A-312 Water Ditching and Survival

Participant Workbook

Prepared by DOI Office of Aviation Services Training Division
and Interagency Partners

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A312
Water Ditching and Survival

Revision History

Version	Description	Date
1.00	Original Materials	2007
1.10	Refined objectives, reorganized current material, updated instructor guide, presentation, participant workbook	2011
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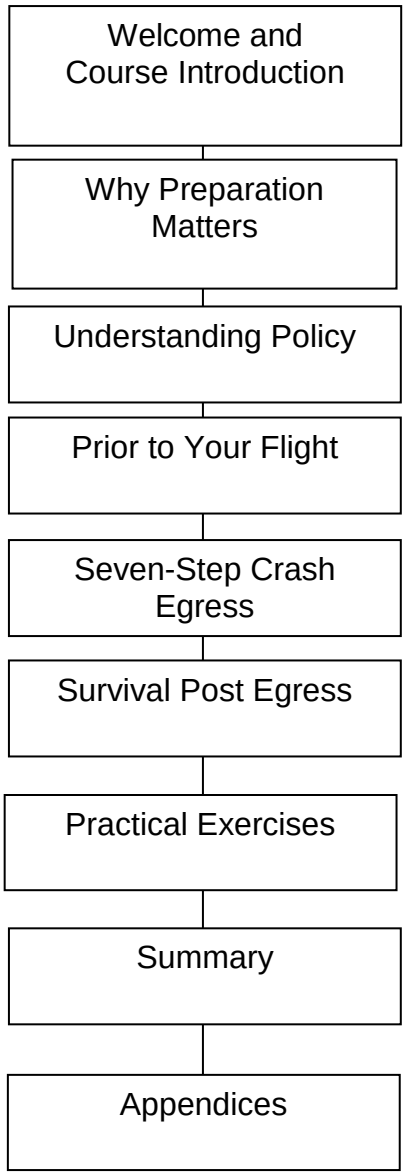
1.60	Formatting updates to new IG/PPT	3/31/14

A312
Water Ditching and Survival

Course Map



Welcome and Introduction

Get to Know Your Classmates

Be prepared to share:

- Your name?
- Your position?
- What are some of the ways you use aviation support to accomplish your mission?
- Have you ever had prior training in Water Ditching Egress?

Course Purpose

This course is designed to provide participants with a series of procedures to utilize during an aircraft water ditching. Successful completion of A-312 requires students to demonstrate an appropriate level of knowledge and skills required to safely egress an aircraft during a water ditching scenario.

Objectives

At the conclusion of this course, you should be able to:

1. Explain the concept of having a positive mental attitude and why it is critical in surviving an aircraft water ditching.

2. Explain the difference between overwater flights and extended overwater flights in accordance with bureau policy.

3. List three important pieces of information that should be discussed in a briefing prior to an overwater flight.

4. Explain the flight situations in which a Personal Floatation Device (PFD) is required to be worn.

5. Explain the conditions under which an anti-exposure suite must be worn according to bureau policy.

6. List three pieces of Aviation Life Support Equipment (ALSE) that are associated with overwater flight activities.

7. Without assistance, verbalize the seven-step emergency egress process as it is delivered in this course.

8. List two methods of determining the direction to the water surface after exiting the aircraft.

9. List two potential hazards that may be encountered on the surface of the water following a water ditching.

10. Demonstrate two group survival techniques which may increase the possibility of survival in a post water ditching scenario.

11. Demonstrate one method of conserving body heat while alone in the water, during a post water ditching scenario.

12. Accurately demonstrate a minimum of three egresses from simulated aircraft water ditching, using the seven-step process.

Module 1: Why Does Preparation Matter?

Notes

Objective

1. Explain the concept of having a positive mental attitude and why it is critical in surviving an aircraft water ditching.

Water ditching is defined as a forced landing of an aircraft on water.

If you fly over water then ditching is a distinct reality. When an inflight emergency occurs we don't often have many options or a great amount of time to react. Our preparation prior to flight could be the only foundation of knowledge we have to overcome a high stress emergency situation.

How far is "overwater"? When it comes to swimming, not very far if you had to make it back to shore. Especially under adverse conditions and in high stress situations.

You have heard that, "Chance favors the prepared mind!" Increasing your chances of survival during a water ditching will be affected by your level of preparedness.

Most fatalities are officially listed as drowning.

Disorientation, unfamiliarity with underwater escape procedures and the lack of personal flotation devices (PFD) contribute to this statistic.

