

**SECTION 2  
LIMITATIONS  
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## **SECTION 2 LIMITATIONS**

### **GENERAL**

This section includes operating limitations, instrument markings, and basic placards required for safe operation of the helicopter, its engine, and other standard systems. This helicopter is approved as a normal category rotorcraft under FAA Type Certificate No. H11NM as Model R44 in the serial number range 0002 to 9999.

### **COLOR CODE FOR INSTRUMENT MARKINGS**

|                 |  |
|-----------------|--|
| Red             | Operating limit. Edge of red line indicates limit. Pointer should not enter red during normal operation. |
| Red Cross-hatch | Power-off $V_{ne}$ .   |
| Yellow          | Precautionary or special operating procedure range.  |
| Green           | Normal operating range.  |

### **AIRSPEED LIMITS**

#### **NEVER-EXCEED AIRSPEED ( $V_{ne}$ )**

|                                 |          |
|---------------------------------|----------|
| 2200 lb (998 kg) TOGW and below | 130 KIAS |
| Over 2200 lb (998 kg) TOGW      | 120 KIAS |
| Autorotation                    | 100 KIAS |

For  $V_{ne}$  reductions with altitude and temperature, see placard on page 2-9.

#### **ADDITIONAL AIRSPEED LIMITS**

100 KIAS maximum at power above MCP.

100 KIAS maximum with any combination of cabin doors removed.

**ROTOR SPEED LIMITS**

|           |      |             |
|-----------|------|-------------|
| Power On  |      |             |
| Maximum   | 102% | (408 RPM)   |
| Minimum*  | 101% | (404 RPM)** |
| Power Off |      |             |
| Maximum   | 108% | (432 RPM)   |
| Minimum   | 90%  | (360 RPM)   |

\*Transient operation at lower RPM permitted for emergency procedures training.

\*\*99% (396 RPM) permitted on R44s with tachometers showing engine green arc from 99% to 102%.

**POWERPLANT LIMITATIONS**

**ENGINE**

One Lycoming Model O-540-F1B5

**OPERATING LIMITS**

|                                   |   |              |
|-----------------------------------|---|--------------|
| Engine Speed                      |   |              |
| Maximum continuous                | 102%                                      | (2718 RPM)   |
| Maximum transient***              | 105%                                      | (2800 RPM)   |
| Cylinder Head Max Temperature     | 500°F                                     | (260°C)      |
| Oil Maximum Temperature           | 245°F                                     | (118°C)      |
| Oil Pressure                      |   |              |
| Minimum during idle               | 25 psi                                    |              |
| Minimum during flight             | 55 psi                                    |              |
| Maximum during flight             | 95 psi                                    |              |
| Maximum during start & warm up    | 115 psi                                   |              |
| Oil Quantity, minimum for takeoff | 7 qt                                      | (6.6 liters) |
| Manifold Pressure:                | See placard on page 2-9 for MAP schedule. |              |

\*\*\*Intentional operation above maximum continuous speed prohibited.

