# ROBINSON HELICOPTER COMPANY


# R66 Familiarization & Pilot Check-out Course

# Course Objectives

- The objective of this course is to qualify a helicopter pilot/instructor to be able to act as pilot in command and/or instruct in the Robinson R66 helicopter.
- COURSE COMPLETION STANDARDS:
  - This course will be complete when the pilot/instructor passes the end of course written examination with a score of at least 80% and has satisfactorily completed the end of course flight evaluation.
- COURSE PREREQUISITES:
  - This course is intended for pilots/instructors who hold a rotorcraft – helicopter category rating on their pilot certificate and/or flight instructor certificate.
- COURSE CONTENT:
  - This course consists of five hours of ground training and five hours of flight training. The flight and ground training can be accomplished concurrently .

# Ground Training Outline

- Lesson 1:
  - Basic Specifications
  - Systems & Features
  - Required Documents
  - Handling & Maintenance
- Lesson 2:
  - Limitations
  - Normal & Emergency Procedures
  - Performance
  - Weight & Balance
  - Safety Tips/Safety Notices
- Lesson 3 (at aircraft):
  - Preflight Procedures
  - Use of Checklist
  - Cautions
- Lesson 4:
  - Written Exam

# Flight Training Outline

- Lesson 1: Normal Flight Maneuvers
- Lesson 2: Advanced Maneuvers
- Lesson 3: Maneuver Review
- Lesson 4: Confined Area/Ridgeline Ops.
- Lesson 5: Flight Examination

# Flight Lesson 1 Content

1. Before engine starting
2. Engine starting
3. Engine run-up
4. Air work
    a. straight & level
    b. turns
    c. climbs/descents
5. Hovering
    a. forward, rearward, sideward
    b. turns
    c. hover taxi
    d. air taxi
    e. quick-stops
6. Takeoffs
    a. to a hover
    b. normal takeoff
    c. crosswind takeoff
    d. maximum performance takeoff
7. Approaches
    a. normal approach
    b. crosswind approach
    c. steep approach
    d. shallow approach
    e. go-around
8. Landings
    a. from a hover
    b. slope landings
    c. running landings
9. Traffic patterns
10. Autorotations
    a. straight in autorotations
        1) power recovery
        2) touchdown
    b. hovering autorotations

# Flight Lesson 2 Content

1. Review normal maneuvers from lesson one
2. 180 degree autorotations
3. Maneuvering in autorotation
   a. Turns
   b. Varying airspeed
   c. Using pedals
4. Simulated engine failure (forced landing)
5. Settling with power/vortex ring state
6. Low rotor speed recovery (oral discussion only)

# Flight Lesson 3 Content

1. Review all maneuvers as necessary

# Flight Lesson 4 Content

1. Confined area operations
2. Pinnacle/ridgeline operations
3. Platforms

# Flight Lesson 5 Content

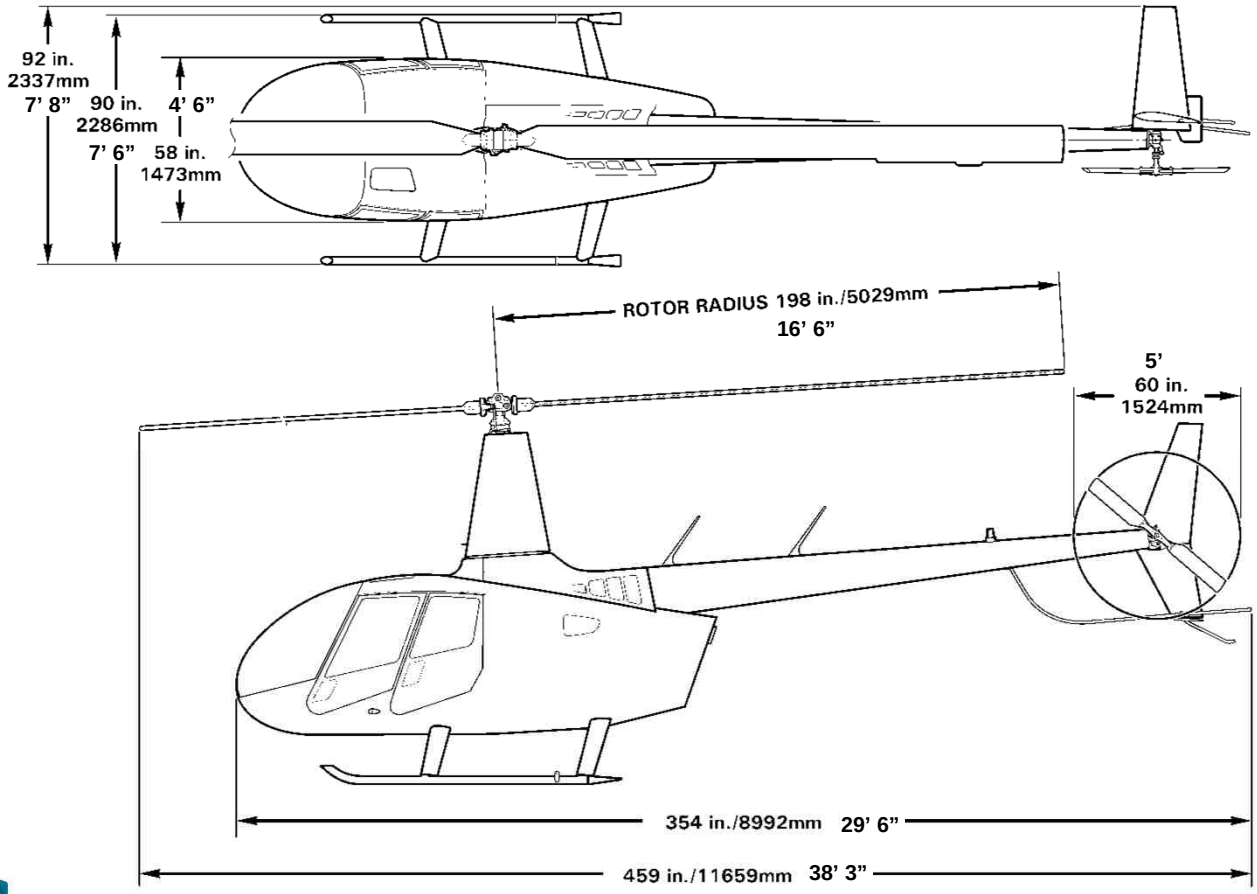
- One-hour flight examination covering:
  1. Normal maneuvers
  2. Advanced maneuvers
  3. Autorotations

