion of the self-study package, record the result in the cadet's logbook and Cadet Training Record.

SAFETY

Nil.

END OF LESSON CONFIRMATION

The cadet's participation in examining aspects of flight safety will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

The cadets' awareness on how the Air Cadet Program is an active participant in the FS Program and how the FSO plays a key role to ensure the safety of all individuals and resources, supports the understanding that FS is the concern for all participants in the Air Cadet Gliding and Powered Flight Programs.

INSTRUCTOR NOTES / REMARKS

Nil.

REFERENCES

A0-045 A-GA-135-01/AA-001 Directorate of Flight Safety. (2002). *Flight safety for the Canadian Forces*. Ottawa, ON: Department of National Defence.

A3-189 Directorate of Flight Safety. (2007). *The flight safety program*. Retrieved November 19, 2009, from <http://www.airforce.forces.gc.ca/dfs-dsv/program-programme-eng.asp>



EXAMINE ASPECTS OF FLIGHT SAFETY (FS)

SECTION 1: THE ROLE OF THE FLIGHT SAFETY OFFICER (FSO) IN THE AIR CADET FLYING PROGRAM

SECTION 2: EDUCATION AND TRAINING

SECTION 3: THE REPORTING PROCESS

SECTION 4: INVESTIGATION PROCEDURES

SECTION 1

THE ROLE OF THE FLIGHT SAFETY OFFICER (FSO) IN THE AIR CADET FLYING PROGRAM



Did you know?

The first known formal recognition of the need for a dedicated FS organization occurred in mid 1942 when the Royal Canadian Air Force (RCAF) Aircraft Accident Investigation Board (AIB) was formed. The Directorate of Flight Safety (DFS) was established in the early 1950s.

FS for the Air Cadet Flying Program is the responsibility of the Canadian Forces (CF). The Chief of Defence Staff (CDS) is tasked with operational command and control of the Air Cadet Flying Program, which includes:

- Air Cadet Gliding Program,
- Air Cadet Powered Flight Program, and
- familiarization flying funded by the Department of National Defence (DND) / CF and the FS Program.

The Chief of the Air Staff (CAS) has been designated as the Airworthiness Authority (AA) for the DND / CF and is responsible for FS policy.

Designated wings act as FS advisors to the Region Comd and assist the Air Cadet Glider Program activities with the program FSO to include:

- advising on FS matters;
- monitoring the safety aspects of flying operations;
- assisting in preparation and timely submission of initial and supplementary occurrence reports and recommending preventative measures (PMs);
- conducting biannual FS surveys of all designated gliding sites;
- assisting the Director of Flight Safety (DFS) and Regional Cadet Air Operations Officer (RCA Ops O) in the event of an accident;
- assisting the Region Comd in preparing comments for FS investigation reports; and
- reviewing Air Cadet Glider Program occurrence reports for quality assurance.



Regions and designated FSOs include:

<u>REGION</u>	<u>REGION COMD</u>	<u>DESIGNATED FSO</u>
Atlantic	Comd Maritime Forces Atlantic (MARLANT)	14 Wing Greenwood
Eastern	Comd Land Forces Quebec Area (LFQA)	3 Wing Bagotville
Central	Comd Land Forces Central Area (LFCA)	8 Wing Trenton
Prairie	Comd 1 Cdn Air Div	17 Wing Winnipeg
Pacific	Comd Maritime Pacific (MARPAAC)	19 Wing Comox



An occurrence is defined as an event involving the operation of an aircraft or support of flying that constitutes an accident or incident.

An occurrence category is an alphabetical designation assigning an overall seriousness classification including:

- aircraft damage level (ADL); or
- personnel casualty level (PCL).

An FSO is designated annually by the RCA Ops O for all regional gliding schools (RGS) and gliding centres. FS qualified personnel wear the FS Diamond Badge on their operational clothing.



The aim of the FS program is to prevent the accidental loss of aviation resources. What is an aviation resource? Basically, anything or anyone involved in or supporting aviation operations.

- planes,
- parts, and
- people.

That can even include such things as the fuellers for the aircraft along with the base kitchen who makes the aircrew's box lunch!

The FS Program is based on four fundamental principles:

- Cause factors are assigned to occurrences, only done to assist the development of effective PMs .
- Personnel involved in conducting and supporting flying operations are expected to freely and openly report all FS occurrences and concerns.
- Determine the cause of occurrences so appropriate, effective PMs can be developed and implemented, personnel involved in conducting and supporting flying operations are expected to voluntarily acknowledge their own errors and omissions.
- Facilitate free and open reporting and voluntary acknowledgement of errors and omissions, the FS Program does not assign blame. Personnel involved in a FS occurrence are not identified in the final reports and the reports cannot be used for legal, administrative, disciplinary or other proceedings.



Did you know?

Before 1963, a Board of Inquiry (BOI) was required to assign blame and recommended punishment for those responsible for an accident. Between 1963 and 1965, this was changed so that information given to an aircraft accident investigation could not be used in disciplinary proceedings.

The FS Program is based on three pillars:

- education,
- analysis, and
- prevention.



Where have you seen an FSO? _____

How do you identify the FSO? _____

All flying aspects for the RGSS and gliding familiarization sites in the Air Cadet Program fall within the responsibilities of an FSO.



The duties and responsibilities of the FSO are outlined in A-GA-135-001/AA-001, *Flight Safety for the Canadian Forces*.

The FSO must be familiar with the unit's operations so that sound advice can be provided on accident prevention and hazardous conditions.



FSO responsibilities are:

- to advise the school / site comd on all aspects of FS,
- to report all accidents and incidents in accordance with A-GA-135-001/AA-001 *Flight Safety for the Canadian Forces*,
- to aid school / site comd in the implementation of the unit FS Program, and
- to monitor all aspects of the operation and advise school / site comds of hazardous conditions.

FS personnel must immediately notify the site comd of any unsafe procedures / practices detected. The site comd immediately rectifies the situation and advises the RCA Ops O of the corrective action proposed / implemented.



Activate Your Brain #1:

FS occurrence is defined as an event



An accident / incident are defined as:

AIR ACCIDENT

An event involving an aircraft between the time the first power plant is attempted with intent for flight and the time the last power plant or rotor stops, (a glider from the time the hook-up is completed until the glider comes to rest after landing), in which one or more of the following occurs:

- someone is missing or receives fatal, very serious or serious injuries, as determined by a medical officer (MO), contributed by an aircraft or its equipment; or
- an aircraft is destroyed, missing or sustains very serious or serious damages.

AIR INCIDENT

An event involving an aircraft between the time the first power plant is attempted with intent for flight and the time the last power plant or rotor stops, (a glider from the time the hook-up is completed until the glider comes to rest after landing), in which one or more of the following occurs:

- someone receives minor injuries, as determined by a MO, contributed by an aircraft, its equipment, or its operation;
- an aircraft sustains very minor damages; or
- there is no injury or damage but accident potential did exist.

GROUND ACCIDENT

An event involving an aircraft when there is no intent for flight, or when there is intent for flight but no power plant start is attempted, or after the power plant and rotors have stopped, in which one or more of the following occurs:

- a person is missing or receives fatal, very serious or serious injury or illness as determined by a MO and where the aircraft equipment or its operation has contributed to the event; or
- an aircraft is destroyed, missing or has sustained very serious or serious damage.

GROUND INCIDENT

An event involving an aircraft when there is no intent for flight, or when there is intent for flight but no power plant start is attempted, or after the power plant and rotors have stopped, in which one or more of the following occurs:

- a person receives minor or no injuries as determined by a MO, or there is a risk of injury or illness and where the aircraft equipment or its operation has contributed to the event;
- an aircraft receives minor damage;
- there is no damage but accident potential existed;
- there is jettison or accidental release; or
- there is damage to civilian or military property.

SECTION 2

EDUCATION AND TRAINING



Education and training not only is a fundamental element of the FS Program but also requires the FSO to be properly qualified.

Flight safety education is fundamental to accident / incident prevention. All personnel involved with flight operations should be aware of flight safety objectives. FS training and education are provided both through formal and informal means.



Activate Your Brain #2:

Where have you seen FS education and training?

_____	_____
_____	_____
_____	_____
_____	_____

All personnel active in the FS Program shall continue to educate themselves by accessing informal information from both military and civilian organizations. Material and information is available from numerous sources, including:

- FS publications,
- bulletins,
- web-based material,
- magazines (eg. *Flight Comment*),
- posters,
- FS reports (Occurrence report / *Epilogue* [EPI]),
- FS briefings,
- conferences, and
- seminars.