**WEIGHT LIMITS**

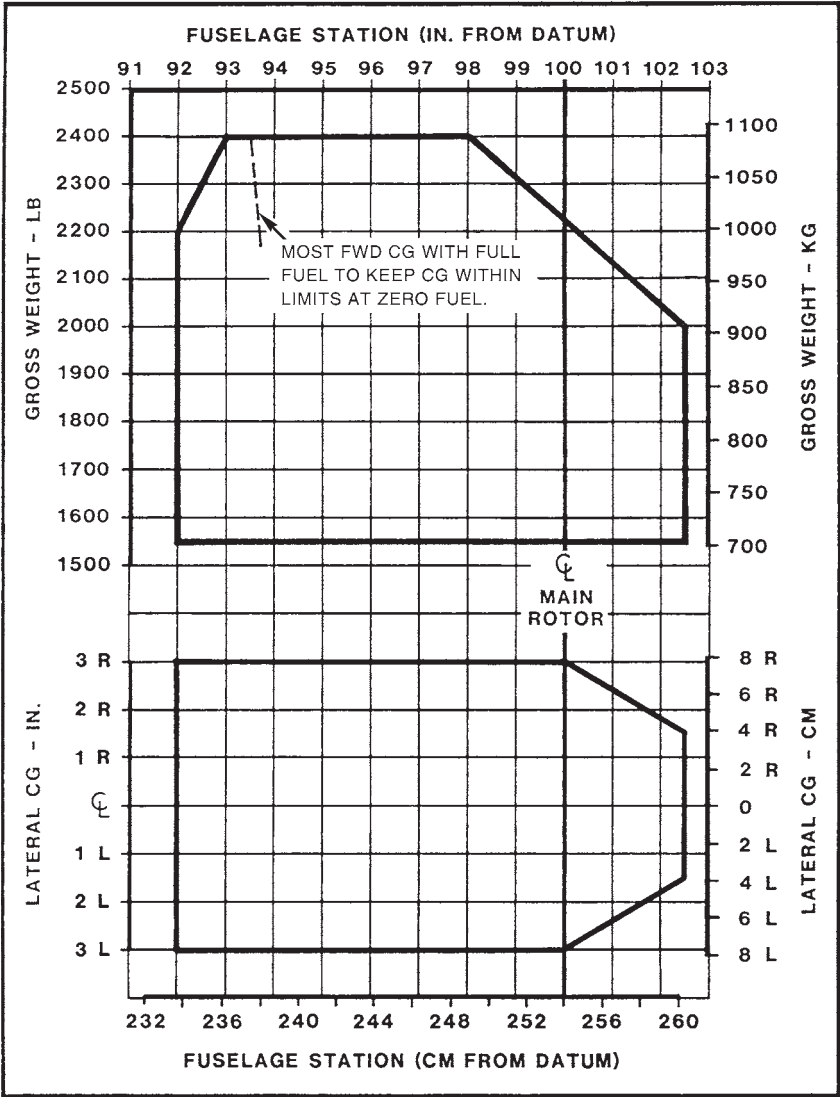
|   |                   |
|---|-------------------|
| Maximum gross weight                              | 2400 lb (1089 kg) |
| Minimum gross weight                              | 1550 lb (703 kg)  |
| Maximum per seat<br>including baggage compartment | 300 lb (136 kg)   |
| Maximum in any baggage<br>compartment             | 50 lb (23 kg)     |

**CENTER OF GRAVITY (CG) LIMITS**

See figure on page 2-4. Reference datum is 100 inches forward of main rotor shaft centerline.

***NOTE***

With all doors installed, a solo pilot weight of 150 lb (68 kg) or greater will ensure CG within limits. For lower pilot weight, compute weight and balance; removable ballast may be required to obtain CG at or forward of aft limit. (See Loading Instructions in Section 6.)



CENTER OF GRAVITY LIMITS

## **FLIGHT AND MANEUVER LIMITATIONS**

Aerobatic flight prohibited.

### ***CAUTION***

Abrupt control inputs may produce high fatigue stresses and cause catastrophic failure of a critical component.

Low-G cyclic pushovers prohibited.

### ***CAUTION***

A pushover (forward cyclic maneuver) performed from level flight or following a pull-up causes a low-G (near weightless) condition which can result in catastrophic loss of lateral control. To eliminate a low-G condition, immediately apply gentle aft cyclic. Should a right roll commence during a low-G condition, apply gentle aft cyclic to reload rotor before applying lateral cyclic to stop roll.

Flight prohibited with governor selected off, with exceptions for in-flight system malfunction or emergency procedures training.

Flight in known icing conditions prohibited.

Maximum operating density altitude 14,000 feet.

Maximum operating altitude 9000 feet AGL to allow landing within 5 minutes in case of fire.

Alternator, RPM governor, low rotor RPM warning system, OAT gage, and cyclic trim or hydraulic control system must be operational for dispatch.

Minimum crew is one pilot in the right front seat. A flight instructor may act as pilot in command from the left front seat. Solo flight from right seat only.

Forward left seat belt must be buckled.

Operation up to 100 KIAS approved with any combination of cabin doors removed. All seat belts must be buckled and loose items in cabin must be properly secured during doors-off flight.

A functioning headset must be worn by each pilot.

## **KINDS OF OPERATION LIMITATIONS**

VFR day and night operations are approved.

VFR operation at night is permitted only when landing, navigation, instrument, and anti-collision lights are operational. Orientation during night flight must be maintained by visual reference to ground objects illuminated solely by lights on the ground or adequate celestial illumination.

Note: There may be additional requirements in countries outside the United States.