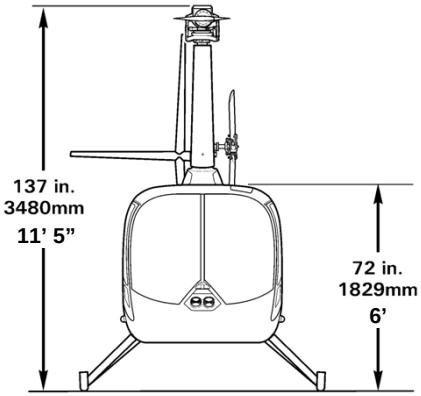
# GROUND TRAINING

# LESSON 1

- Basic Specifications
- Systems & Features
- Required Documents
- Handling & Maintenance

# R66 Basic Dimensions

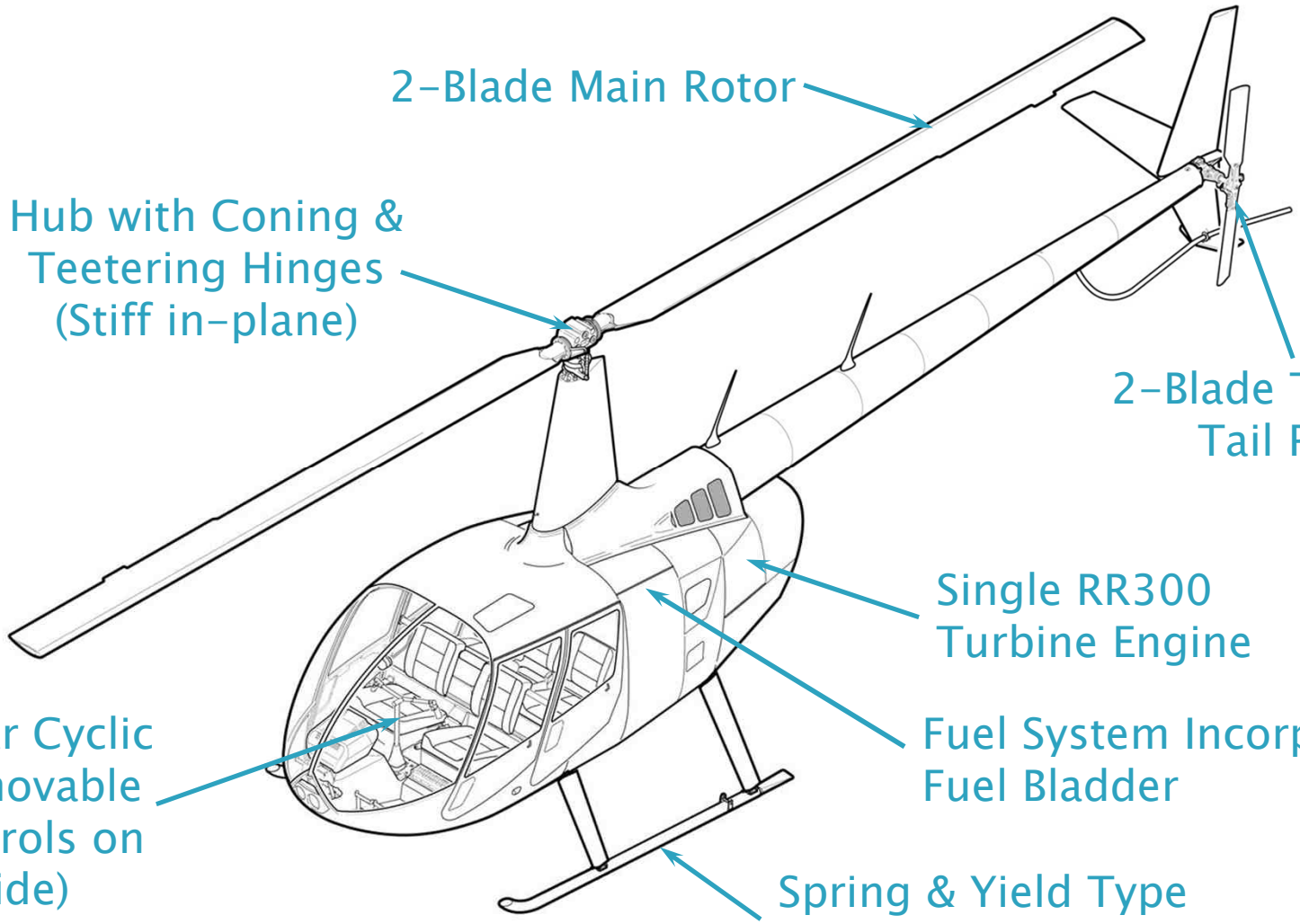


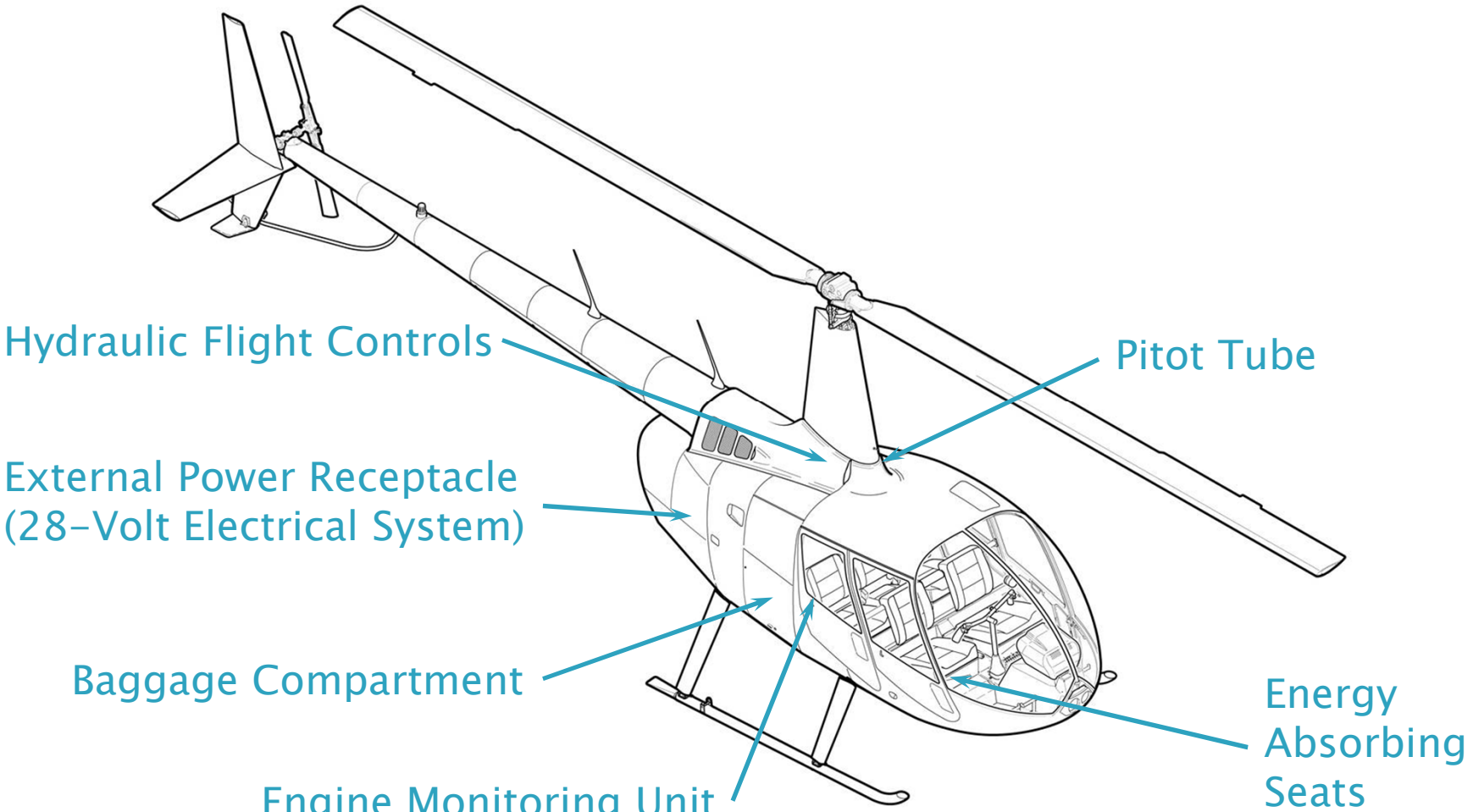
# R66 Basic Specifications

| | |
|---|---|
| Number of Seats | 5 |
| Approx. Basic Empty Weight | 1280 lb |
| Maximum Gross Weight | 2700 lb |
| Usable Fuel Capacity | 73.6 gal (493 lb) |
| Powerplant: | |
| ◦ Rolls-Royce 250-C300/A1 | |
| ◦ Type Certificate No. E4CE | |
| Engine Ratings: | |
| ◦ Rolls-Royce 5 Minute Takeoff | 300 hp at 6016 rpm |
| ◦ Rolls-Royce Continuous | 240 hp at 6016 rpm |
| ◦ Robinson 5 Minute Takeoff Rating | 270 hp at 6016 rpm |
| ◦ Robinson Max Continuous Rating | 224 hp at 6016 rpm |