A more experienced FSO can educate newer, less experienced personnel by passing on knowledge learned through experience or from other leaders.

To work as an FSO, formal qualifications are obtained by completion of the CF flight safety courses, including:

- Basic FS Course (BFSC), and
- Advanced FS Course (AFSC).

The BFSC teaches candidates to:

- develop and implement an effective FS prevention and education program; and
- respond to FS occurrences, to include:
 - reporting;
 - investigating; and
 - implementing preventative measures.

The AFSC teaches candidates to:

- develop and implement an effective wing-level FS prevention and education program, and
- respond to FS occurrences, to include:
 - reporting;
 - investigating; and
 - implementing preventative measures.

The investigator's qualification is a requirement of the CF Airworthiness Program. Formal training includes:

- Basic Investigator (BI 2 and BI 3), and
- Investigator-In-Charge (IIC 1, IIC 2 AND IIC 3).

Training involves all personnel active in the Air Cadet Flying Program. To accomplish this, the FS Program uses:

- FSO formal / informal briefings,
- CF FS publications, and
- awards.



Have you attended a FS briefing? Has an FSO spoke to your group before the squadron started the familiarization (famil) flights at the gliding centre?



It is the responsibility of FS personnel at all levels to advise their comds when they have concerns with respect to FS issues. This advise can take many forms, including:

- formal / informal briefings,
- briefing notes,
- safety committee meetings, or
- informal discussions.

Briefings

FSOs are to provide / conduct briefings on information relevant to the audience which are:

- informative,
- current, and
- interesting.



Did you know?

With young cadets waiting for their first famil flight in a glider, safety is not on their mind. A briefing provides information for these cadets on expected behaviour around the glider, runway and even what to do if they see something questionable.

FS Publications

Magazines and articles are produced and distributed within the CF. *Flight Comment* is the CF FS magazine. It provides relevant, interesting and timely FS information using posters, articles and other training methods.

Within the magazine, numerous articles are presented including:

- Dossiers,
- *Epilogue*,
- From the Investigator, and
- *Lessons Learned*.

Other publications produced by the DFS include:

- *On Target* (single subject of interest),
- *FS Newsletter*, and
- *FS Flash*.



Did you know?

Within the cadet world, newsletters are published by the RGS FSO (RGS-C has an online newsletter called *Fly Right*).

Challenging activities such as crossword and word search puzzles are part of the magazine publications. To learn about FS issues and terminology, complete the following word search puzzle.

Flight Safety Word Search

By: Captain JJP Commodore

Hint 7 Letters "QUESTIONABLE DECISION"

F	T	C	I	D	E	R	P	E	T	I	T	I	O	N	F
P	A	T	T	E	R	N	E	E	N	P	F	D	N	O	P
A	L	T	E	R	R	O	R	N	E	N	I	L	C	O	D
N	E	L	I	G	H	T	F	D	M	L	H	U	M	A	N
O	R	N	I	G	H	T	O	E	E	T	S	F	E	V	T
I	T	A	M	R	U	R	R	D	R	C	S	R	C	I	C
S	N	I	P	A	E	E	M	N	I	A	E	E	H	A	E
R	E	D	I	V	N	F	A	A	U	R	Y	W	A	T	T
O	S	A	O	E	O	F	N	H	Q	T	K	O	N	I	E
T	S	C	U	L	I	E	C	T	E	X	C	P	I	O	D
A	E	R	S	N	T	C	E	F	R	E	A	T	C	N	A
R	A	I	A	H	A	T	A	E	D	E	R	I	V	E	R
E	T	C	G	O	E	S	C	L	O	C	K	U	R	I	G
P	S	I	N	U	R	G	E	N	T	A	C	T	G	Y	E
O	L	D	E	R	C	N	O	I	T	P	U	R	S	I	D
F	O	L	D	S	M	O	D	U	L	A	T	O	R	G	F

AIRY
ALERTNESS
ALTER
AVIATION
CIRCADIAN
CLOCK
CREATION
DEGRADE
DERIVE
DETECT
DISRUPTION

EFFECTS
ERROR
EXTRACT
FATIGUE
FIGURE
FLIGHT
FOCUS
FOLD
GRAVEL
HOURS
HUMAN

IMPIOUS
LEFTHANDED
LIGHT
LINEN
MECHANIC
MODULATOR
NIGHT
OLDER
OPERATORS

PATTERN
PERFORMANCE
PETITION
POND
POWERFUL
PREDICT
RACK
RECOVER
REQUIREMENT
REREAD

SAFETY
SCAN
SEATS
SHIFT
SLEEP
TACT
TORSION
URGENT

Figure A-1 Flight Safety Word Search

Note. From "Flight Comment", 2003, *Flight Safety Word Search*. Retrieved November 23, 2009, from <http://www.airforce.forces.gc.ca/dfs/publications/fc/archive/2000-2004/archive-eng.asp>



Activate Your Brain #3:

As part of FS informal education / training, list some of the information you think an FSO would present in a briefing?

_____	_____
_____	_____
_____	_____
_____	_____

Awards

Flight Comment magazine recognizes staff for accomplishments, including:

- Good Show Award for Excellence in FS, and
- For Professionalism Awards in FS.



Did you know?

Cadet Instructor Cadre (CIC) officers have been recognized in *Flight Comment*. Check out issues: Summer 2002, Summer 2005 and Issue 1 2009.



For more information and to read about some of these CIC officers, go online to <http://www.airforce.forces.gc.ca/dfs/publications/fc/fc-pdv-eng.asp>.

SECTION 3 THE REPORTING PROCESS



FS reports refer to all reports, whether oral or written.

Specific forms must be used to support the FS Program. It is critical that all occurrences are reported as potential or actual compromise of FS. Reports allow the emerging trends to be identified and analyzed.



Did you know?

On February 1, 1968, the unification of the Canadian military brought the Navy, Army and Air Force together to be known as the CF. Occurrences were addressed to the DFS. In 1975, Air Command was formed and assignment of responsibility was divided between the Air Command FS staff and DFS.

In August 2011, the Government of Canada restored the historic naming of Canada's Air Force such that it is now known again as the Royal Canadian Air Force.

There are two categories of forms designed for the FS Program: FS specific and FS related forms.

FS specific forms include:

- CF 215 Flight Safety Occurrence and Birdstrike Report (www.airforce.forces.gc.ca/dfs/publications/docs/cf215.pdf)
- DND 2484 Flight Safety Hazard Report (www.airforce.forces.gc.ca/dfs/publications/docs/fshr-rvsd)

FS related forms include:

- Report on Injuries or Immediate Death Form (form used to report serious or very serious injuries and fatalities),
- Coroner's report, and
- Unsatisfactory Condition Report.



All forms and reports must be completed in a specific format.



FS occurrences are reported if any of the following questions are answered with a yes.

1. Was there an injury or illness to personnel engaged in or supporting air operations, damage to a CF-owned aircraft or aircraft operated by or on behalf of DND / CF or damage to CF equipment used to support air operations?
2. Was there potential for injury or illness or damage to an aircraft?
3. Could reporting the FS event generate a PM that may prevent a similar occurrence?

To report an immediate flight safety hazard or accident call 1-888-WARN-DFS (1-888-927-6337).



Did you know?

The unit of ownership is the unit having control and authority over the aircraft. For ground occurrences, the unit of ownership is the unit, wing or base to which the aircraft is assigned.

There are exceptions for aircraft that include:

- aircraft undergoing depot-level maintenance at a contractor's plant,
- new aircraft being produced for the CF, and
- other non-CF aircraft.

If an accident occurs, the unit of ownership is to be notified by the fastest possible means. The reporting individual briefs the duty officer and confirms details as known.



Did you know?

Damage is defined as physical harm to an aircraft that impairs the value or normal function of the aircraft or portion of the aircraft, which includes:

- loss,
- repair, or
- replacement.

Damage is a result of unusual forces including:

- collision,
- impact,
- explosion,
- fire,
- rupture, or
- overstress.



You are pushing the glider off the runway and you notice a nut lying on the ground beside the glider. What do you do? To whom do you speak?



Activate Your Brain #4:

What must personnel at all levels report?

SECTION 4 INVESTIGATION PROCEDURES



Did you know?

