ENSTROM HELICOPTER CORPORATION

EASA European Aviation Safety Agency

EASA Operational Suitability Data (OSD)
Flight Crew Data
F-28F, F-28F-R & 280FX
Enstrom Report 28-DO-376
Revision No. A
February 24, 2016

Revision Record

Revision No.	Content	Page No.	Date	EASA Approval
Original	F-28F & 280FX OSD Report	All	December 1, 2015	10056013
A	Added Enstrom Model F-28F-R	1-3, 7-8, 11-15	February 24, 2016	10057140

Contents

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Acronyms

AMC	Acceptable Means of Compliance
ATR	Additional Type Rating
EASA	European Aviation Safety Agency
CHKG/CURR	Checking/Currency
FCD	Flight Crew Data
FCL	Flight Crew Licensing
FFS	Full Flight Simulator
FLT CHAR	Flight Characteristics
FLT CHK	Flight Checking
FSTD	Flight Simulation Training Device
FTD	Flight Training Device
IFR	Instrument Flight Rules
ITR	Initial Type Rating
MDR	Master Difference Requirement
MPH	Miles Per Hour
MTOW	Maximum Take-off Weight
ODR	Operator Difference Requirement
OEB	Operational Evaluation Board
OSD	Operational Suitability Data
PROC CHG	Procedural Changes
REC EXP	Recent Experience
RPM	Revolution Per Minute
SEP	Single Engine Piston
SET	Single Engine Turbine
SPH	Single-Pilot Helicopter
SU	Stand Up Instruction
TASE	Training Areas of Special Emphasis
VFR	Visual Flight Rules
VNE	Velocity Never Exceed

Part-ARA	Annex VI to Commission Regulation (EU) No 290/2012 of 30 March 2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)
Part-ARO	Annex II to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)
Part-CAT	Annex IV to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)
Part-FCL	Annex I to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)
Part-ORA	Annex VII to Commission Regulation (EU) No 290/2012 of 30 March 2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)
Part-ORO	Annex III to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)
Part-SPA	Annex V to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

1. Purpose and Applicability

Data is being submitted by Enstrom Helicopter Corporation to establish OSD FCD for the Enstrom F-28F, Enstrom F-28F-R, and Enstrom 280FX models. Data comparing the models is included in the report.

2. Preamble

Where references are made to requirements and where extracts of reference text is provided, these are at the amendment state at the date of evaluation or publication of this document. Users should take account of subsequent amendments to any references, in particular concerning requirements for civil aviation aircrew and air operations.

Determinations made in this document are based on the evaluation of a specific aircraft model, equipped in a given configuration and in accordance with current regulations and guidance.

Modifications and upgrades to the aircraft evaluated may require additional OSD assessment for type designation, training / checking / currency, operational credits, and other elements within the scope of the OSD evaluations.

In accordance with Commission Regulation (EU) No 69/2014 of 27 Jan 2014, the Operational Suitability Data contained in this document are identified as follows:

[M] mandatory Operational Suitability Data, bearing the status of Rule (see GM No 3 to 21A.15(d))

[AMC] non-mandatory Operational Suitability Data, bearing the status of Acceptable Means of Compliance (see GM No 3 to 21A.15(d))

3. General Description of Enstrom F-28F, F-28F-R, and 280FX Models

General

The Enstrom F-28F, F-28F-R, and 280FX are single engine, piston powered helicopters certified for day and night VFR flight that can be equipped for IFR flight training. The Enstrom F-28F, F-28F-R, and 280FX are essentially the same aircraft with different cabin styling to suit the customer's preferences. The aircraft share identical powertrains, rotor systems, landing gear, tailcones, control systems, fuel systems, electrical systems, seating, instrument panels, and pylon structures. The F-28F is eligible for installation of a right hand pilot in command kit. When so configured, the helicopter is identified as an F-28F-R. Their performance is essentially the same. The 280FX is slightly faster, having a subsequent greater range, while the F-28F and F-28F-R are typically a little lighter, giving more useful load. The 280FX has a slightly higher Vne. Otherwise, operating limits, emergency procedures, and capacities are the same for the aircraft. The major difference between the aircraft is in the cockpit shell. The 280FX has a longer, sleeker cockpit shell, while the F-28F and F-28F-R have a more traditional short bubble.

