Airspeeds for Safe Operation

- Yellow arc power (AVGAS, 5 min max) .30 kt IAS max
- Take-off and climbs .....50 kt IAS
- Best range .....80 kt IAS
- Autorotation .....50 kt IAS
- V_{NE} power on .....130 kt IAS (−2 kt / 1000 ft Zp)
- V_{NE} power off .....110 kt IAS (−2 kt / 1000 ft Zp)

Descriptive Data (RFM Sec. 1)

Main rotor

- Type: articulated, soft-in-plane
- 3 blades, diameter 7.20 m (23.6 ft)
- Nominal speed: 530 RPM
- Blade chord: 180 mm (7.1 in)
- **Clockwise rotation** (viewed from above) — opposite to most US types

Tail rotor (Fenestron)

- Shrouded (fenestron) — 7 blades
- Diameter: 600 mm (23.6 in)
- Nominal speed: 5148 RPM
- Advantages: safety on ground, lower noise, better efficiency in crosswind

Transmission

- Primary: belt drive, ratio 0.855:1
- MGB: spiral bevel gear, ratio 11:47
- TGB: spiral bevel gear, ratio 25:11

Powerplant

- Lycoming O-360-J2A, 4-cyl horizontally opposed
- Displacement: 5.9 L (361 cu.in)
- Air cooled, direct drive, normally aspirated, carbureted
- MCP: 108 kW (145 hp) @ 2585–2700 RPM
- 5-min rated (AVGAS, ≤30 kt): 119 kW (160 hp) @ 2585–2700 RPM
- Nominal engine speed: 2650 RPM
- Ignition: 1 Bendix magneto + 1 LSE Plasma II HG electronic

Fuel system

- Tank capacity: 170 L (45 USG), unusable 1.5 L
- Approved: AVGAS 100LL, AVGAS UL91 (unrestricted)
- Alternate: automotive unleaded (RON ≥98, zero alcohol) — limited to MCP, fuel gauge may be inaccurate
- All types mixable; limitations apply as soon as alternate fuel is in tank
- Gravity feed + electric boost pump

Electrical system

- 14 V DC, alternator + battery
- BARC: backup alarm device (fuel and rotor) — works with MASTER OFF
- With MASTER OFF + NR switch on Backup: NR lights (High/Normal/Low) and LOW FUEL caution remain operative

Weight & balance

- MTOW: 700 kg (1543 lb)
- Typical empty weight: ∼420 kg (varies by equipment)
- Useful load: ∼280 kg
- CG envelope: see W&B diagram (RFM p. 2-11)
- Rotor axis: X = 2000 mm

Limitations (RFM Sec. 2)

General

- Day VFR only (night VFR with supplement J40-901)
- Aerobatic flight prohibited
- Flight in known icing prohibited
- Voluntary in-flight engine shutdown / declutching prohibited
- Min crew: 1 pilot, right seat
- Max operating altitude: 13 000 ft Zp
- OAT: −20 °C to ISA+30 °C (max +45 °C)

Rotor speed limits

Power on: green arc 515–540 RPM, max 540, min 515.

Power off: max 610, caution 540–610, normal 515–540, caution 450–515, min 450, transient min 410.

Rotor brake: max 150 RPM. NR horn high >594, low <466.

Engine limits

- Engine speed: 2585–2700 RPM (normal), max 2700
- CHT max: 260 °C; recommended shutdown max: 180 °C
- Oil T max: 118 °C; min for full power: 60 °C
- Oil P: max 7.9 bar; flight max 6.6 bar; T/O min 3.8 bar (CLUTCH off); idle min 1.7 bar
- Fuel P: max 0.55 bar; min 0.02 bar

MLI / Power indication

- **PWR limit** (red radial): 5-min power, 119 kW (160 hp). AVGAS only, max 30 kt, oil temp ≥60 °C.
- **Yellow arc threshold**: MCP, 108 kW (145 hp). After 1 min in yellow, 5-min countdown appears. Conditions for yellow arc use: AVGAS only, ≤30 kt IAS, oil temp ≥60 °C.
- **FLO limit**: full throttle power. Red FLO arc cannot be exceeded mechanically.
- Using alternate fuel (automotive gasoline) forbids use of yellow arc.