Air Command FS staff manage the day-to-day FS Programs and DFS is responsible for accident collection and analysis.



If equipment has not been misused or subjected to unusual stress failures, it shall not be classed as damage, but as normal wear resulting from prolonged service use.

Occurrences are investigated quickly with the objective to prevent or reduce the risk of similar occurrences.



FS occurrences can result in or have the potential to cause a loss of resources.

FS Investigation (FSI)

A FSI refers to any investigation conducted under the terms of A-GA-135-001/AA-001, *Flight Safety for the Canadian Forces*.

DFS Investigator-In-Charge (IIC)

The IIC is appointed by the DFS and reports all aspects of the investigation and coordinates all activities of personnel on the team.

FS Investigation Report (FSIR)

The FSIR is produced to support Class I or most Class II FSI.



Did you know?

Class I to IV is based on the following criteria:

- a. the occurrence category,
- b. the safety of flight compromise level, and
- c. other factors which could impact on the reputation of the FS Program, CF and the department.

Initial Report (IR)

An IR describes the immediately available particulars of the occurrence and must be sent within 12 hours of the event.

Supplementary Report (SR)

An SR is the report normally produced by the wing or unit for aircraft incidents of category D and E. It shall be submitted within 30 calendar days of the occurrence.

Occurrence categories are classified as:		
Aircraft Damage Level (ADL)	Personnel Casualty Level (PCL)	Occurrence Category
Destroyed or missing	Fatal injury or missing	A
Very serious damage	Very serious injury / illness	B
Serious damage	Serious injury / illness	C
Minor damage	Minor injury / illness	D
Nil	Nil	E

Combined Report (CR)

A CR is the combination of the IR and SR in a single report submitted for minor occurrences requiring a limited or a brief investigation and is provided within 48 hours of the occurrence. The report is the same as the SR.

Investigations are conducted by the following:

- DFS conducts Class I and II investigations,
- a specific FSO is tasked by DFS to conduct any Class III Enhanced Supplementary FSIR (ESR), and
- a unit FSO conducts all other FSIs and the report is released to the supporting wing FSO.

The purpose of FSIs is to prevent future accidents. Determining cause factors are a means to identify problems and assists in trend analysis.

Specific cause factors results in a more exhaustive analysis of the occurrence. In turn, measures are formulated that prevents a recurrence of the problem. Cause factors assist in understanding all of the reasons why an accident or incident occurred. Cause factors should lead to PMs.

Standard terminology is used in all reports. Cause factors are any event, condition or circumstance whose presence or absence, within reason, increases the likelihood of a FS occurrence. Cause factors are listed in the following six categories:

- personnel,
- material,
- environment,
- operational,
- unidentified foreign object damage (FOD), and
- undetermined.



Did you know?

On January 1, 2004, the CF adopted the Human Factors Analysis and Classification System (HFACS) to assess and document personnel cause factors (PCF). Active failures and latent conditions need to be identified for all occurrences so that effective PMs can be implemented to reduce future occurrences.



Active failures are either the error(s) or the conscious deviation(s) from an authorized procedure that directly contribute to a FS occurrence.

Latent conditions are situations or circumstances associated with the individual(s) or the system of management (supervision) of the individual(s) involved in the occurrence.

FSIs investigate and classify failures associated with personnel to include:

- unsafe acts or conditions (active failure),
- preconditions for unsafe acts (latent - direct),
- supervision (latent - remote), and
- organizational influences (latent - remote).



Did you know?

Television shows such as The Discovery Channel show "Mayday", are created to show the FS investigation and reporting process.

Read the following FSIR to understand the format of and information within a report.

**CANADIAN FORCES
FLIGHT SAFETY INVESTIGATION (FSI) REPORT (FSIR)
SUPPLEMENTAL REPORT (SR)**

FILE NUMBER: 1010-CGBZG (DFS 2-4-2)
DATE OF REPORT: 16 FEB 04

AIRCRAFT TYPE: Schweizer 2-33A
DATE/TIME: 27 1807Z/1503 Local Sep 03
LOCATION: Summerside, PEI
CATEGORY: "B" Category Accident

This report was produced under authority of the Minister of National Defence (MND) pursuant to Section 4.2 of the Aeronautics Act (AA), and in accordance with A-GA-135-001/AA-001, Flight Safety for the Canadian Forces.

With the exception of Part 1 – Factual Information and when provided for by law, the contents of this report shall only be used for the purpose of accident prevention and are to be seen only by those with a need-to-know in the exercise of their formal functions. In any event, this report shall not be released to the public in whole or in part except under the authority of the Director of Flight Safety, National Defence Headquarters.

Due to the nature of the accident, the Supplemental Report was chosen as the reporting format. As no clear format for this report is outlined within the A-GA-135-001/AA-001, DFS is in the process of aligning all SR reports to reflect ICAO Annex 12 standardization.

1. DESCRIPTION

The auto tow launch began normally and, after the "all out" signal was given, the glider was observed to accelerate slowly. The visiting cadet assigned to signal the tow driver of the glider's progress noticed that the ground run of the glider was unusually long. Using a signal bat, the signal cadet subsequently gave the "stop, stop, stop" signal to the tow driver. As the stop signal was given, the glider became airborne and climbed to approximately 50 feet AGL. Thinking that the glider could successfully take off, the signal cadet then brought the signal bat down but the tow vehicle had already initiated a launch abort. Seeing this, the signal cadet then raised the signal bat straight up again, re-affirming the take off abort signal.

The glider was observed to descend rapidly and land hard in a level attitude approximately 2000' from the runway threshold. Ground roll was minimal and both the pilot and passenger immediately exited the aircraft unassisted. The glider suffered "C" category damage to the main wheel axle and support tubing.

2. INVESTIGATION NARRATIVE

The glider was being flown in support of the Air Cadet Fall Glider Familiarization Program from runway 24 at Summerside Airport, PEI. The accident flight was the 45th of the day. The Instructor Pilot (IP) was tasked to give a public relations flight to a civilian passenger; the IP was seated in the rear seat with the passenger in the front seat. The weather conditions at the time of accident were VFR with wind 180°/10 kts, visibility 15 SM, temperature 23°C, and sky clear.

The investigation revealed that the auto tow vehicle in use was not fully serviceable. The required rapid acceleration of the tow vehicle at the initial part of the auto tow launch would cause the vehicle to hesitate or sputter. To compensate for this and avoid stalling the vehicle, the auto tow driver would accelerate slowly. The tow driver thought this to be acceptable in the interest of keeping the operation going. The auto launch observer was reported as stating that the "truck was having problems all day." The site supervisor, pilot, and launch personnel were aware of this problem.

After having experienced similar slow accelerations during previous launches, the IP again noted the poor acceleration during the accident takeoff. After lift off, the IP observed the airspeed to be 50 MPH, but it soon decayed to 45 MPH at which point she released the towrope. The minimum allowable airspeed on auto tow is 50 MPH. The IP believed that she was "a little late" in reacting to the decaying airspeed. She attempted to lower the nose in order to regain a positive flying attitude and adequate airspeed for the round out but she was hesitant to use excessive forward stick pressure due to the close proximity to the ground. The glider descended rapidly and rounded out at approximately three to five feet without regaining the minimum approach speed of 50 MPH and with insufficient airspeed to arrest the descent during the flare.

At all Atlantic Region gliding sites, visiting cadets are encouraged to participate in the launching of the glider. They are given basic instruction and are closely monitored by the Air Cadet staff. The visiting cadet assigned to signals had little previous experience in his function. He stated that all of the launches that day were slow initially with long ground runs but that the accident flight ground run was longer by comparison. This caused him to doubt the safety of continuing the launch and, subsequently, he gave the stop signal. Upon seeing the glider go airborne, he doubted his decision and momentarily brought the signal bat down. As the glider then released the towrope and started to descend, the signal cadet then held the signal bat straight up again.

The Site Supervisor stated that operations at the launch site were being carried out as per normal with participating cadets being closely supervised by qualified personnel. The problem with the launch vehicle was brought to his attention early in the day at which point he suspended operations and personally investigated the issue. After finding the vehicle to be satisfactory as long as "full" throttle was

not used, the Site Supervisor allowed operations to continue. The Site Supervisor said that at no time during the day did he perceive a further problem with the truck until it was again brought to his attention after the accident.

3. CAUSE FACTORS

3.1 Personnel – Pilot – Technique, in that the pilot did not make a timely and correct reaction to the decaying or inadequate airspeed in the initial portion of the launch.