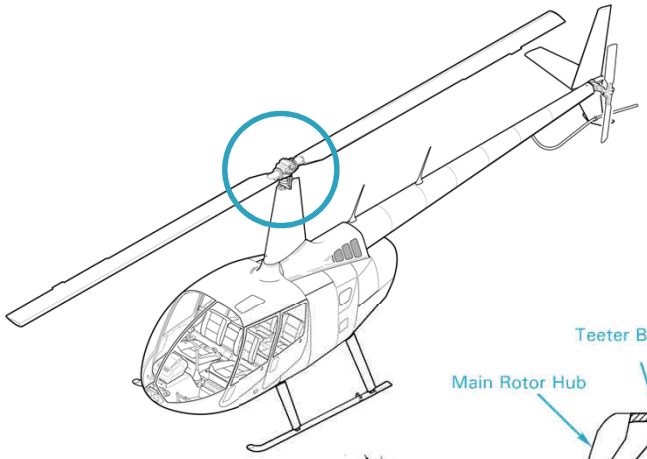
# R66 Features

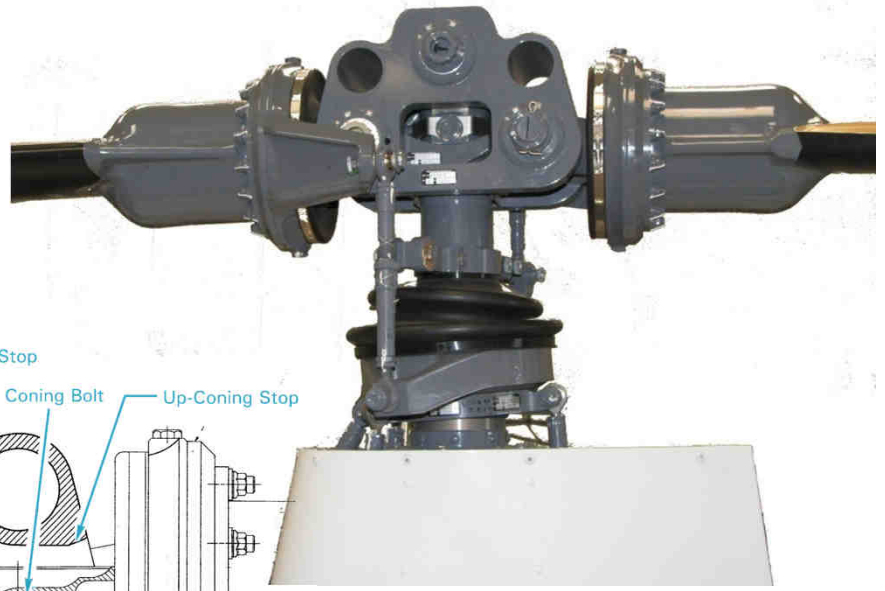


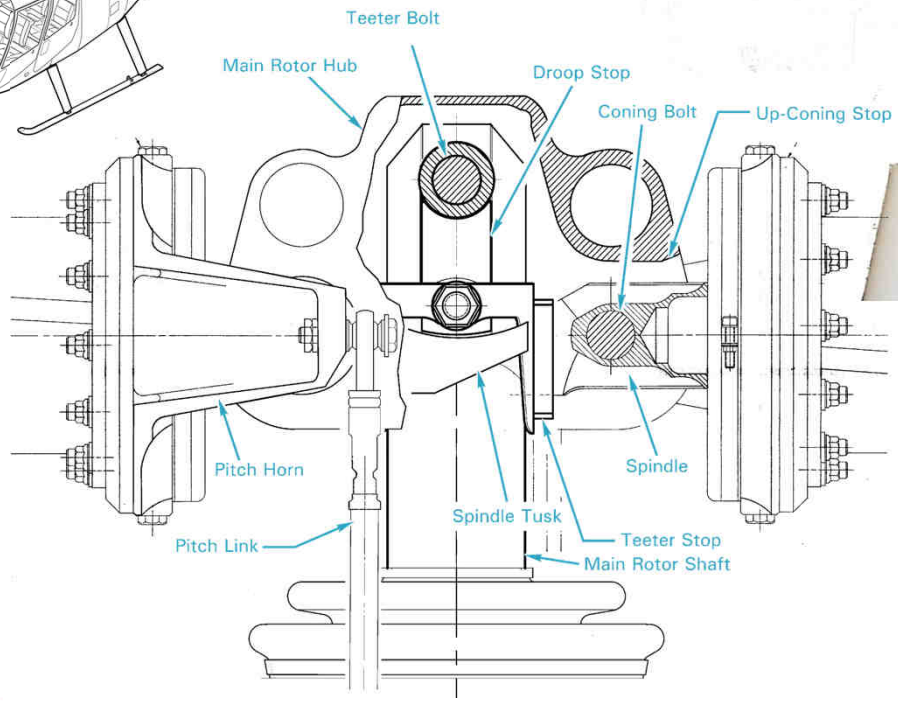
# R66 Features



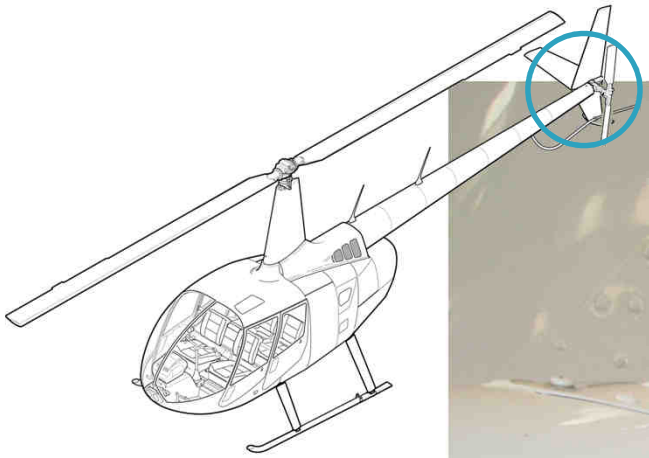
# R66 Main Rotor

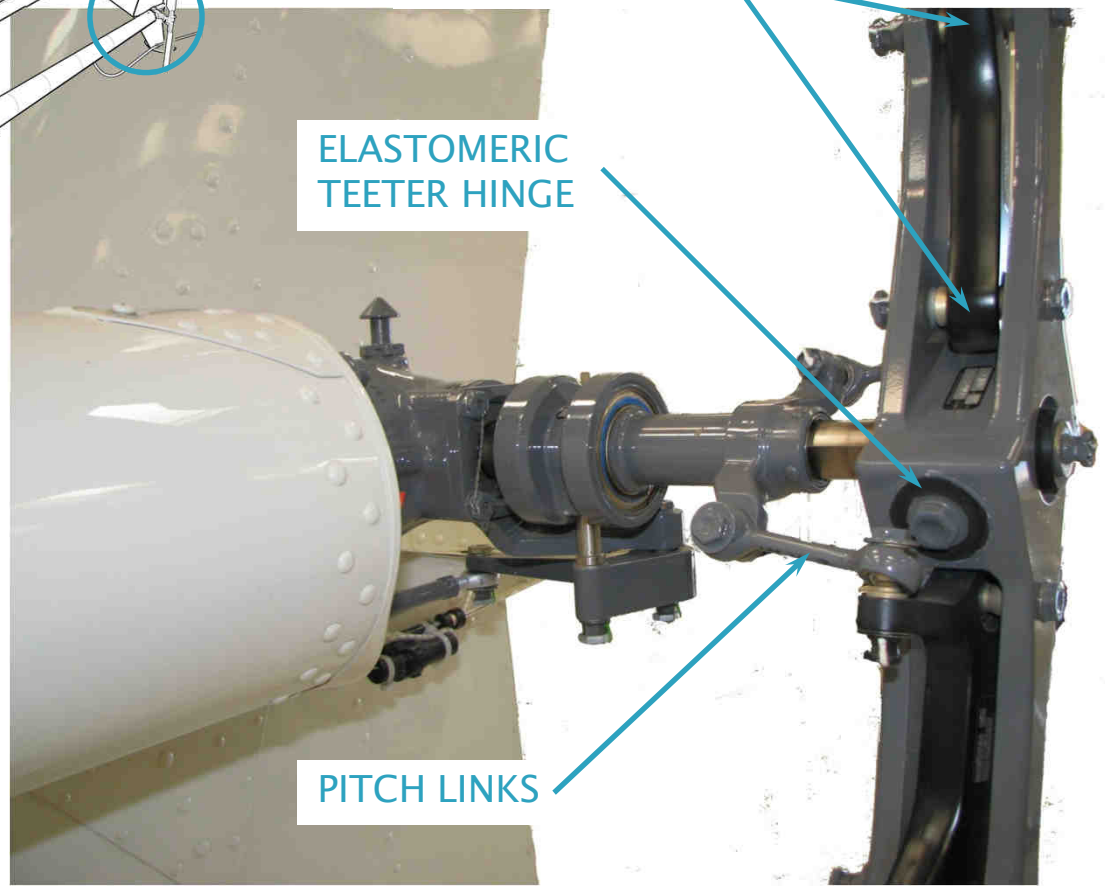






# R66 Tail Rotor

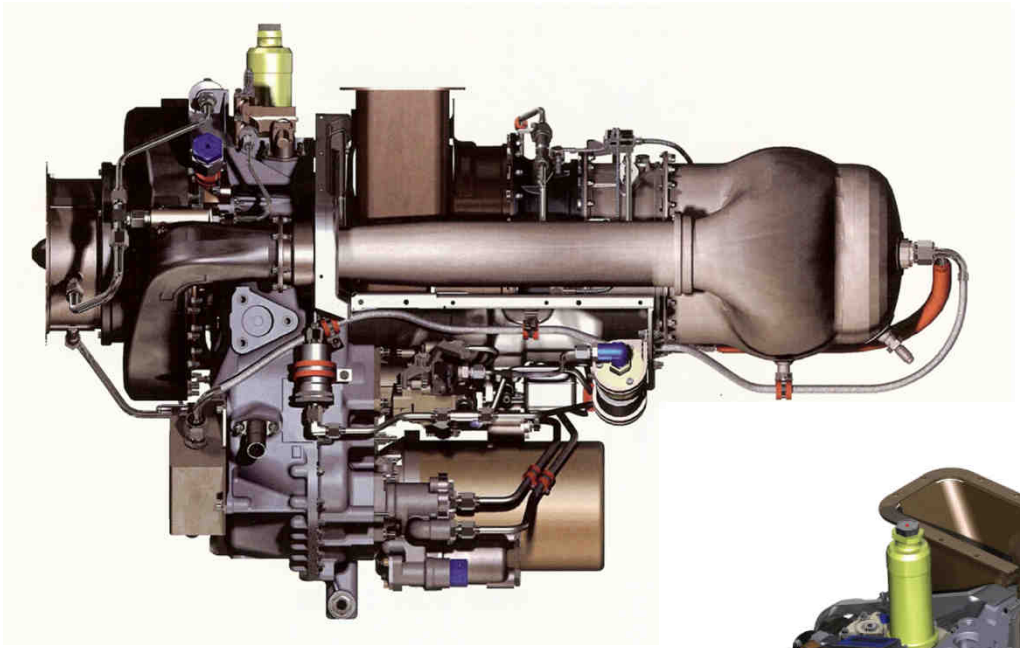




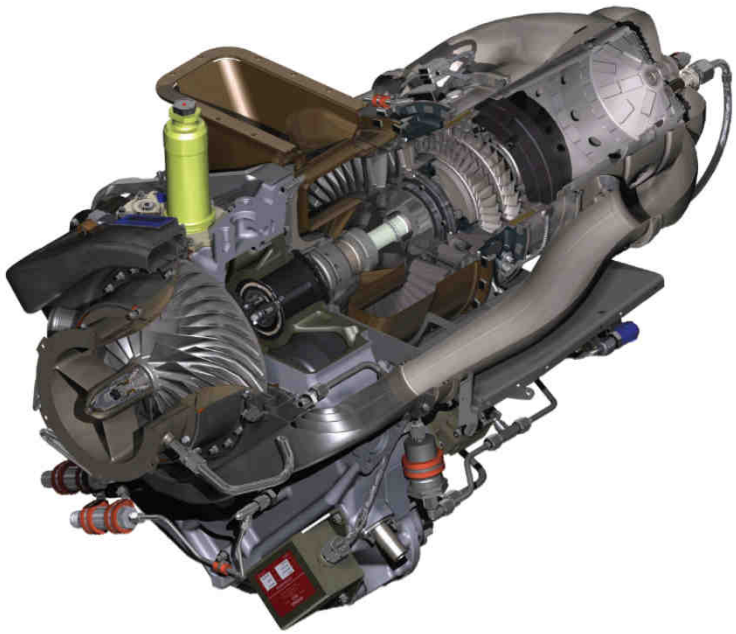
