Factual Report – Attachment 24

Liberty Training Manual (extracts)

OPERATIONAL FACTORS

ERA18MA099

CURRICULUM: TRANSITION / DIFFERENCE PIC - (Single-engine – Turbine-powered)

AIRCRAFT: (Eurocopter AS350 Series, Single-engine – turbine)

OBJECTIVE: To provide the pilot in command with adequate training to enable him/her to understand the aircraft systems, performance parameters, emergency procedures, and emergency drills.

PREREQUISITES: Commercial pilot, certificate, rotorcraft, helicopter and meets the requirements of 14 CFR Part 135.243(b) minimum hourly requirements, or ATP. Must be current in Eurocopter single-engine series helicopter.

TRAINING AIDS: Refer to individual curriculum segments.

TRAINING HOURS: 2.5

COMPLETION STANDARDS: Refer to qualification segment.

APPLICABLE CURRICULUM SEGMENTS:

	Hours
A. AIRCRAFT GROUND	2[5,6] (All AS 350 Series)
B. AIRCRAFT FLIGHT	.5 (AS 350 B2)
	.5 (AS 350 B1)
	.5 (AS 350 BA)
	.5 (EC 130 B4)
	.5 (AS 350 B3)

[5] Approved CTS Training can be substituted for ground school training.

[6] A new pilot with over 500 hours in the aircraft to be 135 checked may reduce the "Aircraft New Hire" ground training by 50%.

CURRICULUM SEGMENT: GENERAL EMERGENCY (HELICOPTER SINGLE AND TWIN ENGINE TURBINE)

OBJECTIVE:	To familiarize pilots with emergencies of a general nature.
INSTRUCTIONAL DELIVERY METHOD:	Platform Instruction, CTS, Lecture, VCR, Etc.
TRAINING AIDS:	Computer with internet access; white-board; VCR, overhead projector, appropriate aircraft, retired parts, aircraft photos/diagrams, systems' diagrams, and airport marking diagrams.
COURSEWARE:	LHI Operations Manual, FAR's/AIM, advisory circulars-aviation weather, excerpts of appropriate advisory circulars, advisory circular-aviation weather services
TRAINING HOURS:	2 hours
TESTING/CHECKING:	Written examination, or oral examination with instructor certification

***NOTE**: The Emergency Training modules that are part of the recurrent General Emergency Training curriculum segment and are identified by an asterisk (*).

EMERGENCY SITUATION TRAINING

A: FLIGHT CREWMEMBER DUTIES AND RESPONSIBILITIES

1. Emergency assignments
2. Captain's emergency authority
3. Reporting incidents and accidents

B: CREW COORDINATION AND COMPANY COMMUNICATIONS

1. Ground agency notification procedures
2. Company communications procedures

*C: AIRCRAFT FIRES

1. Principles of combustion and classes of fires
2. Toxic fumes and chemical irritants
3. Use of appropriate hand-held extinguishers

*D: FIRST AID EQUIPMENT

1. Contents of first aid kit
2. Requirements for first aid kit integrity
3. Use of individual items

*E: ILLNESS, INJURY AND BASIC FIRST AID

1. Principles of CPR
2. Ear and sinus blocks
3. Seeking medical assistance

4. Treatment of shock
5. Heart attack and pregnancy situations

***F: GROUND EVACUATION (Non aircraft specific)**

1. Aircraft configuration
2. Directing passenger flow
3. Blocked or jammed exit procedures
4. Fuel spills and other ground hazards
5. Handicapped persons

***G: DITCHING (Non aircraft specific)**

1. Cockpit and cabin preparation
2. Passenger briefing
3. Crew coordination
4. Primary swells, secondary swells, and sea conditions
5. Appropriate (or recommended) heading and water landings
6. Ditching at night and the hazards of being in the water at night.
7. Procedures for the type and model. (aircraft with floats are exempted.)

NOTE: Ditching will not be demonstrated or practiced because of damage to equipment

H: PREVIOUS AIRCRAFT ACCIDENTS/INCIDENTS

1. NTSB accident report reviews
2. Human factors/considerations
3. NASA reporting system

I: CREWMEMBER INCAPACITATION

1. Company procedures
2. Reporting requirements (NTSB)
3. Interference with crewmembers

J: HIJACKING AND OTHER UNUSUAL SITUATIONS

1. Hijack procedures
2. Bomb threat procedures
3. Security coordinator responsibilities
4. Inflight-intercept signals and procedures