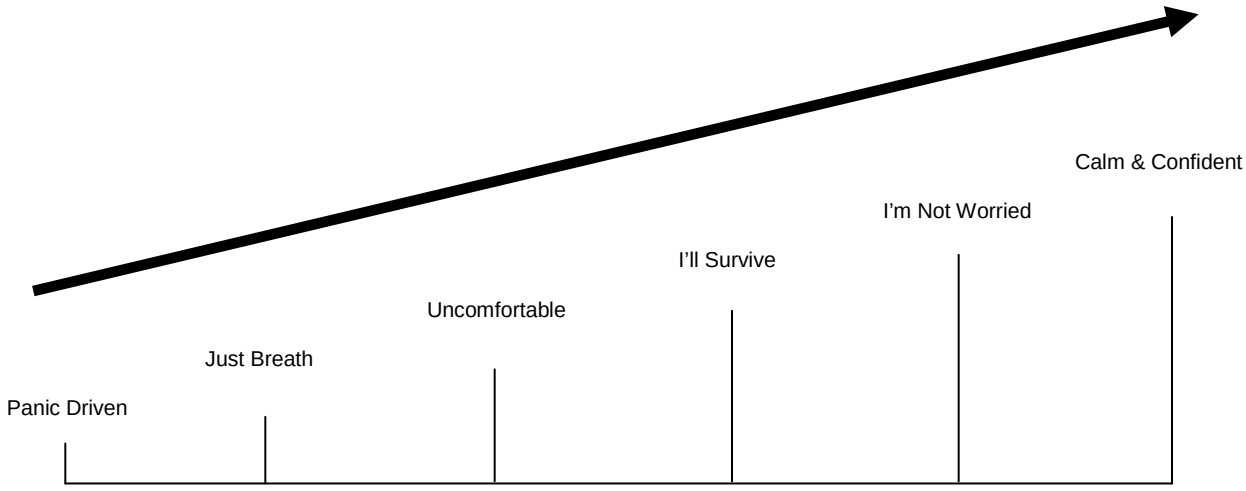
Surviving a Water Ditching is based on your ability to:

Stay Calm, Think Clearly, Remember Your Training

Fear and panic must not be the predominant driving force behind your actions!

"How am I doing?"

Take a few moments to consider how you currently feel when faced with the idea of having to survive a Water Ditching. Look at the graph below and make a mark, based on your current level of comfort with this idea, reflecting where you are.



Survival Depends Upon:

- Protection from incapacitating injury
- Ability to locate and operate emergency exits
- Ability to hold breath and reach the surface with necessary survival equipment

Module 2: Understanding Policy

Notes

Objective

2. Explain the difference between overwater flights and extended overwater flights in accordance with bureau policy.

Interaction/Activity:
Conducting a Mission Over Water

Take 2-3 minutes to list the policy questions that you have concerning overwater flights. Be prepared to share those questions with the group.

Definitions

- Extended Overwater Operations:
  More than 50 nautical miles from shore or suitable landing platform

- Operations Beyond Gliding Distance:
  Beyond the point at which an aircraft that has lost power can safely glide to shore

Personal Flotation Device

- An inflatable PFD must be worn by all occupants in single engine aircraft and made immediately available to all occupants in multiengine aircraft that are operating off of or to water, or that operate beyond gliding distance from shore including water bucket dipping and snorkeling operations.
- Aircraft occupants must wear inflatable PFDs aboard DOI flights when performing water takeoffs or landings (including float and boat-hulled aircraft).
  [Reference – ALSE Handbook Ch2]

Anti-Exposure Suits

- An anti-exposure garment must be worn in single engine aircraft and readily available to occupants of multiengine aircraft when conducting extended overwater flights and when the water temperature is colder than 50° F.
  [Reference – ALSE Handbook Ch2]

Life Raft

- Life Rafts are required for extended overwater operations in accordance with 14 CFR 135.167.
  [Reference – ALSE Handbook Ch4]

Aircraft Floats

- Single-engine helicopters and single-engine airplanes operated beyond power-off gliding distance of shore shall be float-equipped except where established traffic flow requires aircraft to operate beyond gliding distance to shore during takeoffs and landings.
- Multiengine aircraft operated at a weight that will allow it to climb, with the critical engine inoperative, at least 50 feet per minute, at an altitude of 1,000 feet above the surface may be operated over water without floats.
- DOI fleet land aircraft may be repositioned (ferried) with only flight crewmembers on board without the required floats.
  [Reference – 351 DM 2.2.C]

Module 3: Prior to Your Flight

Notes

Objectives

3. List three important pieces of information that should be discussed in a briefing prior to an overwater flight.
4. Explain the flight situations in which a Personal Floatation Device (PFD) is required to be worn.
5. Explain the conditions under which an anti-exposure suite must be worn according to bureau policy.
6. List three pieces of Aviation Life Support Equipment (ALSE) that are associated with overwater flight activities.

Briefings

Pay attention to the briefing, it can save your life!

Know the location of:
- Personal Floatation Device
- Emergency Exits
- Emergency Locator Transmitter
- Life Raft
- First Aid Kit
- Survival Kit
- Fire Extinguisher

Flight Helmets
Chapter 2 of the ALSE Handbook explains when flight helmets are required. Drowning victims frequently receive blows to the head that daze or render them unconscious, thus prevents their escape. By absorbing impact, flight helmets have prevented head injuries to many ditching survivors.

Flight helmets also protect by :
- Offering shielding from the sun
- Retaining heat
- Providing floatation
- Providing eye protection

Make sure you know how to properly don and wear a flight helmet… It has saved lives!

Seatbelts

- Use properly
- Know how to latch and unlatch
- Ensure the belt is positioned in a place where you know to reach for release (typically at your center waist)
- Do not remove until all violent motion has stopped and a reference point has been established
- Remove your belt with the opposite hand from the one holding your reference point

Cargo

- Pilots and passengers can be fatally injured by flying cargo and improperly stowed equipment. They can be hampered in their egress or pinned inside the aircraft by shifting cargo. It is essential that all toolboxes, cargo and equipment be secured before each flight.
- Only those items needed inside the aircraft should be placed in the passenger compartment. All other equipment should be secured in cargo compartments.

Will Egress Be Possible?

Emergency Exits

- Know the location and operation of the Emergency Exits before you take flight.
- Be aware of the exit that is closest to you, however you should consider an alternate in the case this exit is blocked.