3.2 Personnel – Support Personnel – Training, in that the cadet assigned to provide launch signals did not have the required training and experience to adequately judge whether or not the safety of the launch had been jeopardized.

3.3 Personnel – Management (Regional HQ) – Training, in that the instituted policy of having cadets fill launch positions as part of their familiarization experience does not make provision for adequate training in all cases. While functions such as holding a glider's wing or tail are purely mechanical tasks, launch signalling may require a cadet to make a decision based on knowledge or experience that he or she may not possess.

3.4 Personnel – Supervision (Site Supervisor) – Judgement, in that the Site Supervisor decided to continue operations after a problem with the auto launch vehicle was brought to his attention. Although he judged the vehicle to be safe for towing, its performance reportedly continued to be less than ideal. In fact, whether or not there was a mechanical problem with the vehicle is irrelevant. The problem was at least perceived, and led to unconventional launch technique by both the auto tow driver and the pilot.

4. PREVENTATIVE MEASURES

4.1 Greater emphasis on auto tow launch aborts are to be provided within both the Atlantic Region's auto tow conversion course and Proficiency/Currency program. Completion date TBA.

4.2 A PIF has been issued in Atlantic Region suspending the use of cadets in the position of Auto Launch Signaller. Its permanency is pending a review of our training syllabus. Site Supervisors have been reminded of the importance of close supervision of all inexperienced personnel utilized on-field.

4.3 Results of the launch training syllabus review are to be forwarded to the National Air Ops O for consideration of application to all regions.

4.4 All supervisory staff in Atlantic Region will be briefed on the danger of accepting substandard equipment for use in an operational role, possibly during the Annual Program Training Conference in January 04.

4.5 This accident and the accident involving C-GCLN at Miramichi NB, 1 Sep 02, is to be examined by the upcoming Standards Working Group meeting, at CFS in Dec 03, with the goal of evaluating if sufficient supervisory and decision-making training is provided to the 55 regional gliding site commanders and their staffs. This review should be conducted within the scope of discussions held during the recent Air Cadet Flying Training Conference at 19 Wing Comox, in Oct 03.

Figure A-2 FSIR

Note. From "Flight Comment", 2007, *Canadian Forces Flight Safety Investigation (FSI) Report (FSIR)*. Retrieved November 20, 2009, from [http:// www.airforce.forces.gc.ca/dfs/reports-rapports/l/pdf/fsir/cgbzg.pdf](http://www.airforce.forces.gc.ca/dfs/reports-rapports/l/pdf/fsir/cgbzg.pdf)



Activate Your Brain #5:

Analyze the FSIR and comment on the report to include:

- cause factors,
- PMs, and
- who reviews the report?

Notes:

CONCLUSION

Flight safety is the concern for all participants when participating in the Air Cadet Gliding and Power Flight Program. The FSO plays a key role to ensure the safety of all individuals and resources, not only when the flying is being conducted but also by preparing personnel through education and training to recognize dangers. The training and education required by an FSO better prepares these individuals to complete this role.

For you to understand the chain of command of the FS Program, the role and responsibilities of an FSO and the reporting mechanism, you need to understand how the ACFP is an active part of the FS Program.



Did you know?

If you have questions about the FS Program, speak with the FSO at the gliding centre and remember, each region has an FSO.



You can see the complete copy of A-GA-135-001/AA-001, *Flight Safety for the Canadian Forces* online at <http://www.airforce.forces.gc.ca/dfs/publications.manual-manuel-eng.asp>



Congratulations, you have completed your self-study package on EOC560.01 (Examine Aspects of Flight Safety). Hand the completed package to the Training Officer / Proficiency Level Officer who will record your completion in your Proficiency Level Five Logbook.

Answer Guide



Where have you seen an FSO?

gliding centre,

CSTC - glider scholarship

How do you identify the FSO?

Wears the FS Diamond Badge on their operational clothing.



Activate Your Brain #1 answer:

FS occurrence is defined as an event

involving the operation of an aircraft or support of flying that constitutes an accident or incident.



Activate Your Brain #2 answers:

Where have you seen FS informal education / training?

FS publications

magazines (*Flight Comment*)

bulletins

posters

web-based material

FS briefings - CSTC

conferences

seminars

FS reports (Occurrence report / Epilogue [EPI])

Word Search Answer

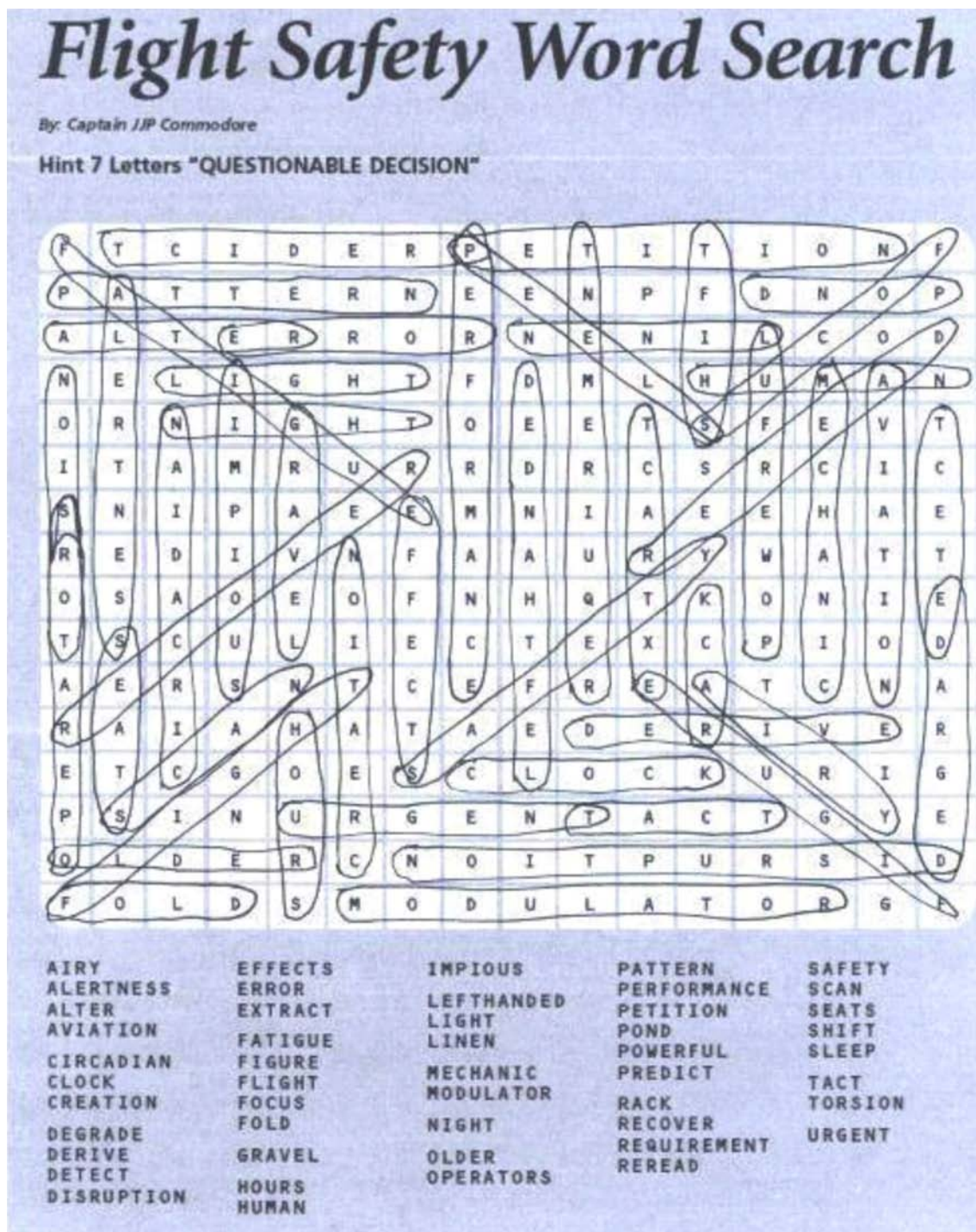


Figure B-1 Flight Safety Word Search Answer

Note. From "Flight Comment", 2003, *Flight Safety Word Search*. Retrieved November 23, 2009, from <http://www.airforce.forces.gc.ca/dfs/publications/fc/archive/2000-2004/archive-eng.asp>



Activate Your Brain #3 answer:

As part of FS informal education / training, list some of the information an FSO should present in a briefing?