## **FUEL LIMITATIONS**

### **APPROVED FUEL GRADES**

| <b>Grade</b>        | <b>Color</b>                | <b>Specification</b>                               |
|---------------------|-----------------------------|--|
| 100                 | Green                       | ASTM D910  |
| 100LL               | Blue                        |  |
| 100VLL              | Blue                        |  |
| UL 91               | Clear to Yellow<br>(no dye) | ASTM D7547   |
| UL 94               |                             |  |
| HJELMCO<br>91/96 UL | Clear to Yellow<br>(no dye) | Hjelmco Oil, Inc.<br>Sollentuna, Sweden            |
| 91                  | Yellow                      | TU 38.5901481-96<br>Ukrainian National<br>Standard |
| B91/115             | Green                       | GOST 1012-72<br>Russian National<br>Standard       |
| B95/130             | Amber                       |  |



**FUEL LIMITATIONS (cont'd)**

**FUEL CAPACITY**

|                         | Total Capacity<br>US gallons (liters) | Usable Capacity<br>US gallons (liters) |
|-------------------------|---------------------------------------|--|
| Tanks with bladders:    |                                       |  |
| Main tank               | 30.5 (115)                            | 29.5 (112)                             |
| Auxiliary tank          | 17.2 (65)                             | 17.0 (64)                              |
| Combined capacity       | 47.7 (180)                            | 46.5 (176)                             |
| Tanks without bladders: |                                       |  |
| Main tank               | 31.6 (120)                            | 30.6 (116)                             |
| Auxiliary tank          | 18.5 (70)                             | 18.3 (69)                              |
| Combined capacity       | 50.1 (190)                            | 48.9 (185)                             |

Note: Per R44 Service Bulletin SB-78B, fuel tanks without bladders should no longer be in service.

**INSTRUMENT MARKINGS**

***NOTE***

Red lines offset so instrument pointer should not enter red. See color code on page 2-1.

**AIRSPPEED INDICATOR**

|                 |                 |
|-----------------|-----------------|
| Green arc       | 0 to 110 KIAS   |
| Yellow arc*     | 110 to 130 KIAS |
| Red cross-hatch | 100 KIAS        |
| Red line        | 130 KIAS        |

\*Earlier airspeed indicators without yellow arc must have the following placard adjacent:

|  |
|--|
| <b>DO NOT EXCEED 110 KIAS EXCEPT IN SMOOTH AIR</b> |
|--|

**ROTOR TACHOMETER**

|                |            |
|----------------|------------|
| Lower red line | 90%        |
| Green arc      | 90 to 108% |
| Upper red line | 108%       |

**INSTRUMENT MARKINGS (cont'd)**

**ENGINE TACHOMETER\*\***

|                |             |
|----------------|-------------|
| Lower red line | 101%        |
| Green arc      | 101 to 102% |
| Upper red line | 102%        |

\*\*Earlier tachometers show green arc from 99 to 102% and lower red line at 99%.

**OIL PRESSURE**

|                  |               |
|------------------|---------------|
| Lower red line   | 25 psi        |
| Lower yellow arc | 25 to 55 psi  |
| Green arc        | 55 to 95 psi  |
| Upper yellow arc | 95 to 115 psi |
| Upper red line   | 115 psi       |

**OIL TEMPERATURE**

|           |                           |
|-----------|---------------------------|
| Green arc | 75 to 245°F (24 to 118°C) |
| Red line  | 245°F (118°C)             |

**CYLINDER HEAD TEMPERATURE**

|           |                            |
|-----------|----------------------------|
| Green arc | 200 to 500°F (93 to 260°C) |
| Red line  | 500°F (260°C)              |

**MANIFOLD PRESSURE**

|            |                     |
|------------|---------------------|
| Green arc  | 16.0 to 24.7 in. Hg |
| Yellow arc | 21.8 to 26.3 in. Hg |
| Red line   | 26.3 in. Hg         |

Yellow arc denotes variable MAP limits. See placard on page 2-9.

