CHAPTER 6: HELICOPTER CAPABILITIES AND LIMITATIONS.

I. Introduction.

It is essential that non-Pilot users of helicopters gain at least a rudimentary knowledge of helicopter capabilities and limitations. The brief summary in this chapter should be supplemented by the basic helicopter safety training that provides further specific information concerning helicopter limitations and operating characteristics. Users are encouraged to extend this knowledge further by engaging in conversations with the individual most qualified to answer, the Pilot.

> REMEMBER: On any flight, the pilot-in-command is responsible for the safety of the aircraft and its occupants.

The user also needs to become familiar with a number of terms in this section. Refer to the Glossary for definitions. These terms include:

- Pressure altitude
- Weight and balance
- Hover-In-Ground Effect
- Maximum certificated gross weight
- Maximum computed gross weight
- Takeoff and landing limitations
- Operating weight
- Useful load
- Fuel consumption
- Density altitude
- Center of gravity
- Hover-Out-Of-Ground Effect
- Hover ceiling
- Weight reduction
- Equipped weight
- Allowable payload
- Cruise speed
- Fuel capacity

For a basic explanation of the principles of helicopter flight, capabilities, and limitations, the user may want to refer to FAA Advisory Circular AC 61-13B, Basic Helicopter Handbook.

II. Helicopter Performance and Selection.

In order to safely and successfully complete the mission, the helicopter must be capable of meeting the performance required. Payload, hover ceiling, airspeed, and fuel requirements need to be considered in selecting the proper aircraft.

Other selection factors such as number of passenger seats, rotor disk diameter, etc. are discussed in Chapter 3, Operational Planning. Chapter 7 and Appendix A address the specifics of the helicopter load calculation, which is the primary planning tool for determining if the helicopter is capable of lifting the load at a given temperature and elevation.

Chart 6-1 summarizes the minimum specifications for the typing of helicopters by allowable payload, number of passenger seats, and water- or retardant-carrying capability. When a helicopter is referred to by type, for example, as a Type 2 helicopter, it must have met the minimum specifications outlined in the chart for a Type 2 helicopter.

Chart 6-1: ICS Type Specifications For Helicopters

TYPE	1	2	3
Useful Load @ 59° F. @ Sea Level	5000	2500	1200
Passenger Seats	15 or more	9-14	4-8
Retardant or Water Carrying Capability (Gallons)	700	300	100
Maximum Gross Takeoff/Landing Weight (Lbs)	12,501+	6,000-12,500	Up to 6000

III. Weight and Balance.
Weight and balance information is kept in each aircraft flight manual or weight and balance book. This information includes:

- Equipped weight of aircraft, as configured;
- Passenger configuration(s);
- Cargo weight and distribution limits;
- Center of gravity (CG) limits;
- Maximum takeoff and landing weights;
- Charts for computing weights and CG location.

IV. Day/Night Flight Limitations.

A. Day Visual Flight Rules (VFR) Only.
Except as noted below, or for reasons of life-or-death emergency, single-engine helicopters shall be limited to flight during daylight hours and only under VFR conditions (minimum ½ mile visibility). Daylight hours are defined as 30 minutes before official sunrise until 30 minutes after official sunset, or, in Alaska, during extended twilight hours when the terrain features are readily distinguishable for a distance of at least one mile.

CAUTION: In mountainous or hilly terrain, compounded by the aspect of the terrain in relationship to the sun's position, one may experience late dawn or early dusk conditions. Flight periods should be adjusted accordingly. Daylight hours may be further limited at the discretion of the Pilot or Helicopter Manager by conditions of visibility caused by smoke, shadows, etc.

B. Authorization For Night-Flying Operations.
Night operations are unique and require agency-specific authorizations.

1. **Weather Minimums For Night Operations.** The following operational weather minimums are required for normal night operations and recommended for helicopters performing emergency (life-or-death criteria) night operations.

   a. Night in uncontrolled airspace below 1200 feet or less above the surface:

      - One (1) Statute Mile Visibility and Clear of Clouds;
      - Visual Surface Light Reference.

   b. Night in all other airspace (controlled or uncontrolled up to but not including 10,000 Feet MSL).

      - Three (3) Statute Miles Visibility.
      - Distance From Clouds:
        - 500 Feet Below Clouds
        - 1000 Feet Above Clouds
        - 2000 Feet Horizontal From Clouds
      - Visual Surface Light Reference.

2. **Tactical Operations.** Multi-engine helicopters may fly during nighttime hours, provided they are equipped with approved night vision goggle (NVG) capability and the Pilots have been approved for NVG operations. NVG helicopter operations must be conducted within prescribed NVG operational Guidelines.