Corrective action for pilots. _____

Where not to walk. _____

Who to speak to if you find something dangerous on the ground. _____

Types of occurrences. _____

Behaviour on the airfield. _____

Behaviour around the aircraft. _____

Who to speak to if a problem is noticed. _____



Activate Your Brain #4 answer:

What must personnel at all levels report?

All FS occurrences _____

Applicable cause factors _____

PMs _____



Activate Your Brain #5:

Analyze the FSIR and comment on the report to include:

- cause factors,
- PMs, and
- who reviews the report?

Notes:

Cause factors

Personnel

- **Pilot** - technique, in that the pilot did not make a timely and correct reaction to the decaying or inadequate airspeed in the initial portion of the launch.
- **Support personnel** - training in that the cadet assigned to provide launch signals did not have the required training and experience to adequately judge whether or not the safety of the launch had been jeopardized.
- **Management** (Regional Headquarter) - training in that the instituted policy of having cadets fill launch positions as part of their familiarization experience does not make provision for adequate training in all cases.
- **Supervision** (site supervisor) - judgement, in that the site supervisor decided to continue operations after a problem with the auto launch vehicle was brought to his attention.

PMs

- Greater emphasise on auto tow launch aborts are to be provided within both the Atlantic Region's Auto Tow Conversion Course and Proficiency / Currency program.
- A proficiency information folder (PIF) has been issued in Atlantic Region suspending the use of cadets in the position of Auto Launch Signaller.
- Results of the launch syllabus review are to be forwarded to the National Air Ops O for consideration of application to all regions.
- All supervisory staff in Atlantic Region will be briefed on the danger of accepting substandard equipment for use in an operational role.

Who reviews the report?

- Standards Working Group



ROYAL CANADIAN AIR CADETS
PROFICIENCY LEVEL FIVE
INSTRUCTIONAL GUIDE



SECTION 2

EO C560.02 – EXAMINE THE CANADIAN BUSH PILOT INDUSTRY

Total Time:	90 min
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PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-805/PG-001, *Proficiency Level Five Qualification Standard and Plan*, Chapter 4. Specific uses for said resources are identified throughout the self-study package within the section for which they are required.

Self-study packages are intended to be completed by the cadet independently. More information about self-study packages can be found in the forward and preface.

Review the lesson content and become familiar with the material prior to facilitating this lesson.

Photocopy the self-study package located at Attachment A for each cadet.

Photocopy the answer key located at Attachment B but **do not** provide it to the cadets.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

A self study was chosen for this lesson as it allows the cadet to examine in greater detail the Canadian bush pilot industry at their own learning pace. This encourages the cadet to become more self-reliant and independent by focusing on their own learning instead of learning directed by the instructor.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have examined the Canadian bush pilot industry.

IMPORTANCE

It is important for cadets to examine the Canadian bush pilot industry as bush flying and aircraft development was an important part of our aviation history providing transportation to remote Northern communities.

SELF-STUDY PACKAGE INSTRUCTIONS

OBJECTIVE

The objective of this self-study package is to have the cadet examine the Canadian bush pilot industry.

RESOURCES

- Self-study package, and
- Pen / pencil.

ACTIVITY LAYOUT

Provide the cadet with a classroom or training area suitable to complete the self-study package.

ACTIVITY INSTRUCTIONS

1. Provide the cadet with a copy of the self-study package located at Attachment A and a pen / pencil.
2. Allow the cadet 90 minutes to complete the self-study package.
3. Provide assistance as required to the cadet.
4. Collect the self-study package once the cadet has finished.
5. Correct the self-study package with the self-study package answer key located at Attachment B.
6. Provide feedback to the cadet and indicate whether or not they have completed the Enabling Objective (EO).
7. Return the completed self-study package to the cadet for their future reference.
8. Record the result in the cadet's logbook and Cadet Training Record.

SAFETY

Nil.

END OF LESSON CONFIRMATION

The cadet's participation in examining the Canadian bush pilot industry will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

The evolution of bush flying and aircraft development is an important part of our aviation history. Through the flying skills of pilots and the availability of appropriate aircraft, remote Northern communities receive food, housing supplies, medical requirements and industrial supplies.

INSTRUCTOR NOTES / REMARKS

Nil.

REFERENCES

C3-348 Ministry of Natural Resources. (2009). *History of bush flying*. Retrieved September 30, 2009, from http://www.mnr.gov.ca/en/Business/AFFM/2ColumnSubPage/STEL02_165922.html

C3-349 The Stuart Graham Papers—Chronology. (2009). *Summary of the commercial flying activities in Canada, 1919–1930*. Retrieved September 30, 2009, from [http://epe.lac.gc.ca/100/200/301.ic.can_digital_collections/sgraham/chron2.htm](http://epe.lac.gc.ca/100/200/301/ic.can_digital_collections/sgraham/chron2.htm)

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The Canadian Bush Pilot Industry



SECTION 1: THE ORIGIN AND DEVELOPMENT OF BUSH FLYING

SECTION 2: AIRCRAFT FLOWN

SECTION 1

THE ORIGIN AND DEVELOPMENT OF BUSH FLYING

POST WORLD WAR 1 (WWI)



Did you know?

In Canada, the word "bush" has been used since the 19th century to describe the hostile environment beyond the clearings and settlements.

There were few registered pilots in Canada at the beginning of WWI. To avoid the hazards of trench life as a soldier, young men took to the skies as members of the British Air Service. For those men who survived wartime flying, returning to civilian life was not as interesting or exciting. These veterans of aerial combat were to become pioneers as bush pilots.



Did you know?

For pilots returning to a civilian life of flying, the main choices included:

- barnstorming,
- crop-dusting, and
- bush flying.

In the remote Canadian north, lack of roads restricted the transporting of necessities such as food, medicine and building material. With the availability of aircraft and pilots willing to fly into these remote areas, bush flying filled this transportation void.

Between 1917–18, Fairchild Aerial Surveys (of Canada) conducted the first winter bush flying. Fairchild Aerial Surveys (of Canada) flew supplies from Hudson, Ontario to Narrow Lake, Ontario for Bathurst Mines.

In 1919, the first aerial survey was completed in Labrador for the South Labrador Pulp and Paper Company, Limited (Ltd). Over 15 000 aerial photographs were taken of the timberland.

With continued development and demands for service in Northern Ontario, ex-Royal Naval Air Service (RNAS) and Royal Air Force (RAF) pilots were hired to fly war-surplus aircraft. The handful of flyers who could fly and fix their aircraft became the core of the fledgling bush flying industry. To survive in the wilderness regions, aircraft needed maintenance.

The first commercial flying started in 1919 when an organized group lead by the Laurentide Paper Company requested two aircraft from the St. Maurice Forestry Protection Association in Quebec to fly fire patrols. The Curtiss HS-2L "La Vigilane" was the first commercial aircraft to complete this duty.



Did you know?

It took 12 hours and 20 minutes over three days to fly the Curtiss HS-2L "La Vigilane" from Dartmouth, Nova Scotia to Grand-Mère on Lac à La Tortue, Quebec.

You can see the La Vigilane and read its story at the Canada Aviation Museum in Ottawa, Ontario.

During the 1919 season, 80 hours of flying time was accumulated. During the 57 flights, experiments in aerial photography for forestry purposes were completed.

The Forest Protection Association decided to withdraw from the operation. The Laurentide Paper Company entered into agreement with one of the pilots, W.R. Maxwell and together they formed Laurentide Air Service Ltd.

Passenger service and surveying was a major role of this new service. Forest fire patrols over the St. Maurice River valley in Quebec was extended to include from Lake-of-the-Woods to James Bay, both in Ontario. The Ontario Department of Lands and Forest requested a survey of forest resources in Northern Ontario.



Did you know?

The first Canadian private pilot licence, air engineer's certificate and commercial aircraft registered were issued in January 1920.

At the same time, the Canadian government approved the establishment of a Canadian Air Force.

The bush flying role continued to evolve with the development of the aircraft. Transporting personnel, patrolling for forest fires and sketching or taking aerial photograph of timber limits became a common task for the pilots.

In 1920, pilots with engineers would fly to Northern Ontario regions not accessed before. Ray Maxwell with his engineer Geordie Doan made the first flight to James Bay, flying from Remi Lake, Ontario near Kapuskasing to Moose Factory, Ontario in an H-Boat. They flew the first ambulance flight in northern Canada 11 days later. Maxwell continued to fly firsts when he made the first volume carriage of airmail in Canada.

