UH-60 LIMITS
CHANGE 5

5.3 Exceeding Operational Limits

Any time an operational limit is exceeded an appropriate entry shall be made on DA Form 2408-13. Entry shall state what limit or limits were exceeded, range, time beyond limits, and any additional data that would aid maintenance personnel in the maintenance action that may be required. The helicopter shall not be flown until corrective action is taken.

SYSTEM LIMITS

5.6 Rotor Limitations

It is not abnormal to observe a %RPM 1 and 2 speed split during autorotational descent when the engines are fully decoupled from the main rotor. A speed increase of one engine from 100% reference to 103% maximum can be expected. During power recovery, it is normal for the engine operating above 100% RPM to lead the other engine. Refer to Figure 5-1 for limitations.

5.6.1 Rotor Start and Stop Limits

Maximum wind velocity for rotor start or stop is 45 knots from any direction.

5.6.2 Rotor Speed Limitations

Refer to Figure 5-1 for rotor limitations. Power off (autorotation) rotor speeds up to 120% RPM R are authorized for use by maintenance test flight pilots during autorotational RPM checks.

5.7 MAIN TRANSMISSION MODULE LIMITATIONS

NOTE

When oil pressure requires adjustment, pressure regulator valves are adjusted to achieve a minimum of 50psi. This is to ensure that the oil pressure remains above 45psi, allowing for slight decays in oil pressure over time.

a. Oil pressure should remain steady during steady state forward flight or in level hover. Momentary fluctuations in oil pressure during transient maneuvers (i.e. hovering in gusty wind conditions), or when flying with pitch attitudes above +6º. These types of oil pressure fluctuations are acceptable, even when oil pressure drops into the yellow range (below 30psi). Oil pressure should remain steady and should be in the 45 to 55 psi range for the UH-60A/EH-60A, and 45 to 60 psi range for the UH-60L, to ensure that when fluctuations occur they remain in the acceptable range as defined above. If oil pressure is not steady during steady state forward flight or in a level hover, or if oil pressure is steady but under 45 psi, make an entry on Form 2408-13.

b. A demand for maximum power from engines with different torque factors (ETF) will cause a torque split when the low ETF engine reaches TGT limiting. This torque split is normal. Under these circumstances, the high power engine may exceed the dual engine limit. (Example: #1 TRQ=96% at TGT limiting, #2 TRQ is allowed to go up to 104%. Total aircraft torque = (96%+104%)/2=100%).

c. With transmission oil temperature operation in the precautionary range, an entry should be made on DA Form 2408-13-1 except when hovering in adverse conditions described in Chapter 8 Desert and Hot Weather Operations.

MAIN ROTOR OVERSPEED
* 127%
** 137%
*** 142%

ENGINE % RPM 1 - 2	
12-Second Transient	105% - 107%
Transient	101% - 105%
Continuous	95% - 101%
Minimum Except For Idle And Transient	91%
AVOID OPERATIONS IN 20%-40% AND 60%-90% RANGE EXCEPT DURING START AND SHUTDOWN	

MAIN ROTOR % RPM R			
POWER ON		POWER OFF (AUTOROTATION)	
Transient	101% - 107%	Maximum	110%
Continuous	95% - 101%	Transient	105% - 110%
Minimum Except For Idle And Transient	91%	Normal	90% - 105%

FUEL QUANTITY	(UH60A, UH60L, & EH)
Normal	200 - 1500 LBS
Precautionary	0 - 200 LBS

AIRSPEED: Maximum is 193 Knots

FOR 700 ENGINES (UH60A, EH60A)

STAB DEG	KIAS LIMIT	ENGINE	Ng	ENGINE OIL	TEMP
0	150	10-Second Transient	102% - 105%	Maximum	150 C
10	100	30 - Minute Limit	99% - 102%	30-Minute Limit	135 - 150 °C
20	80	Continuous	0 - 99%	Continuous	-50 - 135° C
30	60				
40	45				