# R66 Right Side

# R66 Left Side

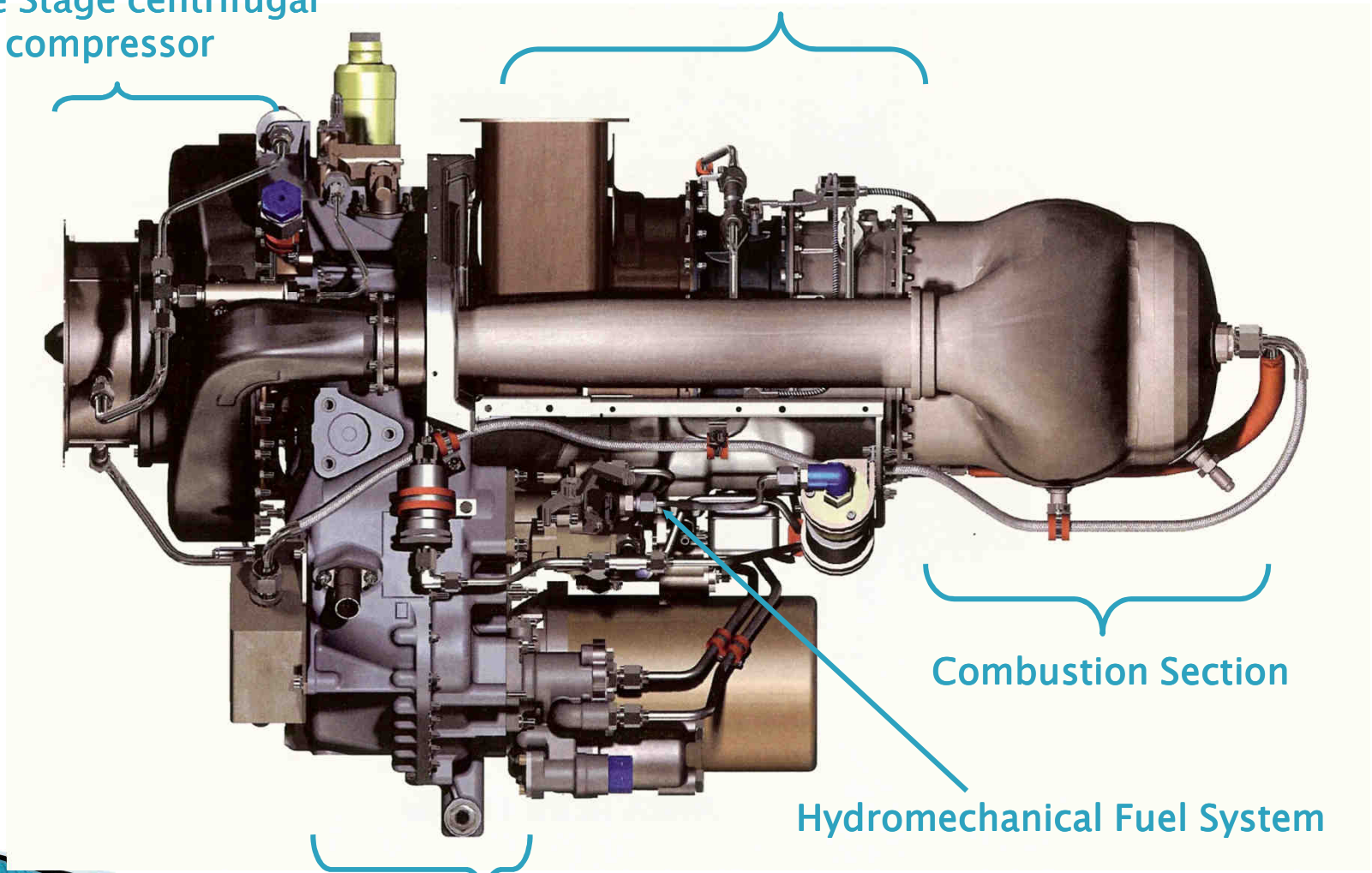
# R66 Engine



ROLLS-ROYCE
RR300



# R66 Engine

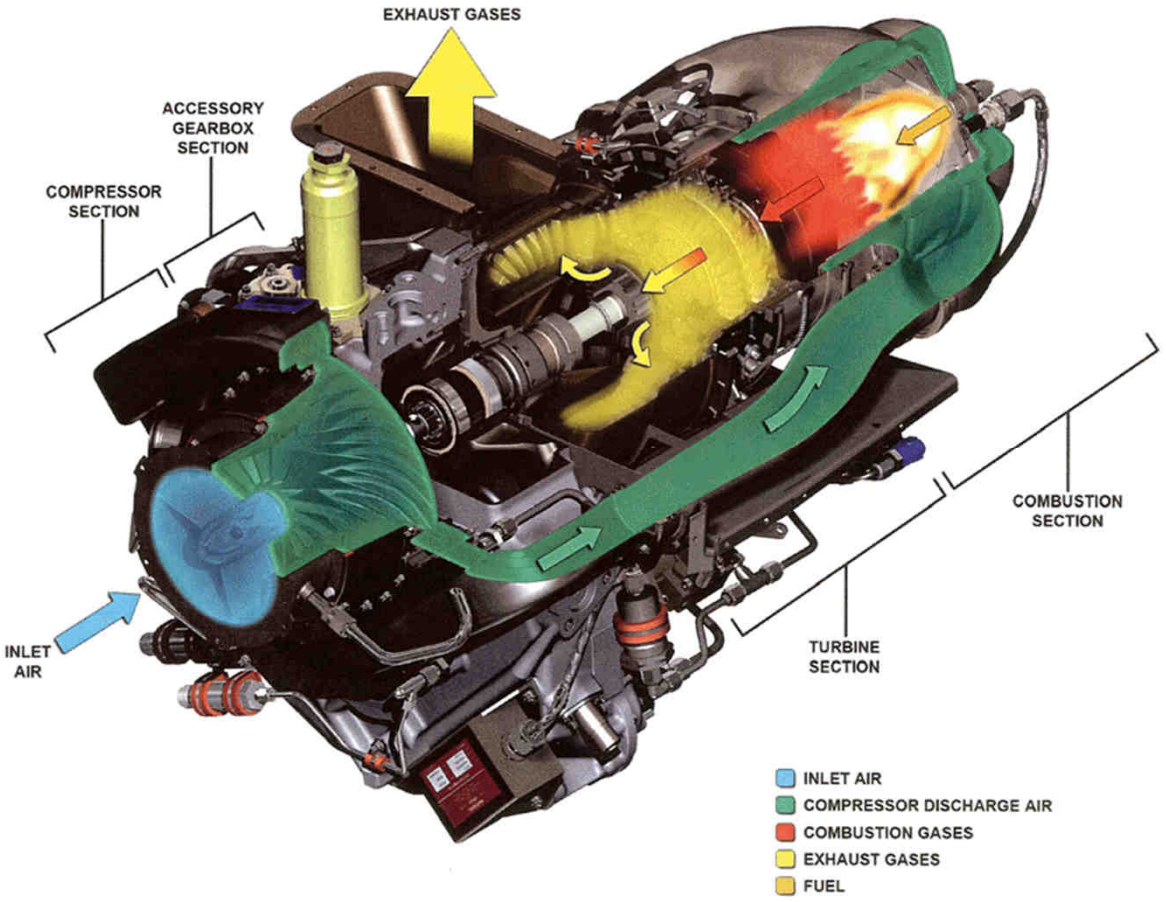

Single Stage centrifugal compressor
Four Stage Gas Coupled Turbine
Combustion Section
Hydromechanical Fuel System
Gearbox