Module 4: Seven-Step Crash Egress

Notes

Objective

7. Without assistance, verbalize the Seven-Step emergency egress process as it is delivered in this course.

THE SEVEN-STEP CRASH EGRESS:

1. “I’m a Survivor!”
2. Unplug Helmet
3. Open Door - BRACE
4. Slow 4 Count, Sit Up
5. Locate and Clear Exit – FIND REFERENCE
6. Release Seatbelt and Exit
7. Hand Up, Head Up, Investigate, Inflate

Take a moment to commit them to memory.
You will be expected to have them memorized and be able to state them back in order to the instructors before the dunker exercise.

What are the SEVEN STEPS?

1.

2.

3.

4.

5.

6.

7.

1. "I'm a Survivor!"
Set the stage for a positive attitude. You will survive.

2. Unplug flight helmet/headset mike jack from coil cord, this prevents getting "hung-up" when exiting the aircraft.

3. Prior to contact with the water, open aircraft door and lock open if you are seated next to one, then BRACE!
External water pressure is reduced, making the door easier to open as the aircraft settles or submerges. Most doors are designed such that forward flight will not affect the door when opened. Keep in mind that the door may latch itself again upon impact. If this happens you may have to wait until the water pressure equalizes before being able to open it again.

4. Slowly count to four, sit up from your brace position.
This allows time for all movement of the aircraft to come to a stop, and reduces the risk of you exiting into a potentially dangerous situation.

5. Locate and Clear Exit – Find your REFERENCE POINT.
If you are seated by a door or an emergency exit, LOCATE and OPEN IT. Your reference point would be either the door frame or the exit window, depending on which you are holding. Once you have established your reference point, **DO NOT REMOVE YOUR HAND** until it is safe to leave the aircraft. Be aware that you may need to climb hand over hand from one seat to another to reach an exit. **Never** let go with both hands at once.

This will keep you from becoming disoriented. If you are in another seat, not located by a door or emergency exit, establish a fixed reference point such as a seat back, or console. Do not let go until your departure path is clear.

6. Using your free hand, release your seatbelt – and EXIT. Do not use your hand holding your reference point! Exit the aircraft following your reference hand**,** by moving hand over hand. Do not climb over other occupants in the aircraft. Wait until they are out. This will lessen confusion and actually speed-up the process.

7. Put your HAND UP, your HEAD UP, INVESTIGATE, then lastly, INFLATE your PFD when you reach the surface. Be sure you investigate the area for danger **BEFORE** inflating your PFD. You might have to dive back under the water to move away from a dangerous situation!

Surviving a Water Ditching

Your mind is your best survival tool. ***Fear and Panic must not be the driving force behind your actions.*** Panic is the natural tendency in a situation such as this. **You must make every effort to remain calm and think clearly.**

You must convince yourself that by using your knowledge, common sense, and a logical thought process you can survive the water ditching. Eliminate negative thoughts and images that may detract from your goal to survive.

Familiarity with the aircraft and a thorough understanding of emergency procedures are essential. You must have this knowledge to aid in your exit and survival of a ditching aircraft.

Submersion and Panic

Aircraft have been known to rollover and sink immediately after impact. Many aircraft will float upside down with the cabin sub-merged for short periods of time due to buoyancy provided by the internal fuel cells. With the cabin inverted and underwater, problems of escaping become compounded, and **panic** is more likely to occur.

Not only must pilots and passengers be protected physically from impact forces, but they must also be mentally prepared to cope with the events that rapidly occur in a water ditching situation. To be simultaneously shaken up, turned end-for-end, possibly rolled upside down, and submerged beneath cold on-rushing water can be a great shock for even the most prepared person. The initial reactions of most ditching survivors have been disorientation, confusion and panic.

Survivors experience not only these factors, but they must overcome other problems that may hamper their escape from the aircraft.

Potential problems:

- **On-rushing water.** The most frequently reported single problem, it is the greatest deterrent to escape. It forces cabin occupants into the rear corners of the cabin, sometimes disorienting them so that emergency exits cannot be located in the underwater darkness.
- **Difficulty, to locate and utilize personal flotation devices.**
- **Inability to see.** Because of darkness or murky water.
- **Difficulty reaching an exit.** Hampered by obstructions, injury, aircraft attitude, entangled clothing, survival gear, interphone cords or seat belts.
- **Inability to open emergency exits.**
- **Pinned in the aircraft.**
- **Difficulty releasing seatbelts.**
- **State of consciousness.**
- **Unable to hold breath long enough.**
- **Smoke, fire or spilled fuel.**

Module 5: Survival Post Egress

Notes

Objective

8. List two methods of determining the direction to the water surface.
9. List two potential hazards that may be encountered on the surface of the water following a water ditching.

Interaction/Activity: Reaching the Surface

Take a moment to write down at least three methods you could use to determine the direction you must travel to reach the surface of the water.

_____

_____

_____

_____

Take a moment to write down at least two hazards you may encounter once reaching the surface.

_____

_____

_____

_____

Reaching the Surface

It is very easy to become disoriented during the rolling and sinking of the aircraft. Personnel have frequently escaped from the aircraft and swam downward rather than upward.

Following the air bubbles to the surface will help in maintaining your surface orientation. Remember also that helmets will float to the surface. Inflating your PFD at this point will assist you in reaching the surface, especially if you are injured.

Remember, however, that if hazardous conditions exist at the surface you will need to deflate your PFD to dive back under the water to move away from the danger.

Be aware of the potential for a water surface fire due to a fuel spill. If you find yourself in this situation try to stay beneath the water surface and swim to a point beyond the fire. If you surface into fire attempt to grasp a breath of air using your PFD as a shield, submerse yourself again and swim to a point of safety.