ENGINE OIL	PRESSURE	ENGINE	%TRQ
Maximum	100 PSI	10-Second Transient Dual-Engine Single-Engine	 100%-125% 110%-135%
Continuous	20-100 PSI*	Continuous Single Engine Only	0%-110%
*35 PSI Minimum at	90% Ng and Above	Continuous Dual Engine	0%-100%

TURBINE GAS	TEMPERATURE	MAIN TRANSMISSION	OIL TEMPERATURE
10-Second Transient	850-886° C	Maximum	120° C
Start Abort Limits	850° C	Precautionary	105 - 120° C
30-Minute Limit	775 - 850° C	Continuous	-50 - 105° C
Normal	0 - 775° C		

MAIN TRANSMISSION	OIL PRESSURE
Maximum	130 PSI
Precautionary	65-130 PSI
Continuous	30-65 PSI
Idle and Transient	20-30 PSI

Minimum	20 PSI

FOR 701C ENGINES (UH60L)

ENGINE	Ng	ENGINE OIL	TEMP
10-Second Transient	102% - 105%	Maximum	150 C
30 - Minute Limit	99% - 102%	30-Minute Limit	135 - 150 °C
Continuous	0 - 99%	Continuous	-50 - 135° C

ENGINE OIL	PRESSURE	ENGINE	%TRQ
Maximum	120 PSI	10-Second Transient Dual-Engine Above 80 KIAS 80 KIAS or Below	 100%-144% 120%-144%
5-Minute Limit	100-120 PSI	Single Engine	135%-144%
Normal Operation	26-100 PSI	Maximum Continuous	
Idle	22-26 PSI	Single Engine	0%-135%
Minimum	22 PSI	Dual Engine Above 80 KIAS At Or Below 80 KIAS	 0%-100% 0%-120%

TURBINE GAS	TEMPERATURE	MAIN TRANSMISSION	OIL TEMPERATURE
10-Second Transient	903-949° C	Maximum	140° C
2.5 Minutes Transient Contingency Power	878-903°C	Precautionary	105-140°C
Start Abort Limits	851° C	Continuous	-50-105°C
10-Minute Limit	851-878°	**MAIN TRANSMISSION**	**OIL PRESSURE**
30-Minute Limit	810 - 851° C	Maximum	130 PSI
Normal	0 - 810° C	Precautionary	65-130 PSI
		Continuous	30-65 PSI
		Idle And Transient	20-30 PSI
		Minimum	20 PSI

POWER LIMITS

5.8.3 Engine % RPM Limitations

Transient % RPM 1 or 2 operation in yellow range (101% to 105%) is not recommended as good operating practice. However no damage to either engine or drive train is incurred by operation within this range.

5.8.4 Engine Starter Limits

a. The pneumatic starter is capable of making the number of consecutive start cycles listed below, when exposed to the environmental conditions specified, with an interval of at least 60 seconds between the completion of one cycle and the beginning of the next cycle. A starting cycle is the interval from start initiation and acceleration of the compressor, from zero rpm, to starter dropout. The 60-second delay between start attempts applies when the first attempt is aborted for any reason, and it applies regardless of the duration of the first attempt. If motoring is required for an emergency, the 60-second delay does not apply.

b. At ambient temperatures of 15 C (59 F) and below, two consecutive start cycles may be made, followed by a 3-minute rest period, followed by two additional consecutive start cycles. A 30-minute rest period is the required before any additional starts.
c. At ambient temperatures above 15 up to 52 C (59 up to 126 F), two consecutive start cycles may be made. A 30-minute rest period is the required before any additional start cycles.

5.9 Pneumatic Source Inlet Limits

The minimum ground-air source (pneumatic) required to start the helicopter engines is 40 psig and 30 ppm at 149º C (300 F). The maximum ground-air source to be applied to the helicopter is 50 psig at 249º C (480 F), measured at the external air connector on the fuselage.