EMERGENCY DRILL TRAINING

***A: HAND HELD HALON FIRE EXTINGUISHERS**

1. Inspection tags, dates, and proper charge levels
2. Removal and storage of extinguishers
3. Actual discharge of extinguisher
4. Maintenance procedures and MEL

***B: EMERGENCY DOOR JETTISON (AS350, 355 SERIES, 365N2,EC120B and SK76)**

1. On ground actual jettison of one door.

2. Ground instruction on removal of emergency passenger window and cabin door (AS365N2 and SK76 only)

***C: DITCHING EQUIPMENT**

1. Actual donning and use of individual life vests.

*** Note 1:** The emergency drill training modules, which require the crewmember to actually operate the items of emergency equipment (hands-on), must be conducted initially and at least every 24 months. During the alternate 12-month periods, the emergency drill training may be accomplished by demonstration.

D. Attempts to identify nearest prominent landmark(s)

E. Uses available navigation aids and/or contacts an appropriate facility for assistance

F. Plans a precautionary landing if deteriorating weather and/or fuel exhaustion is impending

EMERGENCY OPERATIONS

J.45 POWER FAILURE AT A HOVER

REFERENCES: AC 61-13; Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to power failure at a hover

B. Determines that the terrain below the aircraft is suitable for a safe touchdown

C. Performs autorotation from a stationary or forward hover into the wind at recommended altitude, and RPM, while maintaining established heading, ±5°

D. Touches down with minimum sideward movement, and no rearward movement

E. Exhibits orientation, division of attention, and proper planning

J.46 POWER FAILURE AT ALTITUDE

REFERENCES: AC 61-13; Helicopter Flight Manual.

NOTE: Simulated power failure at altitude shall be given over areas where actual touchdowns can safely be completed in the event of an actual powerplant failure.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to power failure at altitude

B. Establishes an autorotation and selects a suitable landing area

C. Establishes proper aircraft trim and autorotation airspeed, ±5 knots

D. Maintains rotor RPM within normal limits

E. Compensates for windspeed and direction as necessary to avoid undershooting or overshooting the selected landing area

F. Terminates approach with a power recovery at a safe altitude when directed by the examiner

J.47 SYSTEMS AND EQUIPMENT MALFUNCTIONS

REFERENCES: AC 61-13; Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to causes, indications, and pilot actions for various systems and equipment malfunctions.

B. Analyzes the situation and takes action, appropriate to the helicopter used for the practical test, in at least four of the following areas:

1. Engine/oil and fuel.
2. Hydraulic, if applicable.
3. Electrical.
4. Induction icing.
5. Smoke and/or fire.
6. Flight control/trim.
7. Pitot static/vacuum and associated flight instruments, if applicable.
8. Rotor and/or antitorque.
9. Various frequency vibrations and the possible components that may be affected.
10. Any other emergency unique to the helicopter flown.

J.48 SETTLING-WITH-POWER

REFERENCES: AC 61-13; Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to settling-with-power.

B. Selects an altitude that will allow recovery to be completed no less than 1,000 feet (300 meters) AGL or, if applicable, the manufacturer's recommended altitude, whichever is higher.

C. Promptly recognizes and announces the onset of settling-with power.

D. Utilizes the appropriate recovery procedure.

J.49 LOW ROTOR RPM RECOVERY

REFERENCES: AC 61-13; Appropriate Manufacturer's Safety Notices; Helicopter Flight Manual.

NOTE: The examiner may test the applicant orally on this TASK if helicopter used for the practical test has a governor that cannot be disabled.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to low rotor RPM recovery, including the combination of conditions that are likely to lead to this situation

B. Detects the development of low rotor RPM and initiates prompt corrective action

C. Utilizes the appropriate recovery procedure

J.50 DYNAMIC ROLLOVER

REFERENCES: AC 61-13, AC 90-87; Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to the aerodynamics of dynamic rollover

B. Understands the interaction between the antitorque thrust, crosswind, slope, CG, cyclic and collective pitch control in contributing to dynamic rollover

C. Explains preventive flight technique during takeoffs, landings, and slope operations

J.51 GROUND RESONANCE

REFERENCES: AC 61-13; Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to a fully articulated rotor system and the aerodynamics of ground resonance

B. Understands the conditions that contribute to ground resonance

C. Explains preventive flight technique during takeoffs and landings

J.52 LOW G CONDITIONS

REFERENCE: Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to low G conditions

B. Understands and recognizes the situations that contribute to low G conditions

C. Explains proper recovery procedures

J.53 EMERGENCY EQUIPMENT AND SURVIVAL GEAR

REFERENCE: Helicopter Flight Manual.