# Engine Airflow & Combustion

Air drawn into the inlet is compressed and delivered to the combustion chamber via the diffuser and air discharge tubes.

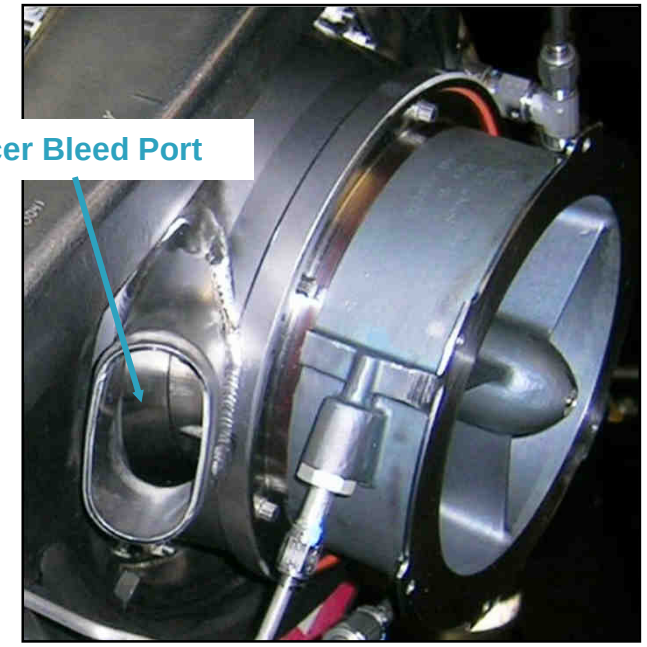
Fuel is added resulting in thermal expansion.

The hot gas is directed through the turbine sections where the energy is extracted by the turbine wheels to drive the compressor and helicopter transmission.