Personal Flotation Devices (PFDs)

If unfamiliar with the use of a PFD, ask the pilot to demonstrate how to inflate it during the pre-flight briefing!

Do not deploy your PFD inside the aircraft. It will restrict your mobility when moving through aircraft doors or windows. It would also be susceptible to puncture by broken Plexiglas and ripped airframe metal.

Once clear of the aircraft activate your PFD by pulling down on the tabs, this will cause the CO2 cartridges to puncture and fill the air cells. If needed, your PFD also has a manual inflation tube, which when blown into will also fill the air cells.

EXPOSURE OR HYPOTHERMIA

If you are not able to get to a raft, the key to survival is to remain calm. From the standpoint of conserving body heat this is the best possible behavior. **Struggling or swimming will cause maximum heat loss due to the flushing action of cold water against the body's critical heat-loss areas**. Also the expenditure of calories produced by strenuous exercise will lessen your endurance.

KEY SURVIVAL POINTS

- A calm body floats better than a tense one.
- 50%-70% of the heat loss of your total body temperature will take place through your head.
- Keeping your head out of the water and the flight helmet on will help minimize this heat loss, as well as provide additional buoyancy.
- The colder the water temperature the more harsh the environment becomes.

WATER TEMPERATURE---SURVIVAL TIME

F. Water Temp.	No Protection Exhaustion Unconsciousness Occurs within	Expected Time of Survival with Floation Device	Expected Time of Survival with Survival Suit
32.5	under 15 min.	15 to 45 min.	18 hours +
32.5 - 40	15 to 30 min.	30 to 90 min.	22 hours +
40 - 50	30 to 60 min.	1 to 3 hours	Indefinite
50 - 60	1 to 2 hours	1 to 6 hours	Indefinite
60 - 70	2 to 7 hours	2 to 40 hours	Indefinite

The cold facts on time and temperature.

Hypothermia Prevention Methods and Equipment Increase Survival Time		
Situation & Predicted Survival Time (Hours) in 50°F Water		
Without flotation device worn:		
	Drown Proofing	**1.5**
	Treading Water	**2**
With personal flotation device (e.g., vest or collar-type PFD):		
	Swimming	**2**
	Holding Still	**2.7**
	H.E.L.P. Position	**4**
	Huddling with Others	**4**
With hypothermia prevention:		
	Flotation Equipment	
	Insulated Flotation Jacket (float coat)	**3 to 9**
	Survival Suit	**Indefinite**

Survival Positions

Notes

H.E.L.P. Position

If you are alone in the water assume the H.E.L.P. (Heat Escape Lessening Posture) position. Draw the knees to the chest, lock hands over knees. This will also help retain critical body heat.

Group Huddle

Survivors should huddle together while afloat in the water. This aids in preventing heat loss and presents a larger target for rescuers to locate.

Signaling for Rescue

There are many signaling devices to help survivors increase their chances of being rescued. Each type of signaling device has a specific design and purpose, as well as definite operating limitations. The wider range of devices you have, the greater your chance of rescue.

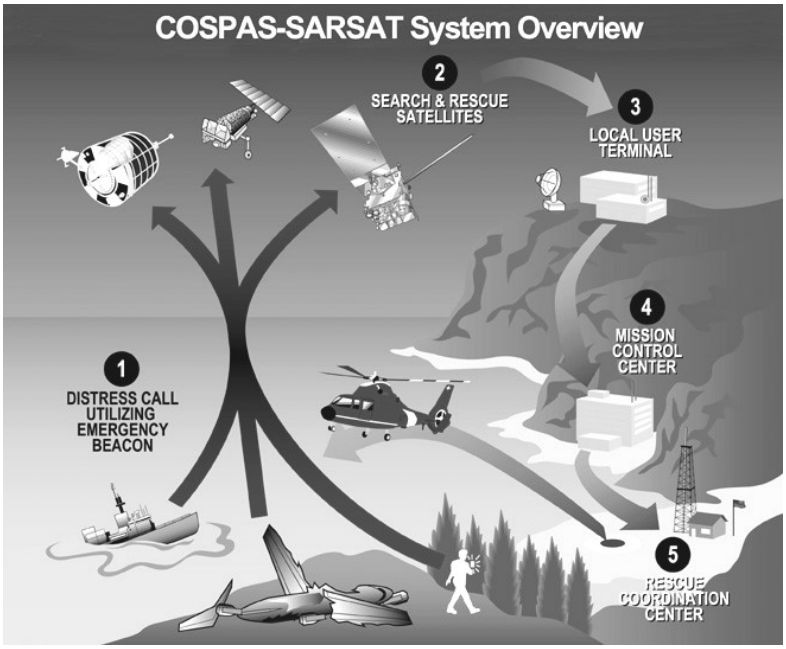
Being able to alert the rescue party of your situation or whereabouts is essential. The chance of being spotted accidentally does not generally occur. The negative effect of heavy swells on the visibility of any floating object in the ocean is well understood by sailors. The chance of an alerted ship or aircraft pinpointing and reaching the position of the raft is slim, unless the survivor can provide a constant signal.

Hand-Held Rocket Flares: These are generally of two types, low altitude with a short bum span and high altitude with a long burn span.

Pen Gun Flares: A 45-caliber cartridge is screwed into the end of the pen gun and fired by a spring-loaded pin. The flare generates a candle power of 4,000 and attains altitudes of 450 to 500 feet and has a burning time of between 5 and 10 seconds.