Airframe

The airframe is comprised of three sections: cabin assembly, pylon assembly, and tailcone assembly.

a. Cabin Assembly: The cabin assembly is fabricated from molded fiberglass and is an integral unit. It is attached to the pylon by six bolts and contains the aluminum seat structure, plus the instrument panel, cyclic, collective, and tail rotor controls. The windshield and upper and lower windows provide excellent visibility. The swing-open style doors provide access to the cabin.
b. Pylon Assembly: The pylon assembly is fabricated from steel tubing, houses the engine, and supports the landing gear, cabin, main transmission, and tailcone.
c. Tailcone Assembly: The tailcone assembly is a semi-monocoque type and attaches to the pylon assembly with three bolts for easy removal and installation. The tailcone supports the horizontal stabilizers, tail rotor driveshaft, tail rotor gearbox, tail rotor, and tail rotor guard.

Landing Gear

a. Main Landing Gear: The main landing gear consists of two tubular aluminum skids attached to the airframe by means of the forward and aft cross tubes through four air-oil oleo struts. The struts cushion ground contact during landing and are part of the ground resonance prevention. Drag struts give the gear stability and strength and prevent fore and aft movement during ground contact maneuvers. Replaceable hardened steel skid shoes are installed on each skid to resist skid wear on hard surfaces.
b. Tail Rotor Guard: A tubular aluminum tail rotor guard is installed on the aft end of the tailcone. It acts as a warning to the pilot upon an inadvertent tail-low landing and aids in protecting the tail rotor from damage.
c. Ground Handling Wheels: Each landing gear skid tube has ground handling wheels or provisions for installing removable ground handling wheel assemblies. Each assembly has a manually operated over-centering device to lift the skids clear of the ground. The ground handling wheels should be retracted for engine run-up. If the aircraft has optional removable Brackett® wheels, they should be removed before engine run-up.

Engine

The F-28F, F-28F-R, and 280FX helicopters are powered by a Textron-Lycoming HIO-360 series piston engine. The Textron-Lycoming HIO-360 series engine is a four cylinder, direct drive, horizontally opposed, air cooled, fuel injected engine. The F-28F/280F series helicopters are equipped with an Enstrom installed turbocharger system which allows the engine to produce its rated horsepower up to the certified altitude limit.

Flight Controls

The flight controls comprise the three conventional primary systems: the collective, cyclic, and antitorque/directional controls. The flight control systems are not hydraulically boosted. The cyclic controls include an electric force trim system. The aircraft also has fixed horizontal and vertical stabilizers mounted on the tailcone to provide additional stability and attitude control during high speed flight.

Power Train

The power train includes the main rotor transmission, belt drive system, and tail rotor drive shaft and transmission.