The Ontario government promoted the continued growth of bush flying by contracting services from the few air services. Large government contracts provided flying work for detail mapping, to include:

- showing lakes,
- waterways, and
- forest types.

Other contracts required the transporting of firefighting personnel and to complete fire patrols.

Pilots started flying to the North for the thrill of flying into remote areas, but this soon changed from thrill of flying to flying for profit. The number of licensed pilots, registered aircraft and private flying companies decreased by 1924; flying hours and amount of freight carried increased.

The Canadian Air Force discontinued providing flying services that could be provided by private companies.



Activate Your Brain #1:

W.R. Maxwell played a major role with the development of bush flying. Can you name some of the first accomplishments he made?

Creation of the Ontario Provincial Air Service (OPAS)

The Ontario government had seen the benefits of utilizing aircraft and created the OPAS to own and operate its own fleet of aircraft. Through its development of services and the pilots who flew the aircraft, the OPAS represented the "cradle of bush flying."



Did you know?

The OPAS established its primary base of operation at Sault Ste. Marie, Ontario. Other bases of operation were established across Northern Ontario. The first fleet of aircraft consisted of 13 surplus Curtis HS-2L flying boats.

With OPAS flying, contracts decreased for Laurentide and many of the best pilots and engineers left Laurentide to the new government flying service.

Laurentide tried to counter the loss of contracts by introducing scheduled services, including:

- air service into the Quebec gold field between Angliers, Lake Fortune and Rouyn, and
- mail service to Haileybury, Ontario, Angliers, Quebec and Rouyn, Quebec.

Both services were not well received by the communities and Laurentide Air Service Ltd. terminated operations in 1925.

With the discovery of Ontario gold at Red Lake, OPAS started to fly all the men, supplies and equipment needed, to Red Lake before the winter freeze.

Competition for air services developed with Patricia Airways and Exploration Ltd. providing the first scheduled air service into the gold field at Red Lake, carrying:

- passengers,
- freight, and
- mail.



Did you know?

Patricia Airways and Exploration Ltd. was developed by Roy Maxwell, the first director of OPAS. Many of the OPAS aircrews joined Maxwell.



Activate Your Brain #2:

St. Maurice Forestry Protection Association and OPAS first used what aircraft?

Northern Air Service Ltd.

In northeastern Ontario, Northern Air Service Ltd. was formed to fill the void left by Laurentide. Supplies from the Quebec goldfields were transported by Northern Air Service Ltd.

Bush flying operations continued to rely on the surplus WWI aircraft, including:

- H-boats,
- Canuck trainers,
- Avro 504Ks, and
- other available aircraft.



Did you know?

Bush flying activity was mainly developed in Ontario and Quebec. The companies set the framework for the progression of bush flying into other Canadian provinces and territories.

Western Canada Airways (WCA)

A Winnipeg businessman, James Richardson, saw the merits and potential of aircraft to serve the remote northland of Western Canada. The base of operation was located at Hudson, Ontario. With the new company a new aircraft was introduced, the Fokker Universal with a newly developed radial, air-cooled engines and a high-wing cabin.



Did you know?

Early bush pilots and engineers often sat exposed in open-cockpit aircraft during the winter when the temperature could be 35 below zero.

Bush flying duties mainly operated in the northern Ontario and Quebec goldfields. The first major undertaking of its kind in northern Canada was for WCA to supply men, machinery and materials to the west coast of Hudson Bay at Fort Churchill, Manitoba. The airlift was completed in the winter. The successful airlift was noted in government reports.



Did you know?

In 1927, Fort Churchill, Manitoba was selected as the ocean terminus of the Hudson Bay Railroad because of the successful airlift completed by WCA.

More large contracts were given to WCA, including the transporting of men and equipment to a new mining development north of Senneterre, Quebec. WCA work proved that the north was open for operations, 12 months of the year.

At this time, aircraft development was undertaken by designers, mainly because of the development of the Pratt and Whitney radial, air-cooled engine.

With winter flying, new innovations were made to improve the operation of the Fokker which was not designed for the bush. The Elliott Brothers of Sioux Lookout, Ontario redesigned skis to replace the Fokker designed skis. The new skis improved landing on rough frozen lakes and the design was used on bush planes for many years.



Did you know?

Admiral Byrd used the Elliot Brothers skis on his aircraft for all three expeditions into the Antarctic.

Expanding to the Artic Circle

With flying a common sight in the southern bush, companies looked further north, well into the Artic Circle. Aircraft would build fuel caches in the summer, landing on the lakes with aircraft equipped with floats. Once the lakes froze, flights continued with aircraft landing using skis.

The cooperation and team work of the pilots and mechanics or air engineers kept the far north open 12 months of the year. Unreliable aircraft would leave the crew stranded on a remote lake miles from anywhere with no communications. The skills of the mechanic would make the aircraft flyable or the crew would have to make the long walk out of the bush.



Figure A-1 Fokker Universal

Note. From "Western Canada Aviation Museum", 2006, *Ghost of Charron Lake-Fokker Universal Standard Aircraft G-CAJD*. Copyright 2006 by fokkeraircraftrecovery.ca. Retrieved December 2, 2009, from <http://www.interactivestudio.ca/fokker2/history.htm>

New challenges faced the crew, especially in this cold environment. At times, a new engine had to be delivered to the crippled aircraft and changed in the field or repairs to a collapse landing gear made in hot or cold situations. The challenges of working in the sub-zero temperatures lead to innovations. To protect the pilot and engineers, an all-weather canvas nose hanger was designed with a small stove for servicing aircraft engines outdoors.



Did you know?

Starting an engine in the late 1920's was challenging. The oil was drained from the engine at the end of the day and stored in a warm building then returned to the engine in the morning. If the oil was too thick, it had to be warmed over a fire pot while another fire pot was placed under the engine to thaw it. The oil was added and if it did not start, the process was repeated until the engine started.

Flying in the Artic Circle was limited to the daylight hours. Many times the crew would spend the night in the sub-zero temperatures, starting the aircraft in the early morning darkness to maximize the daylight flying time.

Canadian Airways

Canadian Airways was formed in 1930 by uniting WCA and the Aviation Corporation of Canada. The flying interests of the Canadian Pacific Railroad (CPR) and the Canadian National Railroad (CNR) was included. Canadian Airways controlled almost all air business in Canada. With the new company was introduced the Junkers JU52.

Aircraft design continued to grow and more aircraft were developed to serve multiple roles from carrying large freight including:

- bulldozers,
- tractors,
- a complete sawmill,
- cement,
- dynamite,
- fuel oil,
- horses, and
- cows for milk.

Flying locations continued to expand, supplying freight and personnel to communities, mining sites and dam constructions sites.

Austin Air Service

Two Toronto, Ontario brothers, Jack and Chuck Austin created Capreol and Austin Air Service in 1934. The name changed to Austin Airways shortly after the opening. The aircraft were Waco cabin biplanes. The modifications the brothers introduced included a removable panel on the port side behind the cabin. This allowed the loading of a stretcher, creating Canada's first commercial air ambulance.

Mining personnel were the main clients but in 1936, the Department of Lands and Forest used many air services to aid during the large forest fire season.



Did you know?

Pilots were paid a monthly salary and a dollar a flying hour. When the dollar an hour was changed to a dollar a mile, aircraft started moving faster in shorter times.

Austin Airways established numerous Ontario bases from Sudbury, Chapleau, Gogama and Biscotasing. A summer base was established at Temagami, Ontario. Austin aircraft flew over Northern Ontario and beyond, linking remote native communities. Fish hauling was a profitable business with these communities.

By 1941, Austin Airways had expanded in Ontario, to South Porcupine and Nakina with regular flights into James Bay and soon flying on both sides of Hudson Bay.

The creation of northern airlines provided the mainstay of transporting personnel and material between southern communities to northern remote communities. The expansion of roles for these airlines changed with the development of aircraft, better suited for remote flying duties. From the larger cargo aircraft to smaller aircraft better suited to fly into smaller remote lakes, the role of the bush pilot continues to evolve to today's standards.



Did you know?

Television shows such as The Discovery Channel show "Ice Pilots", are created to show the role and hardships of pilots in northern Canada.

The bush aircraft come in various sizes and shapes but are designed to withstand the take-off and landing in short distances.