Pistol Launched Flares: These are generally available in 12 gauge, 25mm, and 37mm. They produce a candle power of 10,000 and have a burning time of between 10 and 30 seconds. They are also referred to as meteor flares, are capable of alerting ships from as far away as 20 miles and aircraft at around 10 miles depending on atmospheric conditions.

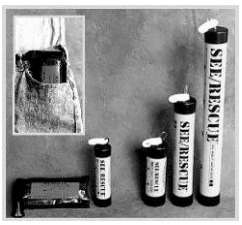
EPIRB (Emergency Position Indicating Radio Beacon) is a modified version of the aviation ELT (Emergency Locator Transmitter). It is usually equipped with both a manual and a salt water activating system. This self-contained, battery-operated unit transmits an inaudible, electric oscillating or "swept" tone. The beacon is capable of transmitting a continuous distress signal 24 hours a day for the life of the batteries. The important benefit of an EPIRB is that the survivor need not be awake or be able to see the rescue vessel in order to alert it.



Search and Rescue Satellites: The latest in search and rescue technology is a satellite system called SARSAT (Search and Rescue Satellite). These satellites are equipped with special receivers that are tuned to standard international distress frequencies. Orbiting, these satellites are capable of receiving and pinpointing transmissions almost anywhere on earth.

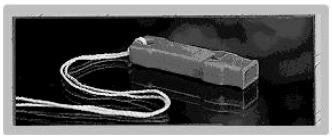
***** Once Activated EPIRBs or ELTs Should Be Left On Continuously *****

Signaling Devices: Capabilities and Limitations

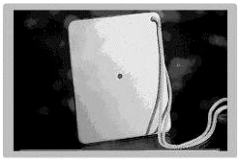


Daytime Smoke Flares: Use only if you know aircraft or ships are in the area. These flares are adversely affected by poor visibility. They are difficult for rescue personnel to see if they must look into the sun. They are also limited by relatively short bum times.

Lights (strobe, flash): These are effective only at night and have a limited battery life; carry extra batteries.



Whistle or Horn: Your position relative to the wind direction and the rescue vessel will influence their effectiveness. The most obvious limitation of a whistle or horn is distance.



Signal Mirror: There must be a workable angle between the sun and your mirror, and the sun and the rescue craft. Mirrors have proven effective at 10 miles plus. (Limited to daytime and sunny skies.)

Dyes: Dyes are visible in the water at relatively close range only, one mile or less. Dye can best be seen by aircraft flying at higher altitudes, but have limited visibility at sea level from boats. Also, it will dissipate quickly in rough seas.

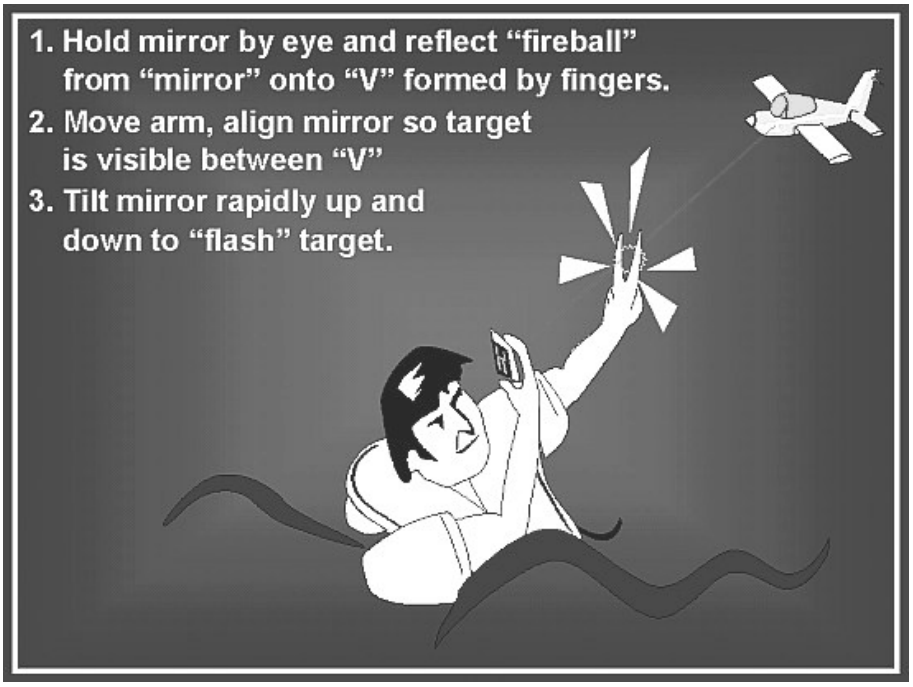
Survival Post Egress

Aerial Flares: Very effective at night or close range in daylight. These can be difficult to see against bright sunlight.

Rescue Lasers: Rescue lasers can be waterproof and have a long battery life. Used similarly to a signal mirror, it can be seen up to 3 miles away during daylight and up to 20 miles away at night.

By illustrating the multiple capabilities of signaling devices, and more importantly their individual limitations, the necessity of having a variety of devices should be apparent.