a. Main Rotor Transmission: The main rotor transmission provides a 7.154:1 reduction ratio between the upper pulley and main rotor system. The transmission has a sight gauge which is located on the aft right side and is visible through a panel in the baggage compartment or through the upper access step. Total oil quantity in the transmission is 6 pints (2.84 liters). It is splash lubricated. A magnetic drain plug located on the bottom left aft side of the transmission can be checked for metal particle contamination. All 280FX aircraft are equipped with chip detector annunciator in the instrument panel. Starting with serial number 744, F-28F aircraft may be equipped with the chip detector annunciator as optional equipment. The chip detector is standard equipment on all later production F-28F aircraft.
b. Belt Drive System: The belt drive system consists of two pulleys, a poly-vee belt, and a belt tensioning mechanism. The lower pulley is bolted to the engine and drives the belt. The belt drives the upper pulley which is attached to the main transmission via a sprag (overrunning) clutch. The sprag clutch allows the rotor system to disconnect from the engine and autorotate in the event of an engine failure or during autorotation practice. The belt tensioning mechanism is controlled by a handle in the cabin and allows the belt to be disengaged during engine start. Once engaged, the tensioning mechanism keeps the belt under constant tension.
c. Tail Rotor Drive Shaft and Transmission: The tail rotor transmission reduction ratio is 1:1. The tail rotor transmission supports and drives the tail rotor assembly. A filler port and a sight gauge are located in the aft end of the transmission. The total oil capacity of the transmission is 5 ounces (.15 liters). The transmission utilizes a splash lubricated, non-vented, closed oil system. A magnetic drain plug located on the bottom aft side of the transmission can be checked for metal particle contamination. All 280FX aircraft are equipped with the chip detector annunciator in the instrument panel. Starting with serial number 744, F-28F aircraft may be equipped with the chip detector annunciator as optional equipment. The chip detector is standard equipment on all later production F-28F aircraft.

Main Rotor

The main rotor assembly is a three-bladed, high inertia, fully articulated rotor system. Three hydraulic dampers are incorporated to control the lead-lag motions of the blades.

Tail Rotor

The tail rotor assembly is a two-bladed, teetering, delta hinged rotor assembly.

Fuel System

The fuel system consists of two interconnected 21 US gallon fuel tanks, which feed simultaneously to the engine. The tanks are located on the left and right side of the aircraft over the engine compartment. The tanks have a total fuel capacity of 42 US gallons, with a total of 2 gallons unusable fuel, one gallon unusable fuel in each tank. Each fuel tank is gravity fed to a central distributing line, which connects to the electric boost pump and engine-driven pump. The fuel control valve is an off-on type and is located on the firewall next to the pilot's right shoulder. Each tank has an individual sump drain valve in the bottom. There is also a main gascolator filter located aft of the firewall in the engine compartment. The drain valve control is on the right-hand side of the engine compartment and extends beyond the side panel.

Electrical System

The basic power supply system is either a 12-volt or a 28-volt direct current system with a negative ground to the helicopter structure. A belt-driven 70-amp alternator is located on the aft part of the engine. On early production helicopters with a 12-volt system, the 12-volt battery is located in the right-hand side of the pilot's compartment and serves as a stand-by power source to supply power to the system when the alternator is inoperative. If the helicopter has a 28-volt system or is a later production helicopter with a 12-volt system, the 28-volt or 12-volt battery is located above the right side of the aft landing gear cross tube.

Flight Instruments

The standard flight instruments that are installed as basic equipment comply with the requirements under visual flight rules for day or night operation. The panel arrangement provides ease of visual observance and includes space provisions for installation of additional instruments to meet individual requirements. Instruments include an airspeed indicator, altimeter, compass, and outside air temperature indicator.

Annunciator Panel

The annunciator panel is located at the top of the instrument panel. It consists of caution lights and warning lights. Older model F-28F helicopters do not have an annunciator panel, but they do have warning and caution lights as required by regulations.