5.10 Engine Start Limits

CAUTION: Engine start attempts at or above a pressure altitude of 18,000 feet (701C), or 20,000 feet (700) could result in a Hot Start.

Crossbleed starts shall not be attempted unless the anti-ice light is off, and operating engine must be at 90% **Ng SPEED** and rotor speed at 100% **RPM R**. When attempting single-engine starts at pressure altitudes above 14,000 feet, press the start switch with the **ENG POWER CONT** lever **OFF**, until the maximum motoring speed (about 24%) is reached, before going to **IDLE**. Engine starts using APU source may be attempted when within the range of FAT and pressure altitude of Figure 5-5.

5.11 Engine Overspeed Check Limitations

Engine overspeed check in flight is prohibited. Engine overspeed checks, on the ground, are authorized by designated maintenance personnel only.

5.12 Fuel Limitations

When using all fuel types, both fuel boost pumps shall be on and operational, otherwise engine flameout may result.

LOADING LIMITS

5.14 Weight Limitations

AIRCRAFT	MAXIMUM WEIGHT
UH-60A	20,250
EH-60A	20,250
UH-60A (see first note)	22,000
EH-60A (see first note)	22,000
UH-60L	22,000
External Lift Mission (see third note)	23,500
ESSS aircraft on ferry mission (see second note)	24,500

NOTE

UH-60A and EH-60A maximum gross weight can be extended from 20,250 to 22,000 pounds only when wedge mounted pitot-static probes and either/or MWO 55-1520-237-50-58 or MWO 1-1520-237-50-73 are installed.

Airworthiness release required.
External lift missions above 22,000 pounds can only be flown with cargo hook loads above 8,000 pounds and up to 9,000 pounds.
In addition to the above limits maximum weight is further limited by cargo floor maximum capacity of 300 pounds per square foot. Refer to Chapter 6.

5.15 Stowage Provisions
Maximum capacity for each storage compartment is 125 pounds.

5.16 Cabin Ceiling Tiedown Fittings
The four cabin ceiling tiedown fittings have a limited load capability of 4,000 pounds.

5.17 Cargo Hook Weight Limitation
For UH-60A aircraft, the maximum weight that may be suspended from the cargo hook is limited to 8,000 pounds. For UH-60L aircraft, the maximum weight that can be suspended from the cargo hook is 9,000 pounds.

NOTE: UH-60L aircraft prior to serial number 92-26421, will require an entry into DA Form 2408-13 following the first mission carrying an external cargo hook load exceeding 8,000 pounds.

5.18 Rescue Hoist Weight Limitations
The maximum weight that may be suspended from the rescue hoist is 600 pounds.

AIRSPEED LIMITS

5.19 Airspeed Operating Limits
The airspeed operating limits chart (Figures 5-6, 5-7 and 5-7.1) define velocity never exceed (Vne) as a function of altitude, temperature, and gross weight. The dashed lines represent the Mach limited airspeeds due to compressibility effects. Additional airspeed limits not shown on the charts are:
a. Maximum airspeed with external cargo hook loads greater than 8,000 pounds and a corresponding gross weight greater than 22,000 pounds will vary due to the external load physical configuration, but shall not exceed 120 KIAS.
b. Maximum airspeed for one engine inoperative is 130 KIAS.
c. Maximum airspeed for autorotation at a gross weight of 16,825 pounds or less is 150 KIAS.
d. Maximum airspeed for autorotation at a gross weight of greater than 16,825 pounds is 130 KIAS.
e. Sideward/rearward flight limits. Hovering in winds greater than 45 knots (35 knots with external ERFS) from the sides or rear is prohibited. Sideward/rearward flight into the wind, when combined with windspeed, shall not exceed 45 knots (35 knots with external ERFS).
f. SAS inoperative airspeed limits: (1) One SAS inoperative - 170 KIAS. (2) Two SAS inoperative - 150 KIAS. (3) Two SAS inoperative in IMC - 140 KIAS.
g. Hydraulic system inoperative limits: (1) One hydraulic system inoperative - 170 KIAS. (2) Two hydraulic systems inoperative - 150 KIAS. (3) Two hydraulic systems inoperative in IMC - 140 KIAS.
h. Searchlight and landing light airspeed limits: (1) Landing light. If use is required, the landing light must be extended prior to reaching a maximum forward airspeed of 130 KIAS. With landing light extended, airspeed is limited to 180 KIAS. (2) Searchlight. If use is required, the searchlight must be extended prior to reaching a maximum forward airspeed of 100 KIAS. With searchlight extended, airspeed is limited to 180 KIAS.
i. **VOL** The maximum airspeed for autorotation shall be limited to 100 KIAS.