Sensor failures

If any EPM sensor shows “Failed” after self-test, only one flight is permitted with the following restrictions: use Section 5 performance charts, control carb heat manually below 80% MLI, monitor related parameters.

Emergency Procedures (RFM Sec. 3)

Power failures

Hover below 8 ft AGL: counter yaw with left pedal, cushion with collective, lower collective once landed.

During take-off: most critical situation — counter yaw with left pedal, use aft cyclic to level. Before 30 kt do not lower collective. Above 30 kt slightly pitch up while lowering collective. Cushion contact with collective.

Other in-flight: lower collective immediately to maintain full Nr. Use pedals for yaw. Maintain 30–50 kt IAS (50 kt recommended). Select landing area into wind. Adjust collective to keep Nr in green arc. At ∼60 ft AGL flare smoothly. Below 50 kt this will not stop sink rate. Level

with forward cyclic while raising collective. Average manoeuvre requires 200–300 m (650–1000 ft) clear of obstacles.

Above 2000 ft AGL: best glide at ∼80 kt (no wind). Recommended Nr mid-yellow arc (480 RPM). At ∼300 ft reduce to 50 kt, check Nr green, proceed as above. Practical glide ratio 2:1 to 3:1, or 0.7–1 NM per 2000 ft AGL.

In-flight engine restart: only when autorotation stabilized with sufficient time. Stabilize autorotation, check boost pump ON, fuel valve OPEN, mixture RICH, both ignitions ON upward, ∼50% throttle, press starter. Governor may be engaged or not. Be prepared for yaw to the left if power recovers.

Land immediately

- **Engine fire (in flight)** — cabin heater OFF, enter autorotation, fuel valve OFF, fuel pump OFF. Above 8000 ft: increase to 90 kt to accelerate descent. Pull rotor brake after landing, wait for rotor stop.
- **Electrical fire (continues)** — if fire persists after alternator OFF + master OFF: land immediately.
- **Tail rotor failure (hover IGE)** — detected by sudden yaw to left and/or ineffective pedals. Land immediately, reduce throttle to reduce left yaw rate, cushion with collective.
- **Yaw control failure (hover IGE)** — lower collective smoothly while rolling off throttle to reduce yaw.
- **OIL P red warning light** — low oil pressure, engine seizure risk. Land immediately.
- **LOW FUEL red** (<10 L / 2.6 USG on EPM) — land immediately.
- **CO alarm** with symptoms (headache, dizziness) — cabin heater OFF, open vents, change heading. If symptoms: land immediately.
- **MGB/TGB chips** accompanied by vibration, noise, or MGB temperature rise — land immediately.