4. Helicopter Main Characteristics

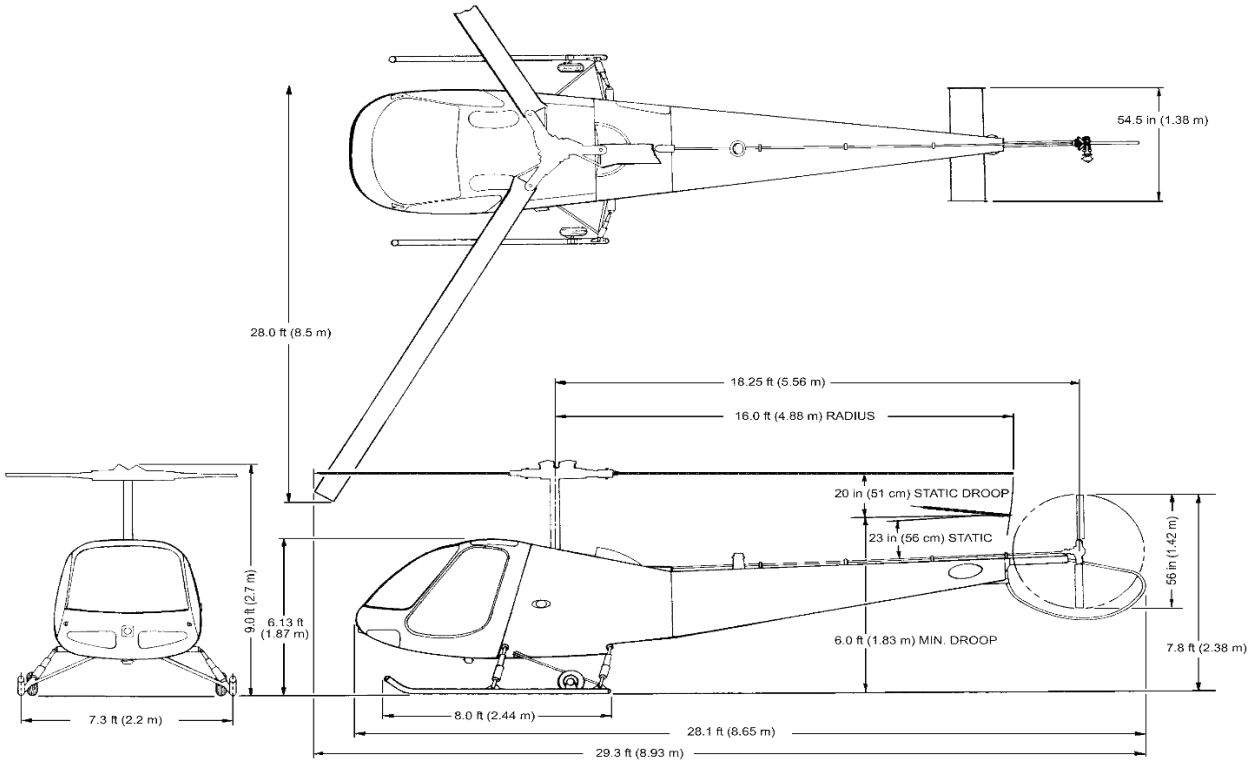
4.1 Summary of Main Characteristics of the Enstrom F-28F, F-28F-R, and 280FX

			F-28F/F-28F-R	280FX
Dimensions	Fuselage	Length	351.6 inches	351.6 inches
		Width	58.5 inches	54 inches
		Height	108 inches	108 inches
	Main Rotor	Diameter	32 ft.	32 ft.
	Tail Rotor		56 inches	56 inches
# of Main Rotor Blades			3	3
Minimum Flight Crew			1	1
Seating Capacity	Including Pilot Seats		3/2	3
Engine			Textron Lycoming HI0-360-F1AD	Textron Lycoming HI0-360-F1AD
Fuel Cells	# of Cells		2	2
	Usable Capacity		40 Gal.	40 Gal.
Air Speed	Power ON [1]	Absolute V_{NE}	112 MPH	117 MPH
	Power OFF [2]		85 MPH	85 MPH
	Doors Off		No Restrictions	No Restrictions
Rotor Speed	Power ON	Maximum	351 RPM	351 RPM
	Power OFF	Minimum	334 RPM	334 RPM
Max Approved Operating Altitude			12,000 ft at 2350 lb.	12,000 ft at 2350 lb.
MTOW with Internal Load			2600 lb.	2600 lb.
MTOW with External Load			2600 lb.	2600 lb.