5.20 Flight With Cabin Door(s) / Window (s) Open.
The following airspeed limitations are for operating the helicopter in forward flight with the cabin doors / window open:
a. Cabin doors
(1) Cabin doors may be fully open up to 100 KIAS with soundproofing installed aft of station 379.
(2) Cabin doors may be fully open up to 145 KIAS with soundproofing removed aft of station 379 or with soundproofing secured properly.

(3) The doors will not be intentionally moved from the fully open or closed position in flight. The cabin doors may be opened or closed during hovering flight. the cabin doors must be closed or fully opened and latched before forward flight. Should the door inadvertently open in flight, it may be secured fully open or closed.
b. Gunner's window(s) may be fully open up to 170 KIAS.
c. Cockpit doors sliding windows will not be opened or closed during flight except during hover.
d. Flight with cockpit door(s) removed is prohibited.
e. VOL Flight with cabin door(s) and window(s) open is not authorized.

5.21 Airspeed Limitations Following Failure Of The Automatic Stabilator Control System.

a. Manual control available. If the automatic stabilator control system fails in flight and operation cannot be restored:
(1) The stabilator shall be set full down at speeds below 40 KIAS.
(2) The stabilator shall be set at zero degrees at speeds above 40 KIAS.
(3) Autorotation airspeed shall be limited to 120 KIAS at all gross weights.
b. Manual control not available. The placard airspeed limits shall be observed as not-to-exceed speed (powered flight and autorotation), except in no case shall the autorotation limit exceed 120 KIAS.

MANEUVERING LIMITS

5.22 Prohibited Maneuvers

a. Hovering turns greater than 30º per second are prohibited. Intentional maneuvers beyond attitudes of ±30º in pitch or ±60º in roll are prohibited.
b. Simultaneous moving of both **ENG POWER CONT** levers to **IDLE** or **OFF** (throttle chop) in flight is prohibited.
c. Rearward ground taxi is prohibited.

5.23 Restricted Maneuvers

5.23.1 Manual Operation of the Stabilator. Manual operation of the stabilator in flight is prohibited except as required by formal training requirements, or as alternate stabilator control in case the AUTO mode malfunctions.

5.23.2 Downwind Hovering. Prolonged rearward flight and downwind hovering are to be avoided to prevent accumulation of exhaust fumes in the helicopter and heat damage to windows on open cargo doors.

5.23.3 Maneuvering Limitations

a. The maneuvering limits of the helicopter, other than as limited by other paragraphs within this section, are always defined by main rotor blade stall. Stall has not been encountered in one G flight up to the airspeeds shown in chart Figure 5-6 for aircraft without ESSS installed and Figure 5-7 for aircraft with ESSS installed.
b. The blade stall chart (Figure 5-8) while not an aircraft limitation, provides the level flight angle of bank at which blade stall will begin to occur as a function of airspeed, gross weight, pressure altitude and temperature. When operating near blade stall, any increase in airspeed, load factor (bank angle), turbulence, or abrupt control inputs will increase the severity of the stall. Fully developed stall will be accompanied by heavy four per rev vibration, increasing torque, and loss of altitude. Recovery is always accomplished by reducing the severity of the maneuver, that is by reducing collective, reducing airspeed, and/or reducing the angle of bank. Maneuvering flight which results in severe blade stall and significant increase in 4 per rev vibration is prohibited.