Land as soon as possible

- **CHT red arc** (stays) — if hovering, depart in translation. If in flight, reduce power. Once landed, keep nominal Nr for cooling.
- **Oil T red arc** (stays) — same as CHT. Reduce power, land, keep Nr for cooling.
- **Oil P red arc** (>7.9 bar / 115 PSI, stays) — reduce power.
- **Oil P yellow arc** (6.6–7.9 bar, stays) — normal at cold start/warm-up. In flight: reduce power.
- **Oil P yellow arc** (1.7–3.6 bar / 25–52 PSI) — normal at idle. CLUTCH light may appear at this range (normal). Monitor OIL P warning light — if it illuminates: land immediately.
- **Fuel P high** (>0.55 bar / 8 PSI) — switch boost pump OFF, check for decrease.
- **Fuel P low** (<0.03 bar / 0.5 PSI) — check boost pump ON, reduce power, Vy 50 kt. If pump already ON → land immediately.
- **ALT amber** (yellow on EPM = not charging) — check ALT switch ON. If yellow: battery draining, turn off non-essential equipment. Caution: prolonged flight without alternator = loss of electronics.
- **CLUTCH amber** (continuous) — clutch pressure low or belt worn. Reduce IAS to 50 kt. Be prepared to enter autorotation.
- **Electrical fire** (stops after switching off) — determine source. If resolved, switch other systems back on. Land as soon as possible.
- **Tail rotor / yaw control failure (in flight)** — 70–80 kt IAS, adjust power to minimize sideslip, running landing. Prefer wind from the right. Enter autorotation, roll off throttle, land with as much airspeed as surface permits.
- **EPM complete loss** — switch NR to Backup, control carb heat manually (COLD at high power, HOT at low power). If LOW FUEL lights visible in this case: land immediately.
- **Carb T yellow** (stays, possible icing) — move carb heater to HOT if necessary. If condition persists, avoid prolonged flight at low power. Land as soon as possible with a cautious approach.
- **MGB T° amber** (stays, with noise/vibration) — move to 50–80 kt IAS in translation.
- **LOW FUEL amber** (≈12 L / 3.2 USG) — avoid sideslips and sharp manoeuvres. If EPM reads <10 L: land immediately.

Continue flight

- **GOV OFF blue** (steady) — governor disengaged. Control engine/rotor speed with twist grip. Continue flight.
- **GOV OFF blue** (blinking) — governor inoperative. If rotors desynchronized from engine: apply collective to resynchronize. If blinking stops: continue flight, keep rotor synchronized. If blinking continues and rotors are synchronized with engine: disengage governor, control Nr with twist grip. Continue flight.
- **Engine governor failure** — detected by Nr not regulated in green arc, throttle not at extreme, speed changes in level flight, GOV light blinking. Hold twist grip firmly, overtake governor. Switch governor OFF. Regulate Nr in green arc with twist grip. Continue flight. *Always stabilize Nr before switching governor off.*
- **MLI failure** — XXX on MLI display. Above 5500 ft Zp: limited by full throttle. Below 5500 ft: do not exceed 80 kt IAS. Cautious landing requiring not more power than previous take-off.
- **MLI degraded modes** (yellow display) — parameter lost (engine speed, throttle, OAT, or ambient pressure). Continue flight.
- **BATT yellow** (green/white on EPM charge indicator) — battery is being charged normally. Have alternator regulator serviced after flight.
- **Oil T yellow arc** — allow engine to warm up. Wait before applying full power.
- **Loss of engine speed sensor** — XXX on engine EPM. Refer to NR indicator for rotor speed. Overtake governor by firmly gripping twist grip. Switch governor OFF. Regulate throttle manually. Continue flight.
- **Loss of main rotor speed sensor** — XXX on rotor EPM. Keep powered flight, no fast descent or autorotation practice. Refer to NM indicator. Continue flight.
- **BRAKE amber** — rotor brake engaged. Disengage and lock.

Caution / Warning Lights Summary

- **STARTER amber** (stays on after release) — pull mixture OFF to stop engine, switch MASTER OFF. Starter relay stuck — have it serviced.
- **NR High amber** — raise collective or reduce throttle.
- **NR Low amber** — lower collective or increase throttle.
- Blinking light = yellow arc on EPM tachometer.
- Continuous light warns when approaching red limit.