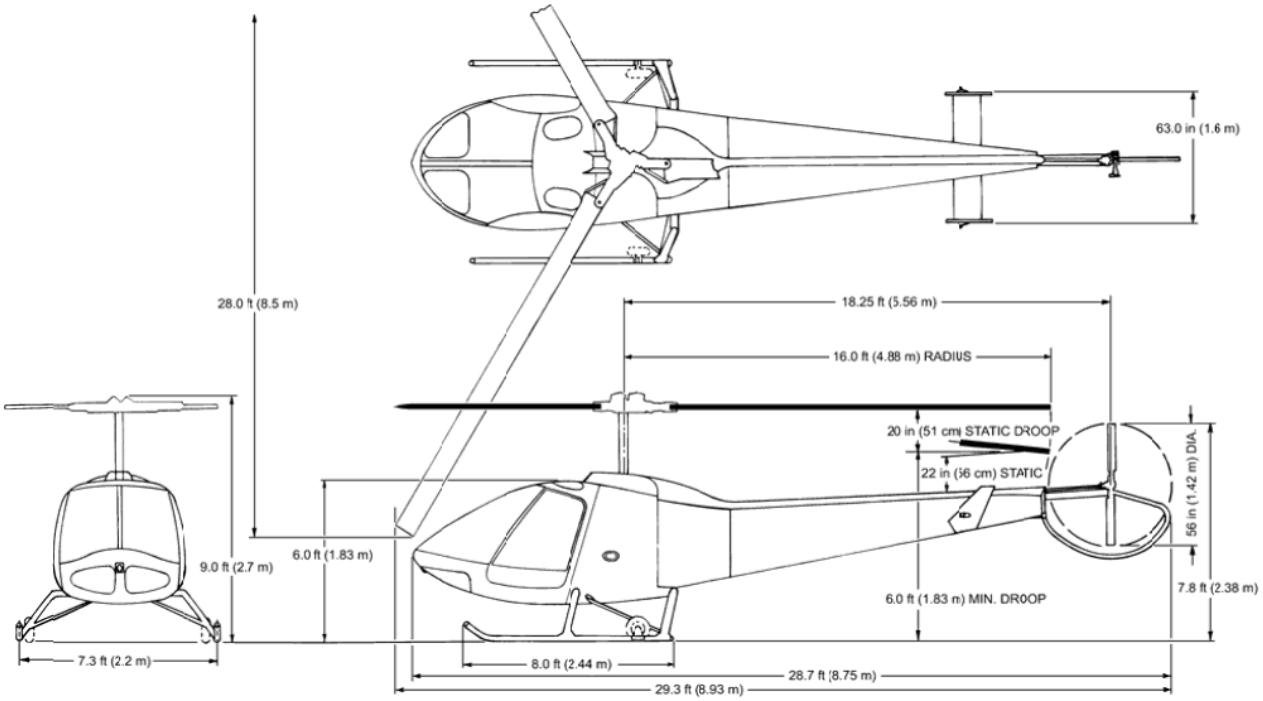
[1] V_{NE} for altitudes from sea level to 3000 ft. See Flight Manual for variations.

[2] V_{NE} for autorotation is 85 MPH or the power-on V_{NE}, whichever is lower.

4.2 Exterior Dimension of Enstrom F-28F/F-28F-R



4.3 Exterior Dimension of Enstrom 280FX



5. Operator Difference Requirement (ODR) Tables [M]

Operator Difference Requirement Tables have been produced to show the differences between the F-28F, F-28F-R, and 280FX.

GENERAL OPERATOR DIFFERENCES REQUIREMENTS TABLE											
DIFFERENCE AIRCRAFT: 280FX BASE AIRCRAFT: F-28F/F-28F-R				COMPLIANCE METHOD							
				TRAINING					CHKG/CURR		
GENERAL	DIFFERENCES	FLT CHAR	PROC CHG	A	B	C	D	E	FLT CHK	REC EXP
DIMENSIONS	WIDTH	NO	NO	SU					A	A
FLIGHT DECK DESIGN	WINDSHIELD	NO	NO	SU					A	A
CABIN LAYOUT	WINDSHIELD/SMALLER DOORS	NO	NO	SU					A	A
ENGINE	NONE	NO	NO	SU					A	A
LIMITATIONS	VNE 117 MPH VS VNE 112 MPH	NO	NO	SU					A	A