3. **Logistical Operations**. Pilots may operate at night under the following conditions:

   a. Agency and Contract Pilots may, with agency specific approval, solo pilot single engine helicopters at night for ferry and maintenance purposes. Transportation of passengers at night in a single engine helicopter is prohibited.

b. Agency and Contract Pilots may, with agency specific approval, fly twin engine helicopters at night for ferry, transportation of passengers, and maintenance purposes.

c. Conduct all night helicopter operations, other than night vision goggle (NVG) operations, in one of the following ways:

To and From Airports and Heliports having FAA approved lighting.

To and From Helibases approved by the Regional or State Aviation Manager.

4. **Emergency Operations.** The principles and procedures of risk management and analysis outlined in Chapter 3 shall be applied to any decision regarding conducting a nighttime emergency operation, particularly those conducted in adverse conditions of fog, mountainous terrain, etc.

a. **Pilot-in-Command Authority.** For single-engine and twin-engine night operations under emergency life-or-death criteria, final authority for the safety of the flight is a decision of the Pilot.

V. Instrument Flight Rules (IFR) Flight Limitations.

Instrument Flight Rules (IFR) operations are authorized when aircraft and Pilot(s) are approved and carded. Flights into IFR conditions shall be conducted only:

- In a multi-engine helicopter certificated for IFR operations.
- When weather minimums meet or exceed those prescribed in 14 CFR 135 for helicopter IFR operations.

VI. Wind Restrictions.

(See Chart 6-2.) The capability to fly a helicopter in excessive wind conditions varies considerably with the weight class of the helicopter and the degree of turbulence associated with the wind. If the helicopter flight manual or the helicopter operator's policy does not set lower limits, the following shall be used. These limits may be further restricted at the discretion of the Pilot or other air operations personnel. Limitations are as follows:

A. Flight Above 500' AGL.

Flights more than 500 feet from the surface are allowed in winds up to 50 knots for all types of helicopters.

B. Flight Below 500' AGL.

1. **Type 1 (Heavy) And Type 2 (Medium) Helicopters.** Steady winds shall not exceed 40 knots, or a maximum gust spread of 15 knots.

2. **Type 3 (Light) Helicopters.** Steady winds shall not exceed 30 knots, or a maximum gust spread of 15 knots.

Chart 6-2: Wind Restrictions For Types 1-3 Helicopters

FLIGHT ABOVE GROUND LEVEL	FLIGHT PERMITTED IN WINDS LESS THAN / MAXIMUM GUST SPREAD (in knots)		
	TYPE 1	TYPE 2	TYPE 3
MORE THAN 500' AGL	50 / NA	50 / NA	50 / NA
LESS THAN 500' AGL	40 / 15	40 / 15	30 / 15

VII. Snow Operations.

(See Glossary for definition of snow operations.) Snow operations may require special Pilot and aircraft approval and carding. Flights in snow conditions may be accomplished provided the following conditions are met.

A. Flight.

- VFR conditions are maintained;
- Turbine helicopters are equipped with snow kits as prescribed by the approved flight manual.

B. Landings.

If landings are to be made in snow conditions (see Glossary), helicopter must be equipped with snow pads.

VIII. Helicopter Flight Over Congested Areas.

➔ The Federal Aviation Regulations governing flight over congested areas is dependent on the type of operation being performed. Part 91 would typically apply to flight operations by government owned or operated aircraft, Part 135 to vendor aircraft, and Part 133 to all external load operations.

IX. Lockdown of Controls.

➔ Specific direction may be provided by the procurement document. In general, when trained ground or aircrew personnel are available to assist in loading and unloading, the Pilot should remain at the controls as long as the rotors are turning.

When these personnel are not available to assist, whenever practical, the aircraft should be shut down and rotors stopped prior to departure of passengers and Pilot.

It is recognized that there are certain situations when personnel are not available and which may require the Pilot to lockdown the controls (flight idle with controls locked). A common example is the Pilot needing to check that the doors (cargo or passenger) are secure. In these cases, the Pilot may lockdown the controls, but should not leave the area of the rotor arc.

X. Military Helicopter Limitations.

The use of Military aircraft shall comply with the requirements established in the Military Use Handbook**.** Military helicopters and flight crews, including National Guard and Coast Guard, must be agency-approved by letter or card. A copy of this letter must be available.

The military performance planning cards (PPC) system may be used, at the discretion of military Pilots, in lieu of the load calculation format. See Chapter 7.

➔ Helicopter management personnel should be aware that military radios may not be compatible with the operation and should be checked prior to use. Military helicopters might not be configured to carry cargo. If they are, utilize military external load equipment, provided it meets military safety standards.

For further information, see Military Use Guide, Aviation, or local agreements with military authorities such as the National Guard.