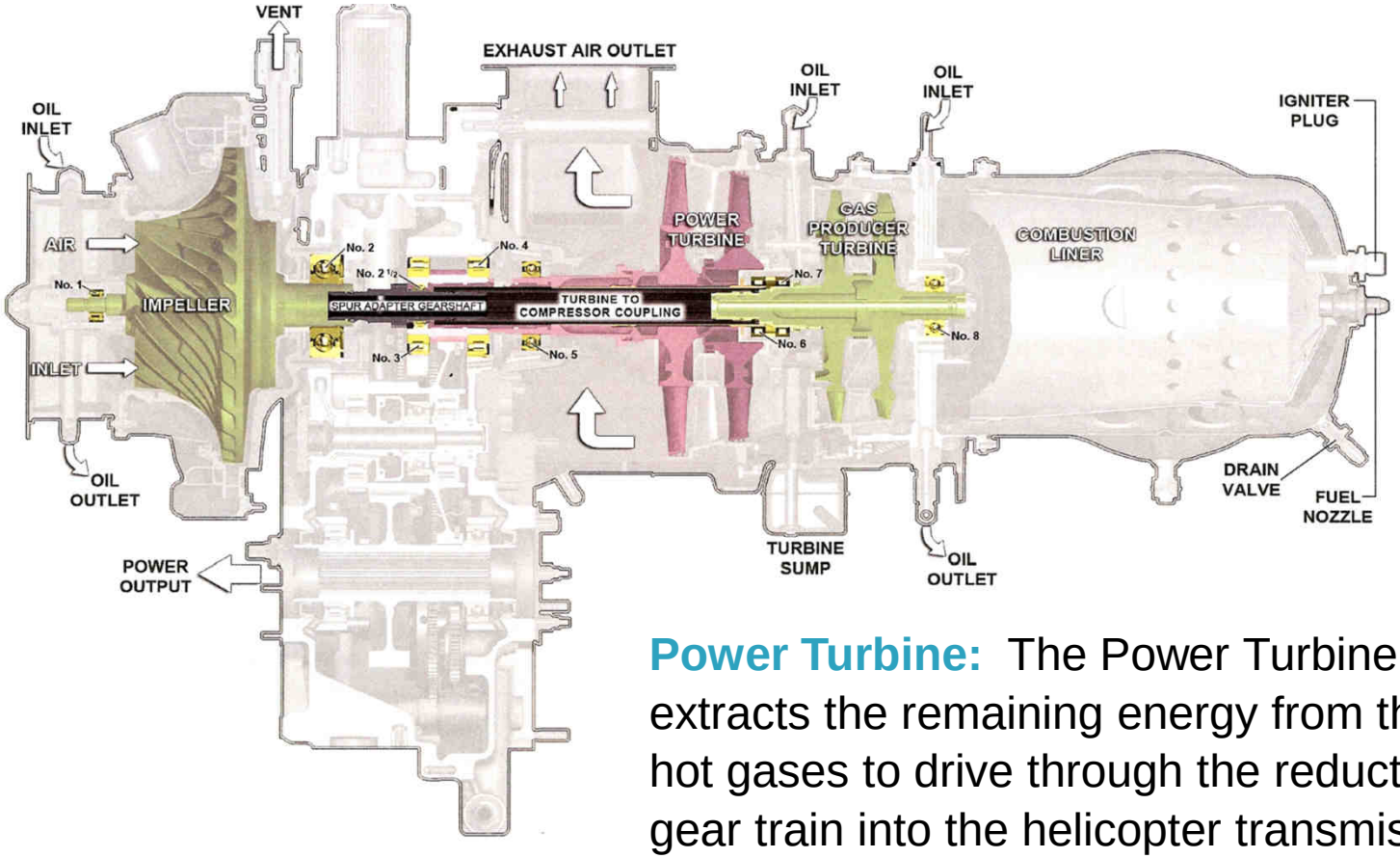
# Compressor Inducer Bleed

- In some older engines, certain airflow conditions can lead to aerodynamic stall of the compressor blades which can lead to a complete loss of engine compression – known as “Compressor Surge”.
- Compressor surge control is accomplished via an inducer bleed system. This system bleeds air from the entrance to the impeller splitter vanes during low RPM and dumps it overboard.
- During higher RPM, compressor demand will suck air in through the inducer.