Proper method for utilizing a signal mirror or rescue laser:



Raft Deployment and Use

1. Start exiting as soon as the rotors or props have come to a full stop.

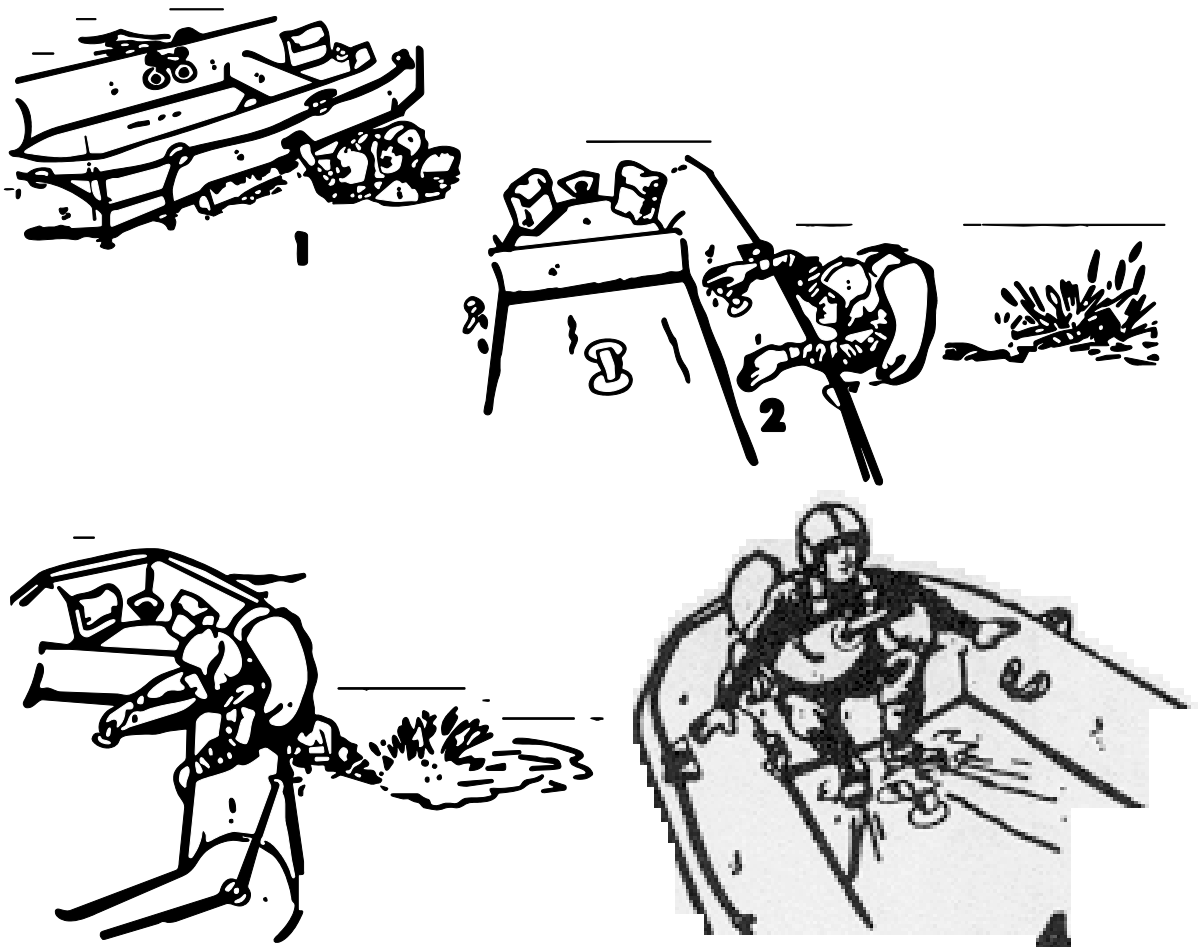
2. When deploying a life raft, maintain control of the lanyard, but do not secure the lanyard permanently to the aircraft (in case the aircraft sinks the raft will also).

3. Deploy the raft into the wind. This will cause the raft to stay in proximity of the aircraft, making entry much easier (must be careful not to puncture raft on sharp edges of aircraft).

4. ***Your PFD'S should be inflated prior to the transition*** between the aircraft and the raft.

In calm seas entry into the raft can be done directly from the aircraft. In rougher seas this is more difficult to accomplish, and entry into the water first is usually necessary. Enter the raft as quickly as possible in order to reduce the risk of hypothermia.

Make sure you are familiar with the raft onboard your aircraft.



Module 6: Egress Practical Exercises

Notes

Objective

10. Demonstrate two group survival techniques which may increase the possibility of survival in a post water ditching scenario.

11. Demonstrate one method of conserving body heat while in the water, during a post water ditching scenario.

12. Accurately demonstrate a minimum of three egresses from simulated aircraft water ditching, using the seven-step process.

Emergency Response Procedures Briefing

- EMS Contact Method
- Designate WHO will contact EMS
- Identify any First Responders/EMTs
- Identify and locate emergency equipment
- Locate entry routes for emergency services
- Assembly and evacuation routes
- Discuss and assign positions for exercises
- Emergency procedures demonstration

Summary

You should now be able to accomplish the objectives for this course. If you have any remaining questions regarding them, ask the instructor for clarification at this time.

Objectives

At the conclusion of this course, you should be able to:

1. Explain the concept of having a positive mental attitude and why it is critical in surviving an aircraft water ditching.

2. Explain the difference between overwater flights and extended overwater flights in accordance with bureau policy.

3. List three important pieces of information that should be discussed in a briefing prior to an overwater flight.

4. Explain the flight situations in which a Personal Floatation Device (PFD) is required to be worn.

5. Explain the conditions under which an anti-exposure suite must be worn according to bureau policy.

6. List three pieces of Aviation Life Support Equipment (ALSE) that are associated with overwater flight activities.

7. Without assistance, verbalize the seven-step emergency egress process as it is delivered in this course.

8. List two methods of determining the direction to the water surface after exiting the aircraft.

9. List two potential hazards that may be encountered on the surface of the water following a water ditching.

10. Demonstrate two group survival techniques which may increase the possibility of survival in a post water ditching scenario.