5.23.3.1 High Speed Yaw Maneuver Limitation. Above 80 KIAS avoid abrupt, full pedal inputs to prevent excess tail rotor system loading.

5.23.3.2 Limitations for Maneuvering With Sling Loads. Maneuvering limitations with a sling load is limited to a maximum of 30º angle of bank in forward flight (Figure 5-9). Side flight is limited by bank angle and is decreased as airspeed increases. Rearward flight with sling load is limited to 35 knots.

5.23.3.3 Limitations for Maneuvering With Rescue Hoist Loads. Maneuvering limitations with a rescue hoist load is limited to maximum of 30º angle of bank in forward flight (Figure 5-9). Side flight is limited by bank angle and is decreased as airspeed is increased. Rearward flight with hoist load is limited to 35 knots. Rate of descent is limited to 1,000 feet-per-minute.

5.23.3.4 Bank Angle Limitations. Bank angles shall be limited to 30º when a **PRI SERVO PRESS** caution light is on.

5.24 Landing Gear Limitations.

Do not exceed a touchdown sink rate of 540 feet-per-minute on level terrain and 360 feet-per-minute on slopes with gross weights of up to 16,825 pounds; above 16,825 pounds gross weight 300 feet-per-minute on level terrain and 180 feet-per-minute on slopes.

5.25 Landing Speed Limitations.

Maximum forward touchdown speed is limited to 60 knots ground speed on level terrain.

5.26 Slope Landing Limitations

The following slope limitations apply regardless of gross weight or CG, with or without ESSS/ERFS.

CAUTION: When performing slope landings with External Extended Range Fuel System Tanks, ensure tank to ground clearance.

NOTE: Because of the flat profile of the main transmission and forward location of both transmission oil pumps, transmission oil pressure will drop during nose-up slope operations. At slope angle of 10º an indicated oil pressure of 30 to 35 psi is normal, and at a 15º slope angle a pressure in the range of 10 to 15 psi is normal, due to pitching of the helicopter.

a. 15º nose-up, right wheel up or left wheel upslope. The slope limitations shall be further reduced by 2º for every 5 knots of wind.

b. 6º nose downslope. Landing in downslope conditions with tail winds greater than 15 knots shall not be conducted. A low-frequency oscillation may occur when landing nose-down on a slope with the cyclic near the aft stop.

c. The main gearbox may be operated up to 30 minutes at a time with pressure fluctuations when the helicopter is known to be at a nose-up attitude (i.e., slope landings or hover with extreme aft CG).

ENVIRONMENTAL RESTRICTIONS

5.27 Flight in Instrument Meteorological Conditions (IMC)

This aircraft is qualified for operation in instrument meteorological conditions.

5.28 Flight In Icing Conditions.

a. When the ambient air temperature is 4º C (39º F) or below and visible liquid moisture is present, icing may occur. Icing severity is defined by the liquid water content (LWC) of the outside air and measured in grams per cubic meter (g/m3).

(1) Trace	LWC 0 to 0.25 g/m3
(2) Light	LWC 0.25 to 0.5 g/m3
(3) Moderate	LWC 0.5 to 1.0 g/m3
(4) Heavy	LWC greater than 1.0 g/m3

b. Helicopters with the following equipment installed and operational are permitted to fly into trace or light icing conditions. Flight into light icing is not recommended without the blade deice kit. Flight into moderate icing shall comply with paragraph 5.28 c.

(1) Windshield Anti-ice
(2) Pitot Heat
(3) Engine Anti-ice
(4) Engine Inlet Anti-ice Modulating Valve
(5) Insulted Ambient Air Sensing Tube

c. For flight into moderate icing conditions, all equipment in paragraph 5.28 b. and blade deice kit must be installed and operational. Flight into heavy or severe icing is prohibited.
d. Helicopters equipped with blade erosion kit are prohibited from flight into icing conditions.