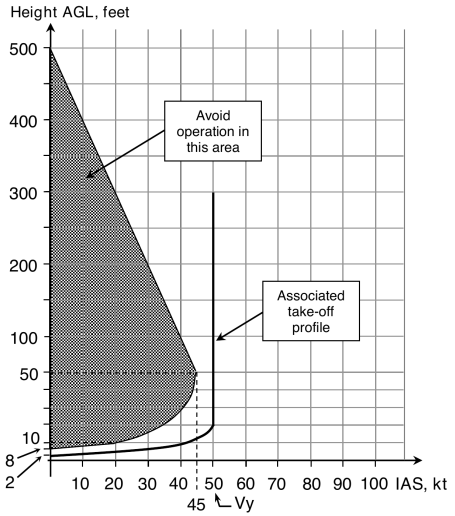
Aural Warnings

- **Continuous tone (loud horn)** — rotor speed approaching low limit.
- **Intermittent tone** — rotor speed approaching high limit.
- **Short tone** — LOW FUEL warning light comes on.
- **Continuous beep** — oil pressure lost with plasma ignition ON; or engine ignition HOT at startup; or plasma ignition left ON with MASTER OFF.
- Horn can be temporarily muted with NR switch to MUTE; reengages when condition clears.

Performance Diagrams (RFM Sec. 5)

Height-Velocity Diagram (p. 5-3)

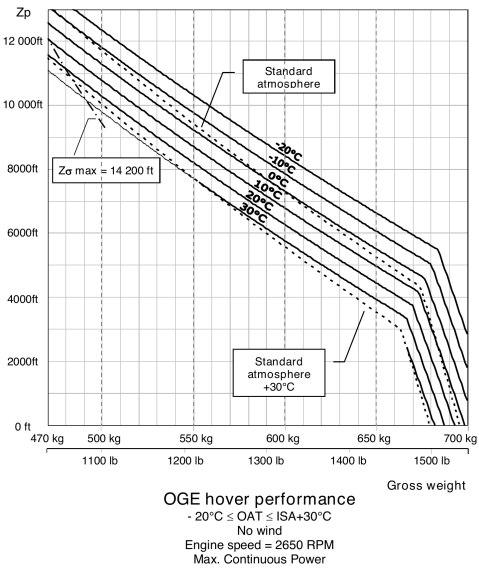
Height-Velocity diagram



Avoid the shaded area — no safe autorotation possible. During T/O, limit RoC to 500 ft/min below 100 ft AGL. Same envelope demonstrated regardless of altitude/temperature.

OGE Hover Performance (p. 5-4)

Hover Out of Ground Effect



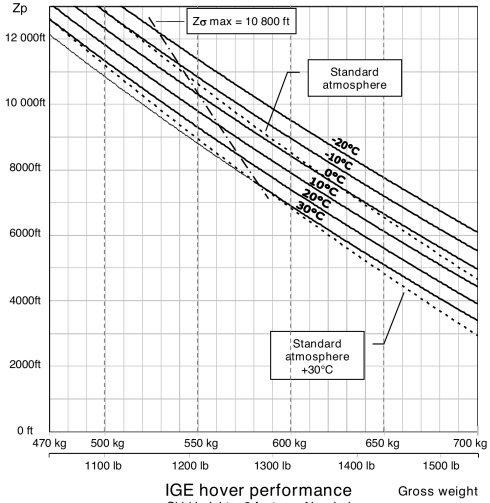
OGE hover performance
- 20°C ≤ OAT ≤ ISA+30°C
No wind
Engine speed = 2650 RPM
Max. Continuous Power

Z_σ max = 14 200 ft. No wind, 2650 RPM, max continuous power. −20 °C ≤ OAT ≤ ISA+30 °C.

IGE Hover Performance (p. 5-5)

Z_σ max = 10 800 ft. Skid height 2 ft, no wind, 2650 RPM, max continuous power.

Hover In Ground Effect



IGE hover performance

Skid height = 2 feet - No wind
- 20°C ≤ OAT ≤ ISA+30°C
Engine speed = 2650 RPM
Max. Continuous Power

A wind speed of 35 kt at all headings was demonstrated at sea level.
A wind speed of 25 kt at all headings was demonstrated at maximum reduced weight
(M/σ_{max} = 835 kg, refer to following pages for reduced weight computation).