The skills of men and women include good piloting skills and a need to adapt to precise flight at slow speeds for landings and take-offs on small lakes and landing strips. Bush pilots tend to be self reliant individuals with knowledge of wilderness survival.

Today, bush flying has evolved into a new outlet, supporting new services to remote locations.

Missionaries fly in and out of remote communities to provide religious service to communities.

Bush flying has evolved into a family activity with the availability of rentals and charter tours. Small companies provide bush pilots to fly people into small remote locations to provide recreational support to many people, including:

- hunters,
- fishermen,
- photographers, and
- outdoor enthusiasts (campers and hikers).



Did you know?

Training is available to teach pilots the skills to fly and land float aircraft which has opened new locations for the owners of private aircraft. With more pilots receiving the skills to fly specially equipped aircraft, comes the dangers of inexperienced pilots flying to remote locations.

With the development of helicopters, bush flying has introduced specific helicopters to fly into remote communities not accessible by aircraft. The ability to manoeuvre a helicopter into confined spaces introduced a modern mode of transportation to provide support to more northern communities and outposts. The role of fire detection is better suited for helicopters as they can hover over tight spots, give accurate information, fly loaded detection patrols during high-hazard days or high-risk areas and land crews in specific areas.



Activate Your Brain #3:

Can you name some of the air services?

SECTION 2 AIRCRAFT FLOWN

Many aircraft were used to promote the bush flying role for Canadian air services. Development of bush flying specific aircraft was not a priority as many air services used the aircraft of the day. Many aircraft were float planes as most of the land planes could not land on unprepared fields and the large amount of undeveloped, forested land led to many aircraft having to land on lakes.

PIONEER BUSH FLYING AIRCRAFT

Pilots who trained on different aircraft during WWI returned to Canada and flew the war-surplus aircraft purchased for pioneering services to northern, isolated communities. The aircraft were large flying boats that required specific sized lakes and landing stripes to operate. The main base of operation was a water base suitable for the large lumbering aircraft to land and take-off.

Curtiss HS-2L

The Curtiss HS-2L flying boat was an open cockpit aircraft used for costal patrols during WWI. This aircraft was the pioneer bush flying aircraft. The single Liberty engine aircraft could land and take-off from water but had wheels for manoeuvring on land. The Canadian government first used these aircraft for anti-rum-running, fishery and custom patrols on the east and west coast before two HS-2Ls were sent to fly fire patrols for the St. Maurice Forestry Protection Association of Quebec.

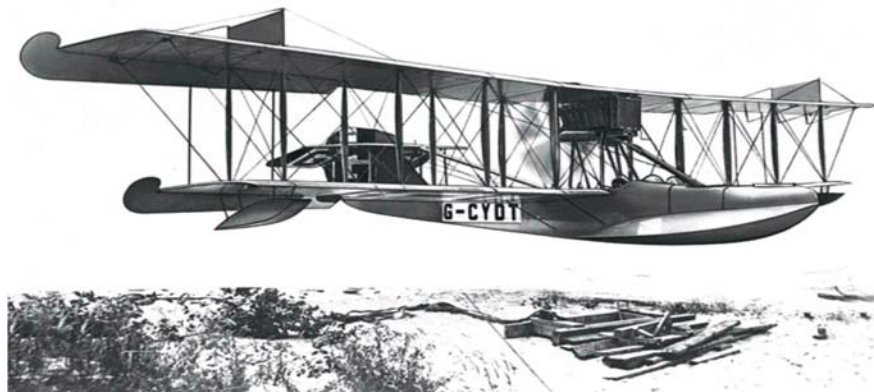


Figure A-2 Curtiss HS-2L

Note. From "Défense nationale", 2004, *Curtiss HS-2L*. Retrieved December 2, 2009, from <http://www.airforce.foces.ca/v2/equip/resrc/images/hst/l-g/hs2l.jpg>

Vickers Vedette Flying Boat

The Vickers Vedette flying boat was the first aircraft built to a Canadian specification for Canadian conditions. The RCAF flew this aircraft for forestry surveying and fire protection patrols. The aircraft was flown to wilderness areas for communications and photography surveys for the preparation of maps by the Geological Survey of Canada.



Figure A-3 Vickers Vedette Flying Boat

Note. From "Government of Canada", 2004, *Canadian Military Heritage*. Retrieved December 2, 2009, from http://www.cmhg-phmc.gc.ca/cmh/en/image_587.asp

de Havilland Moth

The OPAS used the de Havilland Gypsy Moth but the RCAF used the de Havilland Cirrus Moth.



Figure A-4 de Havilland DH-60 Cirrus Moth

Note. From "National Defence", 2004, *Canada's Air Force, Aircraft, Historical Aircraft, de Havilland DH-60 Cirrus Moth*. Retrieved December 2, 2009, from <http://www.airforce.foces.ca/v2/equip/hst/moth-eng.asp>



Did you know?

The word Gypsy and Cirrus was the name of the engine design.

Curtiss JN-4 "Canuck"

The Curtiss JN-4 was used by Northern Air Service Ltd. to fly many firsts including:

- first ski flying,
- first airmail,
- first aerial survey, and
- first flight across the Canadian Rockies.



Figure A-5 Curtiss JN-4

Note. From "Canada Aviation Museum", *Curtiss JN-4 "Canuck"*—*Canada Aviation Museum*. Retrieved December 2, 2009, from <http://www.aviation.technomuses.ca/collections/artifacts/aircraft/CurtissJN-4Canuck>

Avro 504k

Only two of the Canadian version of the Avro 504 were built and flown by the RCAF. A civil Avro 504k was one of the first commercial passenger flights into the Canadian bush on October 15–17, 1920. Two passengers sat in the front open cockpit seat and were flown from Winnipeg to Le Pas, Manitoba.

An Avro 504k made the first winter flight to James Bay in 1922.



Figure A-6 Avro 504k G-CYFG

Note. From "Canada Aviation Museum", *Avro 504K G-CYFG—Canada Aviation Museum*. Retrieved December 2, 2009, from <http://www.aviation.technomuses.ca/collections/artifacts/aircraft/Avro504KG-CYFG>

Fokker Standard Universal

The Fokker Standard Universal was built in 1926. The fuselage and tail surfaces were made of welded tubular steel, covered with fabric. The wings were plywood with a Sitka spruce spar and the engine was the Wright J-4B 200 horse power (hp). The pilot sat in an open cockpit while the engineer travelled in the enclosed cargo section.



Figure A-7 Fokker Standard Universal

Note. From "Western Canada Aviation Museum", 2006, *Ghost of Charron Lake-Fokker Universal Standard Aircraft G-CAJD*. Copyright 2006 by fokkeraircraftrecovery.ca. Retrieved December 2, 2009, from <http://www.interactivestudio.ca/fokker2/history.htm>



Did you know?

A Fokker Stand Universal was used by Admiral Byrd for his 1928–1930 expedition to the Antarctic.

Junkers Ju-52 CF-ARM

Canadian Airways Ltd. flew the Junkers Ju-52 from the Red River. The Junkers Ju-52 was the largest single-engine aircraft operated in Canada and was fondly referred to as the "Flying Boxcar". The single engine aircraft was brought to Canada from Germany and outfitted with a 830 hp Roll Royce Buzzard engine.



Figure A-8 Junker Ju 52 CF-ARM

Note. From "Western Canada Aviation Museum", 2009, *Junkers Ju-52*. Copyright 2009 by Western Canada Aviation Museum. Retrieved December 2, 2009, from <http://www.wcam.mb/junkers.html>



Did you know?

The Junkers Ju-52 lands at 47 miles per hour and appears to float toward the ground like a glider.

Waco

The Waco biplane had a cabin for both the pilot and engineer to fly protected from the environment. Up to three people can travel in this aircraft.



Figure A-9 Waco UIC

Note. From "Alberta Aviation Museum Edmonton", 2009, *Waco UIC (1933)*. Copyright 2009 by Alberta Aviation Museum. Retrieved December 2, 2009, from http://www.albertaaviationmuseum.com/index.php?option=com_content&task=view&id=31&item=41

Noorduyn Norseman

The Noorduyn Norseman is a commercial aircraft designed as a light transport. The Norseman has a Whitney R-1340 radial engine. The design of this large bush plane enabled it to remain in service from 1935–1959 when many were replaced by the de Havilland Otter.