**CARBURETOR AIR TEMPERATURE**

|            |                |
|------------|----------------|
| Yellow arc | -19°C to + 3°C |
|------------|----------------|

**PLACARDS**

In clear view and readable by pilot in flight:

| LIMIT MANIFOLD PRESSURE - IN. HG           |        |      |      |               |      |      |      |      |
|--|--------|------|------|---------------|------|------|------|------|
| MAXIMUM CONTINUOUS POWER                   |        |      |      |               |      |      |      |      |
| PRESS<br>ALT-FT                            | OAT-°C |      |      |               |      |      |      |      |
|  | -30    | -20  | -10  | 0             | 10   | 20   | 30   | 40   |
| SL   | 22.6   | 22.9 | 23.2 | 23.5          | 23.8 | 24.1 | 24.4 | 24.7 |
| 2000                                       | 22.2   | 22.5 | 22.8 | 23.1          | 23.4 | 23.7 | 24.0 | 24.2 |
| 4000                                       | 21.8   | 22.2 | 22.5 | 22.8          | 23.1 | 23.4 | 23.7 | 23.9 |
| 6000                                       | 21.4   | 21.8 | 22.1 | FULL THROTTLE |      |      |      |      |
| FOR MAX TAKEOFF POWER (5 MIN), ADD 1.6 IN. |        |      |      |               |      |      |      |      |

| NEVER EXCEED SPEED - KIAS   |        |     |     |     |           |     |     |     |
|---|--------|-----|-----|-----|-----------|-----|-----|-----|
| 2200 LB TOGW & BELOW  |        |     |     |     |           |     |     |     |
| PRESS   | OAT-°C |     |     |     |           |     |     |     |
| ALT-FT  | -30    | -20 | -10 | 0   | 10        | 20  | 30  | 40  |
| SL  |        |     |     |     |           |     |     |     |
| 2000  |        | 130 |     |     |           |     | 127 | 123 |
| 4000  |        |     |     |     | 126       | 122 | 118 | 114 |
| 6000  |        |     | 126 | 122 | 117       | 113 | 108 | 103 |
| 8000  | 126    | 122 | 117 | 112 | 107       | 101 | 96  | 91  |
| 10000   | 117    | 112 | 106 | 101 | 95        | 90  | 85  |     |
| 12000   | 107    | 101 | 95  | 89  | NO FLIGHT |     |     |     |
| 14000   | 95     | 89  |     |     |           |     |     |     |
| OVER 2200 LB TOGW, SUBTRACT 10 KIAS<br>FOR AUTOROTATION, SUBTRACT 30 KIAS |        |     |     |     |           |     |     |     |

Note: Earlier placards do not include MAP and  
airspeed limits at -30°C.

**PLACARDS (cont'd)**

Near main fuel tank filler cap:

FUEL  
100 OCT MIN GRADE AVIATION GASOLINE

or

FUEL  
AVIATION GASOLINE – GRADE 100 LL  
OR SEE PILOT'S HANDBOOK

Near aux fuel tank filler cap:

AUX FUEL  
100 OCT MIN GRADE AVIATION GASOLINE

or

AUX FUEL  
AVIATION GASOLINE – GRADE 100 LL  
OR SEE PILOT'S HANDBOOK

Near fuel shut-off valve:

FUEL

On fuel shut-off valve:

ON OFF

Near main tank fuel gage:

For bladder style tank

29.5 US GAL

For aluminum (non-bladder) tank

30.6 US GAL

**PLACARDS (cont'd)**

Near aux tank fuel gage:

For bladder-style tank

AUX 17.0 US GAL

For aluminum (non-bladder) tank

AUX 18.3 US GAL

In clear view of pilot:

MINIMUM SOLO PILOT WEIGHT 150 LB  
(SEE PILOT'S HANDBOOK)

or

SEE PILOT'S HANDBOOK FOR SOLO PILOT  
WEIGHT LESS THAN 150 LB (68 KG)

THIS ROTORCRAFT APPROVED FOR  
DAY AND NIGHT VFR OPERATIONS

LOW-G PUSHOVERS PROHIBITED

On removable cyclic grip:

SOLO FROM RIGHT SEAT ONLY

On or near collective controls:

NO STOWAGE  
KEEP AREA CLEAR

On aircraft without ashtray, in clear view of all occupants:

NO SMOKING

On aircraft with ashtray, in clear view of all occupants:

NO SMOKING IN FRONT SEATS

**PLACARDS (cont'd)**

Inside each baggage compartment:

**CAUTION**

DO NOT EXCEED ANY OF THE FOLLOWING:

- COMPARTMENT CAPACITY: 50 LB MAX
- COMBINED SEAT PLUS COMPARTMENT: 300 LB MAX
- ROTORCRAFT GROSS WEIGHT LIMIT

SEE ROTORCRAFT FLIGHT MANUAL FOR ADDITIONAL  
LOADING INSTRUCTIONS.