SYSTEM OPERATOR DIFFERENCES REQUIREMENTS TABLE										
DIFFERENCE AIRCRAFT: 280FX BASE AIRCRAFT: F-28F/F-28F-R				COMPLIANCE METHOD						
				TRAINING					CHKG/CURR	
SYSTEM	DIFFERENCES	FLT CHAR	PROC CHG	A	B	C	D	E	FLT CHK	REC EXP
21 AIR CONDITIONING	NONE	NO	NO	SU					A	A
22 AUTO FLIGHT	NONE	NO	NO	SU					A	A
23 COMMUNICATIONS	NONE	NO	NO	SU					A	A
24 ELECTRICAL POWER	NONE	NO	NO	SU					A	A
25 EQUIPMENT/ FURNISHINGS	NONE	NO	NO	SU					A	A
26 FIRE PROTECTION	NONE	NO	NO	SU					A	A
28 FUEL	NONE	NO	NO	SU					A	A
30 ICE AND RAIN PROTECTION	NONE	NO	NO	SU					A	A
31 INSTRUMENTS	NONE	NO	NO	SU					A	A
33 LIGHTS	NONE	NO	NO	SU					A	A
34 NAVIGATION	NONE	NO	NO	SU					A	A
35 OXYGEN	NONE	NO	NO	SU					A	A
52 DOORS	NONE	NO	NO	SU					A	A
63 MAIN ROTOR DRIVE	NONE	NO	NO	SU					A	A
71 POWERPLANT	NONE	NO	NO	SU					A	A
77 ENGINE INDICATING	NONE	NO	NO	SU					A	A

MANEUVER OPERATOR DIFFERENCES REQUIREMENTS TABLE										
DIFFERENCE AIRCRAFT: 280FX BASE AIRCRAFT: F-28F/F-28F-R				COMPLIANCE METHOD						
				TRAINING					CHKG/CURR	
MANEUVER	DIFFERENCES	FLT CHAR	PROC CHG	A	B	C	D	E	FLT CHK	REC EXP
PREFLIGHT/NORMAL TAKEOFF/CLIMB/ CRUISE/DESCENT/ INSTRUMENT APPROACHES/ LANDING	NONE	NO	NO	SU					A	A
NON-NORMAL MANEUVERS	NONE	NO	NO	SU					A	A

6. Master Difference Requirement (MDR) Tables [M]

6.1 Difference Level Summary

The F-28F, F-28F-R, and 280FX are variants. Difference levels are summarized in the table below for training, checking, and currency.

DIFFERENCE LEVEL	TRAINING	CHECKING	CURRENCY
A	Self-instruction	Not applicable or integrated with next proficiency check	Not applicable
B	Aided instruction	Task or system check	Self-review
C	System devices	Partial proficiency check using qualified device	Designated system
D	Maneuver Training Devices or aircraft to accomplish specific maneuvers	Partial proficiency check using qualified device	Designated maneuver(s)
E	Flight Simulation Training Devices (FSTDs) or aircraft	Proficiency check using FSTDs or aircraft	As per regulation, using FSTDs or aircraft

6.2 Training, Checking, and Recurrent Training Difference Requirements

The Master Difference Requirements are from Level A to A.

Master Difference Requirement (MDR) Table			
		FROM HELICOPTER	
		F-28F/F-28F-R	**280FX**
TO HELICOPTER	**F-28F/F-28F-R**		A/A/A
	280FX	A/A/A	

7. Type Rating List and License Endorsement List [M]

The F-28F, F-28F-R, and 280FX have been evaluated for aircraft categorization and license endorsement. The models are included in the EASA Type Rating & License Endorsement List – Helicopters as below:

Manufacturer	Helicopter Model/ Name	Differences	License Endorsement	Complex	OEB Report/ OSD FCD Available	Remarks
Enstrom -SE Piston-	F-28F F-28F-R 280FX		ENF 28		X	engineering@ enstromhelicopter.com

8. Specification for Training

8.1 Course Pre-Entry Requirements

All candidates must fulfill the FCL.725 requirements of Part-FCL for the issue of class and type ratings.