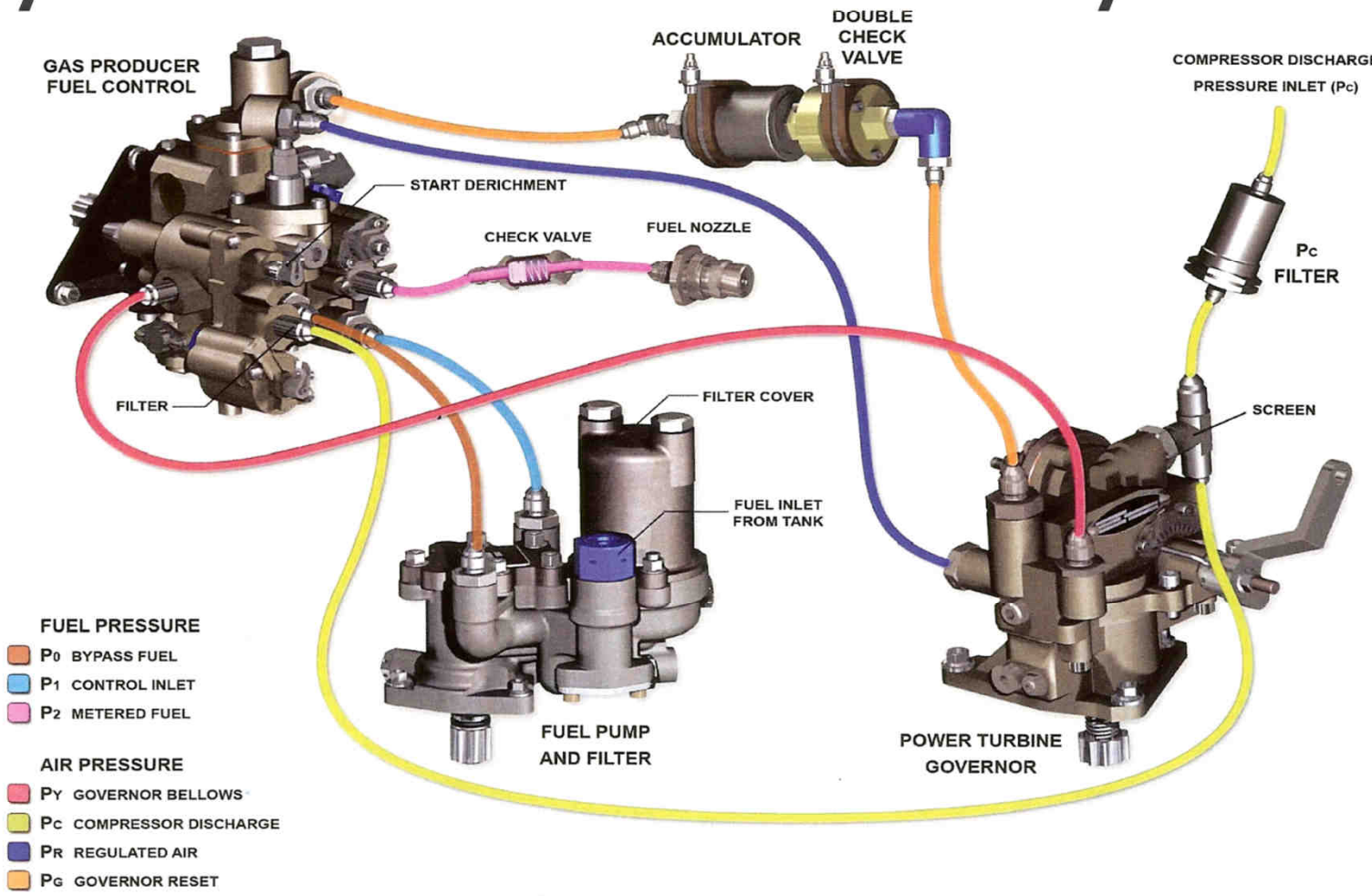
# Turbines

**Gas Producer Turbine:** The main function of the GP turbine is to drive the compressor, oil pump and fuel system accessories.




**Power Turbine:** The Power Turbine extracts the remaining energy from the hot gases to drive through the reduction gear train into the helicopter transmission.

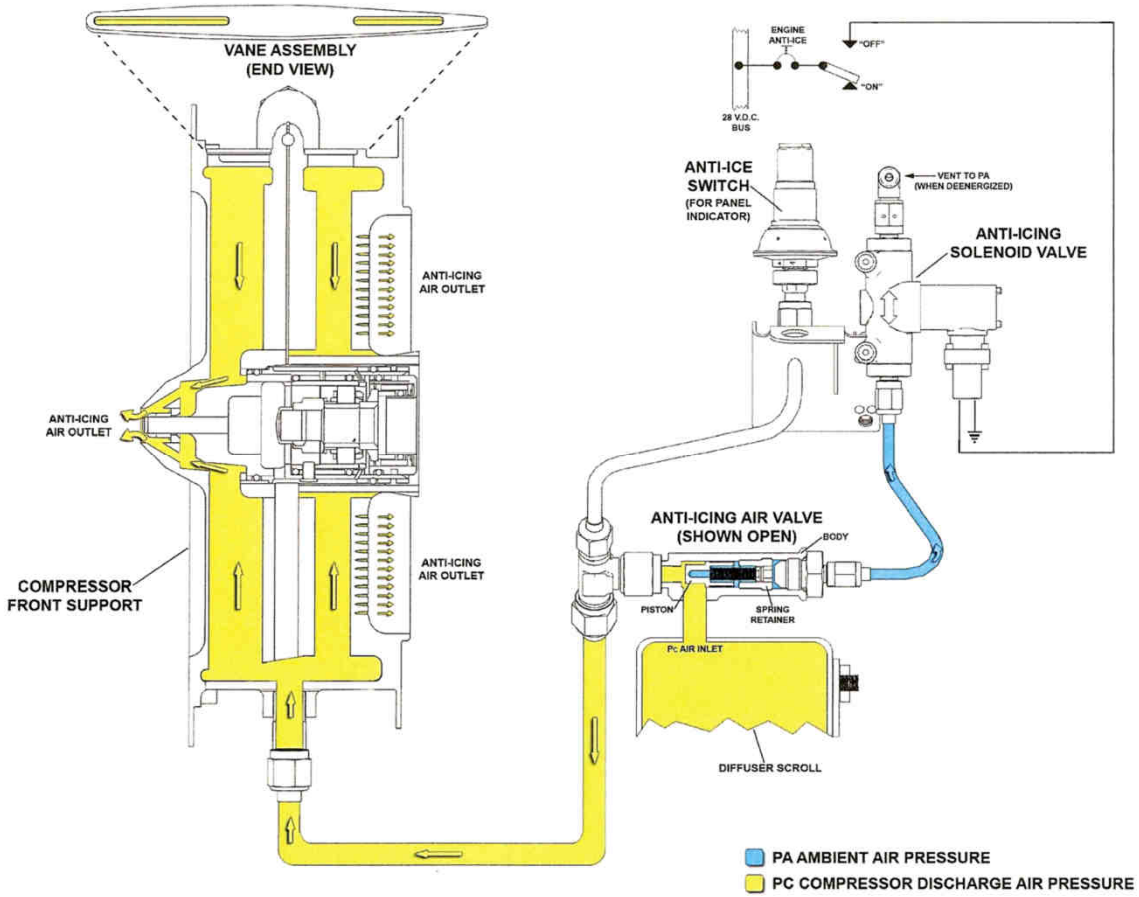