11. Demonstrate one method of conserving body heat while alone in the water, during a post water ditching scenario.

12. Accurately demonstrate a minimum of three egresses from simulated aircraft water ditching, using the seven-step process.

Evaluation

Please be sure to complete and submit the Course Evaluation Form OAS-111 provided by the instructor.

Appendix A: Resources and References

Books/Articles

ALSE Interagency Guide (Former ALSE Handbook)

Motley, Elizabeth. *Survival Stressors Faced by Military Aviators/Aircrew Following Ditching Over Salt Water.* Naval Air Warfare Center.

Brooks, Dr. C.J. *The Human Factors of Surviving a Helicopter Ditching.* Survival Systems LTD.

Fatal and Serious Injury Accidents in Alaska: A Retrospective of the years 2004 through 2009 with Special Emphasis on Post Crash Survival. Federal Aviation Administration, Aviation Safety Alaskan Region. December 2010.

A Safety Study of Survivability in Seaplane Accidents, Report Number Sa9401. Transport Safety Board of Canada. 1994.

Appendix B: *Transport Canada* Article

Transport Canada Transports Canada

Canada

Underwater Egress — Revisited

The following accident represents a nightmare for all pilots (what accident doesn't?), but particularly for seaplane pilots. It was the subject of "Learning From Others," an excellent letter from a reader in *Aviation Safety Letter* 2/97, but the recent release of Transportation Safety Board (TSB) Final Report A96Q0114 gave us no alternative but to highlight this tragic accident before the summer of 1998 arrives. We will also address specific issues relating to the aft emergency exit on the Cessna 206 series floatplane and emergency egress from an inverted, water-filled aircraft. The following has been condensed from information contained in the TSB Final Report, which is available on the TSB's Web site http://www.tsb.gc.ca/.

On July 20, 1996, the float-equipped Cessna U206F with six persons on board started its takeoff run on Rivière des Prairies, Quebec, on a water surface agitated by strong crosswinds from the right. The aircraft lifted out of the water at very low speed, travelled about 1000 ft. before taking off, and fell back on the water in a pronounced nose-up attitude. The pilot continued with the takeoff, and the aircraft lifted out of the water a second time. The left wing then struck the surface of the water, the left float dug into the water, and the aircraft capsized. The pilot told the passengers to unfasten their seatbelts as the aircraft rapidly filled with water. He then went toward the rear to try to open the two cargo doors to let the occupants out. A witness immediately proceeded to the site to assist the occupants. He opened the left front door, and the female passenger and her child evacuated the seaplane. As they had no life jackets, these two persons clung to the floats until the other rescuers arrived. The first firefighters and police officers arrived at the site about 15 min after the accident. The pilot and the other three passengers had drowned inside the aircraft.

The TSB determined that the pilot had been unable to maintain control of the aircraft, which was equipped with Robertson and Flint Aero kits, during a takeoff with 20° of flap in strong crosswind conditions. It also determined that the distribution of the passengers and the complexity of opening the leaves of the rear cargo door with the flaps extended to 20° contributed to the difficulty of the evacuation. There are several issues worth looking into here, but we will limit our discussion to two main areas: (1) the pilot's decision-making process before

and during the short flight, and (2) the aft emergency exit of the Cessna 206 and emergency egress from a water-filled, inverted aircraft.

The facts as provided in the TSB Report would lead many to question why this flight was attempted. Unfortunately, we will never know for sure what led the pilot to go ahead with it. Some would postpone a pleasure flight in a seaplane with three children on board when faced with strong crosswinds and agitated waves, but it often becomes a personal judgement call; it can be assumed that other experienced seaplane pilots might also have decided that the conditions at the time were acceptable. In any event, the pilot was obviously confident in his ability to handle the crosswind; perhaps the fact that the aircraft was equipped with a short takeoff and landing kit and auxiliary wing-tip tank kit, which increase lift and reduce the stall speed of the aircraft, reinforced his confidence.

The second question mark arises from the fact that, during the initial takeoff, the aircraft fell back on the water in a pronounced nose-up attitude, but the pilot decided to continue with the takeoff. The only answers to these questions reside in the complex world of human factors, as they apply to the pilot's own motivations and self-imposed pressures to go ahead with the flight. As stated in the ASL 2/97 article, remember this particular occurrence the next time that you are faced with similar circumstances.

Emergency Exit

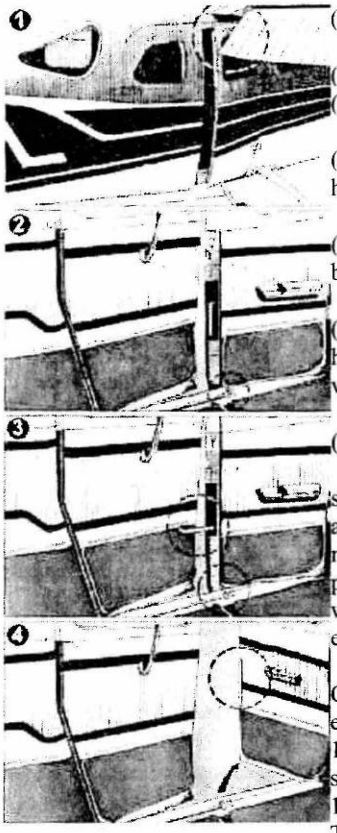
A second fatal accident in less than 12 months brought the issue of the Cessna 206 emergency exit to the forefront. On June 1, 1997, a U.S.-registered float-equipped Cessna 206 had a similar accident at Carroll Lake, Ontario, when the aircraft nosed over in the water, and two passengers were unable to evacuate the aircraft and drowned (TSB A97C0090). In this particular case, the pilot had left the wheels down when he touched down on the water.