8.2 Licensing Requirements

All students must fulfill the requirements of Part-FCL Appendix 9, Flight instruction and skill test. The AMC2 FCL.725(a) of the Part-FCL requires:

For an initial issue of a SEP (H), an approved flight instruction of at least:

Helicopter types	In helicopter	In helicopter and FSTD associated training credits
SEP (H)	5 hrs	Using FFS C/D: At least 2 hrs helicopter and at least 6 hrs total Using FTD 2/3: At least 4 hrs helicopter and at least 6 hrs total

For an additional issue of a SPH, SEP (H) CS 27, an approved flight instruction of at least:

Helicopter types	In helicopter	In helicopter and FSTD associated training credits
SEP (H) to SEP (H) within AMC1 FCL.740H (a)(3)	2 hrs	Using FFS C/D: At least 1 hr helicopter and at least 3 hrs total Using FTD 2/3: At least 1 hr helicopter and at least 4 hrs total

8.3 Initial and Additional Single Engine Piston (SEP) Type Rating

8.3.1 Initial SEP Type Rating (ITR)

Candidates for the initial type rating must:

- Hold a valid helicopter pilot license
- Comply with the requirements set out in Part-FCL Subpart H – Section 1 and 3

8.3.2 Additional SEP Type Rating (ATR)

Candidates for the additional type rating must:

- Hold a valid helicopter pilot license
- Hold a SEP type rating

- Comply with the requirements set out in Part-FCL Subpart H – Section 1 and 3

8.4 Theoretical Knowledge Syllabus and Test Summary [AMC]

8.4.1 Initial and Additional Type Rating

Theoretical knowledge instruction should be provided in accordance with Part-FCL Subpart H – Section 1 – FCL.725.

The following section presents a summary of the material that an Initial and Additional Type Rating training program should consider.

Initial and Additional Type Rating Theoretical Knowledge Syllabus	**ITR**	**ATR**
Helicopter systems and design, transmissions, rotors and equipment, powerplant, normal and abnormal operation of the systems	12.0	12.0
Limitations		
Weight and Balance		
Performance, flight planning and monitoring		
Emergency procedures		
TOTAL THEORETICAL KNOWLEDGE SYLLABUS	12.0	12.0
Theoretical examination • Knowledge Exam Review and Discussion	1.0 As Required	1.0 As Required
TOTAL (HOURS)	13.0	13.0

8.5 Flight Training Course Summary [AMC]

8.5.1 Helicopter Flight Training Course

The following table indicates the minimum flight training required.

Helicopter Flight Training Course	**ITR**	**ATR**
1. Preflight, cockpit procedures, checklist and engine start, hover work, patterns, flight maneuvers, off-field operation maneuvers, confined area operations, quickstops	5.0	2.0
2. Emergency procedures, autorotations, tail rotor failures		
TOTAL FLIGHT TRAINING (HOURS)	5.0	2.0
SKILL TEST	Required	Required

8.6 Training Areas of Special Emphasis (TASE) [M]

Crew must be aware that no magneto check can be done in flight.
Crew must be aware that, especially on take-off and landing, RPM must be correctly controlled as a low RPM has an immediate effect on tail rotor efficiency.
Crew must be aware that it is not advised to rapidly close the throttle to simulate engine failures.
Crew must be aware of the position of the trim CB in case of runaway trim.

9. Specification for Testing, Checking, Currency, and Recent Experience

9.1 Skill Test
As required by Part-FCL.725(c).

9.2 Proficiency Checks
As required by Part-FCL.740.H.

9.3 Specification for Recent Experience
As required by Part-FCL.060.

10. Specification for Flight Simulation Training Devices

No flight simulation training devices exist.

11. Appendices

11.1 Reference to TCDS

11.2 Training Syllabus