5.29 Engine And Engine Inlet Anti-Ice Limitations.

At engine power levels of 10% TRQ per engine and below, full anti-ice capability cannot be provided, due to engine bleed limitations. Avoid operation under conditions of extreme low power requirements such as high rate of descent (1900 fpm or greater), or ground operation below 100% RPM R, during icing conditions. The cabin heating system should be turned off before initiating a high rate of descent.

5.30 Backup Hydraulic Pump Hot Weather Limitations.

During prolonged ground operation of the backup pump using MIL-H-83282 or MIL-H-5606 with the rotor system static, the backup pump is limited to the following temperature / time / cooldown limits because of hydraulic fluid overheating.

FATº C (ºF)	Operating Time (Minutes)	Cooldown Time (Pump Off) (Minutes)
-54º - 32º (-65º - 90º)	Unlimited	--
33º - 38º (91º - 100º)	24	72
39º - 52º (102º - 126º)	16	48

5.31 APU Operating Limitations.

To prevent APU overheating, APU operation at ambient temperature of 43º C (109º F) and above with engine and rotor operating, is limited to 30 minutes. With engine and rotor not operating, the APU may be operated continuously up to an ambient temperature of 51º C (124º F).

5.32 Windshield Anti-Ice Limitations.

Windshield anti-ice check shall not be done when FAT is over 21º C (70 ºF).

5.33 Turbulence And Thunderstorm Operation.

a. Intentional flight into severe turbulence is prohibited.
b. Intentional flight into thunderstorms is prohibited.
c. Intentional flight into turbulence with a sling load attached and an inoperative collective pitch control friction is prohibited.

OTHER LIMITATIONS

5.34 External Extended Range Fuel System Kit Configurations ES

NOTE: Flight with 450-gallon ERFS tanks is prohibited unless operating under an Airworthiness Release from U.S. Army Aviation and Troop Command.
The ERFS kit shall only be utilized in the following approved configurations:
a. A 230-gallon tank installed on each inboard vertical stores pylon.
b. A 230-gallon tank installed on each outboard vertical stores pylon.
c. Four 230-gallon tanks installed, one on each inboard and each outboard vertical stores pylon.

5.35 Jettison Limits

a. **ES** The jettisoning of fuel tanks in other than an emergency is prohibited.
b. **ES** The recommended external fuel tank jettison envelope is shown in Table 5-1.

<table>
<tr><td></td><td colspan="5">Recommended Emergency Jettison Envelope</td><td></td></tr>
<tr><td>Level Flight</td><td colspan="5">0 to 120 KIAS - Slip Indicator Displaced No More Than One Ball Width Left or Right</td><td>120 to Vh - No Sideslip, Ball Centered</td></tr>
<tr><td rowspan="3">Descent</td><td colspan="5">*Jettison Below 80 KIAS Not Recommended</td><td rowspan="3">*Jettison Above 120 KIAS Not Recommended</td></tr>
<tr><td>80 KIAS</td><td>90 KIAS</td><td>100 KIAS</td><td>110 KIAS</td><td>120 KIAS</td></tr>
<tr><td>1000 ft/min</td><td>875 ft/min</td><td>750 ft/min</td><td>625 ft/min</td><td>500 ft/min</td></tr>
<tr><td></td><td colspan="5">*Not recommended because safe jettison at these conditions has not been verified by tests.</td><td></td></tr>
</table>

c. **VOL** Jettisoning, if necessary, shall be accomplished at airspeeds not to exceed 110 KIAS and rates of descent not to exceed 500 fpm.

5.36 Use Of M60D Gun(s) With ERFS Kit Installed. ES

Use of the M60D gun(s) is prohibited when external ERFS tanks are installed on the inboard or outboard vertical stores pylons, unless the external ERFS pintle mount stop is installed.

5.37 Gust Lock Limitations.

a. Dual-engine operation with gust lock engaged is prohibited. Gust lock must not be disengaged with engine running.
b. Single-engine operation with gust lock engaged will be performed by authorized pilots at **IDLE** only.