Objective: To determine that the applicant:

A. Exhibits knowledge of the elements related to emergency equipment appropriate to the helicopter used for the practical test by describing:

1. Purpose of such equipment
2. Location in the helicopter
3. Method of operation
4. Servicing requirements
5. Method of safe storage

B. Exhibits knowledge of the elements related to survival gear by describing:

1. Survival gear appropriate for operation in various climatological and topographical environments
2. Location in the helicopter
3. Method of operation
4. Servicing requirements
5. Method of safe storage

a. When landing on a slope, the airman must return the cyclic control stick to neutral before final fully lowering the collective pitch.

2. Dolly Landing:

a. Care should be exercised to ensure proper directional control as the helicopter becomes heavy on the skids. From a stabilized hover away from the dolly, the aircraft should be laterally hover-taxied over the dolly. This lateral-hover taxi is acceptable provided these risks are assessed:

i. Engine failure immediately after clearing the dolly and the possibility of rolling over due to the landing gear contacting any part of the dolly;

ii. Engine failure immediately after clearing the dolly and the possibility of the tail boom/tail rotor striking the dolly

I. After Landing:

1. Switch off all the unnecessary power-consuming systems and wait 30 seconds until temperatures have stabilized. Hold the N_G corresponding to full low pitch (flight idle) or reduce Ng to 67 to 70 % by retarding the fuel flow control. Switch off the generator, fuel pump(s) and all other consumer circuits. Shut down the engine by setting the fuel flow control to the shutdown position. If the rotor brake is to be used, fully apply it when the rotor speed is between 170 and 14o N_R. It is suggested that the higher limit only be used for shutdown in high winds. After the rotor has stopped, press the "HYD TEST" push-button and leave it in for 1-2 seconds to depressurize the hydraulic accumulator and re-center the yaw pedals, if required.

K-1.2 AS350 Emergency Maneuvers

A. Introduction:

1. The procedures referenced in these maneuvers deal with the common types of emergencies, however, the actions taken in each actual emergency must relate to the complete situation.

2. There is common phraseology used to reflect the degree of urgency in which the airman must react during unusual situations and is reflected as follows:

a. Land (or ditch) immediately: This means that further flight is more dangerous to passengers, crew, and aircraft than making an immediate landing. It means what it means, LAND!

b. Land as soon as possible: This means the airman should land at the nearest site at which a safe landing may be made. To continue flight, although possible, would subject the passengers, crew, and aircraft to an unacceptable risk factor.

c. Land as soon as practical: This means that extended flight in not recommended; however, the degree of urgency now rests with the airman considering such things as weather, surface conditions, health and welfare of the passengers, crew and aircraft. The airman should consider the justification for continuing flight should another situation arise during the continued duration of flight.

B. Autorotation landing procedure following Engine Failure

1. Reduce collective pitch and monitor and control N_R (rotor speed).with collective while establishing the optimum autorotative airspeed of 65 KTS. Confirm actual engine failure

by checking T_4 and that the generator is inoperative; then move the fuel flow control to the shutdown position.

2. According to the cause of the loss of the engine:
   a. Re-light the engine if the aircraft is at or below 13,000 feet; however, a re-light may, and should be attempted throughout the envelope time and situation permitting.
      i. During an en flight re-light, ensure the booster pump(s) are turned on, the generator is turned on and wait until N_G (gas producer) falls below 30% before attempting a normal starting procedure. In order to avoid any jerk on re-synchronization, accelerate the engine progressively, when N_2 (free turbine) speed approaches N_R (rotor speed

      NOTE: This procedure may be too complex to be attempted given altitude or airman workload at the time of engine loss.

   b. If re-lighting the engine is not a consideration, close the fuel shut-off valve and switch off the fuel booster pump and generator; and, if installed--the alternator. If there is a smell of electrical burning; switch off all electrical power by pushing the "All Off" electrical master switch.
3. Maneuver to bring the helicopter as close as possible into the wind and at a height of approximately 65 feet AGL, flare to a nose-up attitude. At a height of 20-25 feet, and at a constant attitude, gradually apply collective pitch to reduce the sink-rate. Just prior to touchdown, level the helicopter to a landing attitude and cancel any side-slip tendency using the anti-torque pedals. Maintain a slow sink-rate with collective and cushion the touchdown with remaining collective pitch
4. Upon touchdown, hold collective stationary until termination of ground run. The surface condition shall determine the amount of ground run appropriate to the landing. Maintain heading with pedals, Level with the cyclic to prevent the skids from digging in and when forward motion stops, slowly lower the collective.

   NOTE: It is possible that the tail skid may touch the ground first.