Figure A-10 Noorduyn Norseman

Note. From "U.S. Centennial of Flight Commission", 2009, *General Aviation: Noorduyn Norseman Bush Plane*. Copyright 2009 by John Stephens. Retrieved December 2, 2009, from http://www.centennialofflight.gov/essay/GENERAL_AVIATION/bush_flying/GA18G3.htm



Did you know?

During WWII, famed band leader Glenn Miller disappeared over the English Channel. It was rumoured that he was abducted by space aliens or the Norseman, he was flying, had design flaws. Neither was true.

PRESENT BUSH FLYING AIRCRAFT

With the advancement of engine design, more powerful power plants allowed new designs to be considered for future bush flying aircraft. Large and small aircraft were built for role specific duties. Helicopter development and refinement created numerous multi-role airframes.



Did you know?

Engines were identified with lettering to include:

- opposed (O),
- radial (R),
- fuel injected (I),
- turbocharged (T or TS),
- geared (G), and
- helicopter or vertical installation (H or V).

de Havilland DHC-2 Beaver

The Beaver was designed as a no-nonsense bush plane with a nine cylinder Pratt & Whitney radial engine. The all metal aluminum, semi-monocoque design had tube frame seats and first flew in 1947. The Beaver had short take-off and landing capability (STOL) and could fly with floats or skis. It was known as a "half-ton truck with wings".



Figure A-11 de Havilland Beaver

Note. From "U.S. Centennial of Flight Commission", 2009, *General Aviation: de Havilland Beaver*. Copyright 1996 by Geoff McDonell. Retrieved December 2, 2009, from http://www.centennialofflight.gov/essay/GENERAL_AVIATION/bush_flying/GA18G3.htm

de Havilland DHC-3 Otter

The Otter first flew in 1951 and was the successor of the DHC-2 Beaver. It was initially called the "King Beaver" but was renamed the Otter. It was like the Beaver but many were converted to turbo-prop Pratt & Whitney or Walter engines.



Figure A-12 de Havilland Otter

Note. From "findtarget reference", 2009, *Seaplane Information*. Copyright 1999–2009 by FindTarget.com. Retrieved December 2, 2009, from <http://reference.findtarget.com/search/seaplane>



Did you know?

The Otter was the basis for de Havilland's successful Twin Otter.

Cessna Floatplanes

Cessna floatplanes were designed in numerous configurations, including:

- single-engine Cessna 182,
- twin-engine Cessna 337 Skymaster, and
- single-engine Cessna Caravan.

The high wing placement allowed the pilot an unobstructed view of the area below. The slow-speed requirement was met by the Cessna, allowing the pilot to observe and report accurately on a fire.



Figure A-13 Cessna 182 Floatplane

Note. From "Creek Side Landing", 2009, *Cessna 182*. Copyright 2009 by Old Planes and Cars for Sale. Retrieved December 2, 2009, from <http://www.oldplanesandcars.com/inventory>



Figure A-14 Cessna 337 Skymaster

Note. From "Canadian Bushplane Heritage Centre", 2009, *Cessna 337 Skymaster*. Retrieved December 1, 2009, from <http://www.bush-planes.com/detection-aircraft-canadian-bushplane-heritage>

Helicopters

With the introduction of helicopters to the role of bush flying, more remote areas were accessible and specific tasks were assigned to the helicopter. Helicopters could land and take off from tight spots and hover over a fire for the observer to note and report the details.

Helicopters varied in size and could fulfill various roles, to include:

- fire watch,
- firefighting,
- construction,
- lumber collection, and
- recreational hunting and fishing excursions.



Figure A-15 Helicopter

Note. From "Canadian Bushplane Heritage Centre", 2009, *Helicopter*. Retrieved December 1, 2009, from <http://www.bush-planes.com/detection-aircraft-canadian-bushplane-heritage>



Figure A-16 Bell 47 Bush Helicopter

Note. From "bush-planes.com", *Bell 47*. Retrieved December 3, 2009, from <http://www.bush-planes.com/Bell47Helicopter.htm>



Figure A-17 Bell Jet Ranger Bush Helicopter

Note. From "bush-planes.com", *Bell Jet Ranger*. Retrieved December 3, 2009, from <http://www.bush-planes.com/BellJetRangerHueyHelicopter.htm>



Figure A-18 Sky Crane Helicopter

Note. From "bush-planes.com", *Sky Crane*. Retrieved December 3, 2009, from <http://www.bush-planes.com/SkyCraneHelicopter.htm>



Figure A-19 C47 Chinook Helicopter

Note. From "bush-planes.com", *C47 Chinook*. Retrieved December 3, 2009, from <http://www.bush-planes.com/ChinookandSeaKnightHelicopters.htm>



If you visit Sault St. Marie, Ontario, you can see and learn about bush planes at the Canadian Bushplane Heritage Centre, or go to <http://bushplane.com>

Can you Identify bush aircraft?

Number the name of the aircraft with the picture of the aircraft.

1	Curtis HS-2L
2	Vickers Vedette Flying Boat
3	de Havilland DH-60 Cirrus Moth
4	Curtis JN-4
5	Avro 504k G-CYFG
6	Fokker Standard Universal
7	Junker Ju 52 CF-ARM
8	Waco UIC
9	Noorduyn Norseman
10	de Havilland Beaver
11	De Havilland Otter
12	Cessna 182 float plane
13	Cessna 337 Skymaster
14	Bell 47 bush helicopter
15	Bell Jet Ranger bush helicopter
16	Sky Crane helicopter
17	C47 Chinook helicopter

Bush aircraft	Number of name
	













CONCLUSION

The historical value of the bush pilot to open Northern Canada can be traced back to the returning pilots from WWI. Although the original reason to become a bush pilot was for the excitement of flying in the wilds of Canada, the development of the air services allowed business to expand during the times of forestry and mining.

Northern communities received the support from the flying services to provide the resources and services that would not be available if the bush aircraft had not been developed to the level of operation today.



Congratulations, you have completed your self-study package on EO C560.02 (Examine the Canadian Bush Pilot Industry). Hand your completed package to the Training Officer / Proficiency Level Officer who will record your completion in your Proficiency Level Five logbook.

ANSWER KEY



Activate Your Brain #1 answer:

W.R. Maxwell played a major role with the development of bush flying. Can you name some of the first accomplishments he made?

Formed Laurentide Air Service Ltd.
First ambulance flight to northern
Canada

First flight to James Bay from Remi Lake
First volume mail carriage of air mail in
Canada



Activate Your Brain #2 answer:

St. Maurice Forestry Protection Association and OPAS first used what aircraft?
surplus Curtiss HS-2L flying boats



Activate Your Brain #3 answer:

Can you name some of the air services?

Laurentide Air Service Ltd
Ontario Provincial Air Service (OPAS)
Northern Air Service Ltd
Canadian Airways

Canadian Air Force
Patricia Airways & Exploration Ltd
Western Canada Airways (WCA)
Austin Air Service

Bush aircraft	Number of name
	5



14



15



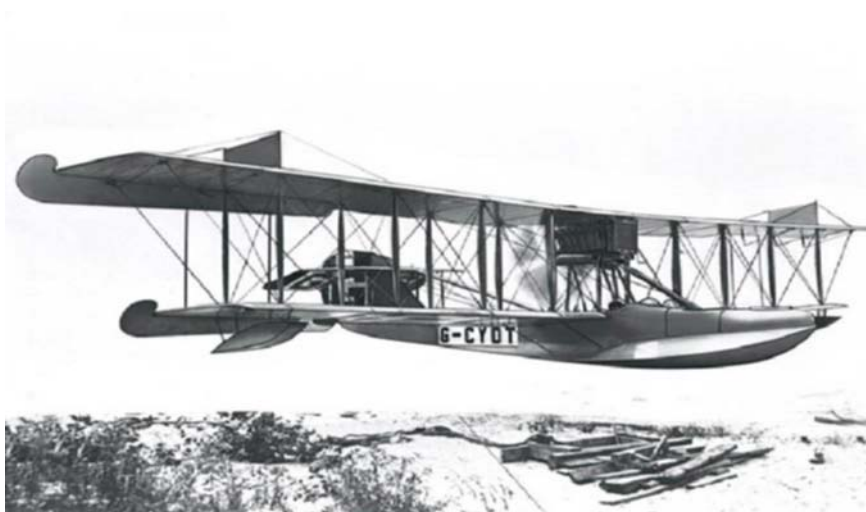
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