The Cessna 206 is equipped with a double cargo door on the right rear side that doubles as an emergency exit. When the flaps are extended to 20°, the forward leaf of the cargo door can open only about 8 cm, and this makes it difficult to fully open the aft leaf of the cargo door. The emergency-exit instructions found in the owner's manual say that, if it is necessary to use the cargo doors as an emergency exit and the wing flaps are extended, the doors are to be opened in accordance with the instructions shown on the red placard mounted on the forward cargo door. According to the TSB Final Report, the instructions found on the placard of the accident aircraft were as follows:

Emergency exit operation:

1. Rotate forward cargodoor handle full forward then full aft.
2. Open forward cargo door as far as possible.
3. Rotate red lever in rear cargo door forward.
4. Force rear cargo door full open.

In ASL 7/90, as a result of a safety information letter from the Canadian Aviation Safety Board, we showed the correct procedure for opening the doors with the flaps down. The procedure is repeated below, along with the original graphic, which clearly illustrates the difficulty:



(a) unlatch the forward cargo door;

(b) open the forward cargo door as much as possible (about 3 in.) (figures 1 and 2);

(c) unlatch the rear cargo door by pulling down on the red handle (figure 2);

(d) partially open the rear door until the door latch at the base of the door is clear of the floor (figure 3);

(e) close the rear cargo door latch by placing the red handle into the well in the door jamb (the locking pins will now be extended, but clear of the fuselage); and

(f) push open the rear cargo door (figure 4).

This sequence shows that the placard leaves out some of the above steps. Now this procedure is quite demanding for most people under normal circumstances. Picture the process in the dark, in an inverted airplane, in rushing water and with two or three distressed passengers trying to escape.

The Cessna 206 emergency-exit issue has been addressed extensively in the past by, among others, the TSB in 1985 and 1989; the ASL 7/90 article referred to above; Cessna service bulletin (SB) SEB91-04, issued on March 22, 1991; and many letters exchanged among the industry, Transport Canada (TC), the TSB and the Federal Aviation Administration (FAA) since the last two fatal accidents. In addition, you — the owners, operators and associations — are well aware of the problem. Although the SB simplifies somewhat the steps required to open the double aft cargo door, the procedure does not eliminate the jamming of the forward cargo door against the flaps when they are lowered. TC clearly stated to the FAA its position that, even with the modification, when the flaps are down, the Cessna 206 emergency exit procedure remains a multistep procedure that can be difficult to execute under emergency conditions.

Following the Carroll Lake occurrence, TC reiterated its concerns to the FAA, and, in its November 1997 reply, the FAA said that new series 206H and T206H would incorporate the provisions of SEB91-04. The FAA also said that, if TC were to issue an airworthiness directive (AD) against 206 series airplanes, the FAA would examine it for possible similar action in the United States. However, owing to the proportionally wider use of floatplanes in Canada than in the United States, the FAA could not say at that time whether an AD with the same intent would be supported by the evidence available from its U.S. databases.

Meanwhile, on November 16, 1997, TC issued Service Difficulty Alert AL-97-04, which strongly recommends that owners and operators of all Cessna 206, U206 and TU206 aircraft

incorporate SB SEB91-04; instruct flight crews to brief passengers and demonstrate the steps necessary to open the exit when flaps are lowered; and ensure that flight crews periodically practice the procedure for opening the emergency exit from outside the aircraft when the flaps are down. It also recommends that there be a maximum of four occupants in the aircraft when waterborne operations are being conducted.

At this time, there is no modification available that completely resolves the emergency-exit issue. Discussions are still ongoing among TC, the FAA and the industry about the possibility of AD action.

Underwater Egress

The TSB's final report refers to a study relating to escape and survival from a ditched aircraft. It states that the rotation of the body underwater and loss of gravitational reference makes disorientation inevitable for survivors prior to their escape from an inverted aircraft. In addition, the darkness produced by water flooding into the aircraft aggravates the disorientation. Survivors who were questioned in this study reported having experienced confusion, panic and disorientation in the occurrences. The study concludes that only those who have experienced disorientation in an underwater trainer understand the problem and know how to deal with it to get out and survive.

Having personally experienced an underwater escape trainer twice, I can attest to the fact that the above statements reflect the reality of an underwater egress situation, except that, in the trainer, you expect the situation to arise (there is no surprise effect); you have a plan or escape route in your mind (or at least you think that you do...); and you are in a clean pool with safety scuba divers. Not so in the real world. Nevertheless, underwater egress training is invaluable for any pilot who flies regularly over water, regardless of the type of aircraft flown. As a matter of fact, passengers or non-pilot crews who also fly regularly over water should consider underwater escape training. Once you have had the training, you will also be in a better position to brief your passengers about what to expect... should the unexpected occur.

Finally, ASL 2/95 featured "Seaplane Accident Survival" as its lead article, and it contained excellent information on this subject. If you do not have a copy of that article, we will be pleased to send you one upon request.