C. Landing after Engine Failure in Hover I.G.E.

1. Do not reduce collective pitch and control yaw with pedals. Cushion the touch-down by increasing collective pitch. Once the aircraft is on the ground, reduce the collective pitch.

D. Landing after Engine Failure in Hover O.G.E.

1. Immediately reduce collective pitch and apply forward cyclic pitch to gain air speed according to available height (approximately 65 knots airspeed) and time permitting move the fuel flow control to the shutdown position. Consider attempting re-lighting the engine according to the procedure outlined in K-1.2 G and control yaw with pedals. Cushion the touch-down by increasing collective pitch. Once the aircraft is on the ground, reduce the collective pitch.

E. Autorotation landing Training Procedure

1. Reduce collective pitch to establish autorotation configuration. Monitor and control N_R (rotor speed) with collective. During final approach, shut down the engine, or reduce power, maintaining the N_G above 67%. After touch-down, still at low collective pitch, apply normal starting procedure.

F. Flame-out in Flight:

1. The symptoms of an engine flam-out in flight are a jerk in the yaw axis (only in high-power flight) with a corresponding drop in rotor speed (aural warning sounds below 360 rpm). The torque will indicate zero and the N_G will also begin falling off to zero. Both the generator warning light and oil pressure drop warning light will illuminate.
2. The pilot must make a decided decision to establish autorotative flight at approximately 65 knots airspeed in a suitable direction and follow the procedure for autorotative flight

G. Relighting the Engine in Flight:

1. The normal relighting ceiling is 13,000 feet, but relighting may be attempted throughout the altitude envelope.
2. When attempting relighting, turn the booster pump and generator on. Wait until the N_G falls below 30% then start the engine normally. Once the engine is running reduce the rate of engine acceleration above 70% to avoid backlash on synchronization.

H. Governor Failure:

1. Large drop in fuel flow rate (Low-side failure):
   a. The symptoms are the same as for complete engine failure but after a few seconds, the N_G stabilizes at a low r.p.m. value (less than 70%.
   b. The pilot must initiate an autorotation! Obtain 65 kts I.A.S., then advance the Fuel Flow control (FFC) lever into the emergency sector and control the engine speed at 70% N_G. ($N_G$and T_4 should rise).
   c. If necessary, increase collective pitch to bring rotor speed to 350 r.p.m. Continue increasing fuel flow until rotor speed is approximately 380 r.p.m and trim collective pitch and fuel flow to hold level flight at this rotor speed.
2. Excessive fuel flow rate (High-side failure):
   a. The symptoms of a high-side-governor failure are an increase in N_G, T_4, torque and rotor r.p.m. The pilot should NOT reduce collective pitch in this situation!
   b. While maintaining collective pitch, the pilot should retard the FFC lever, manually reducing fuel flow capability until rotor speed corresponds to a position of the indicator pointer in the center of the N_R green area.
   c. The pilot must closely monitor the N_R, since any reduction in collective pitch form its original position will result in increased rotor r.p.m., which must be counteracted by adjustment of the FFC lever. Likewise, increasing collective pitch will result in lower N_R which will require repositioning of the FFC lever to maintain the indicator pointer in the center of the N_R green area.
3. In both cases mentioned above, upon turning final, the pilot should establish a low gradient approach path at 65 kts while holding rotor speed at the upper limit of the N_R green area (394 rotor r.p.m.) using the FFC lever.
4. At reaching a point where a deceleration will enable the pilot to stay outside the "Airspeed/height envelope" and touchdown in a safe area the pilot should place the helicopter in a landing attitude with touchdown speed slightly above translational lift.

Y. DITCHING (With Emergency Floatation Gear)
Ref. AFM. /W Liberty Helicopters Emergency Procedures.

In the event of an engine failure or other need for ditching, check rotor r.p.m. and apply the following procedure.

1. Arm the emergency flotation gear.
2. Fire the floatation gear (Recommended maximum firing speed 80kts)
3. Complete the autorotation procedure as described in the basic Manual.
4. Touch down speed must be below 10kts.
5. Alight broadside-on to the sea: Avoid ramming of the nose of the floats on touch down.
6. If aircraft is afloat, evacuate when emergency help arrives
7. If aircraft is sinking, release the seatbelts when the cabin is submerged. Evacuate the aircraft and then inflate the life vests.

Note: Inflation of emergency floatation gear reduces the rotor speed by 20 rpm in autorotation descent

IMPORTANT NOTE: WHEN THE HELICOPTER IS AFLOAT. THE FORWARD DOORS MUST BE OPENED BY ACTUATING THE JETTISON CONTROL