# Hydromechanical Fuel System



# Anti-Ice System

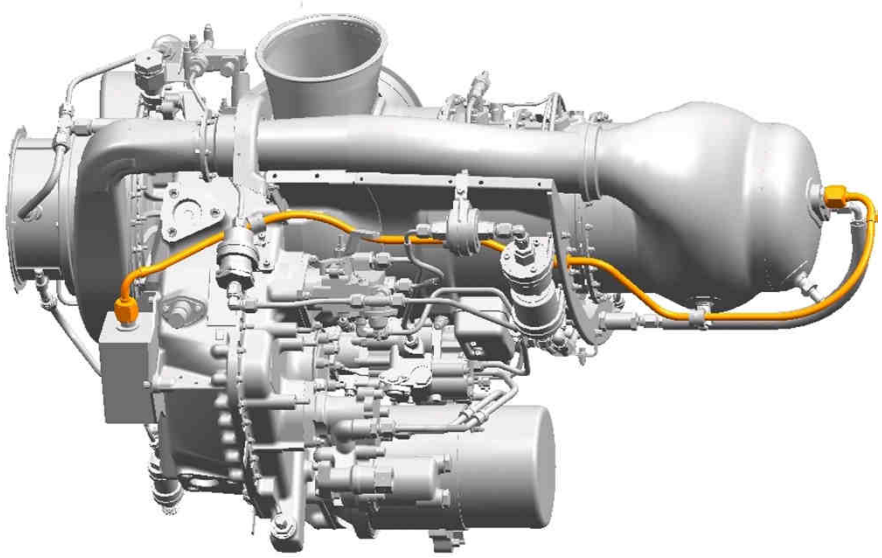
The anti-icing system ports hot compressor bleed air through the compressor inlet support struts. The system is electrically energized OFF, which provides a fail safe ON should power be lost to the control solenoid.

Bleed air is ported into the front support annulus, flows through the inlet guide vanes and exits through slots in the trailing edges and into the compressor.



# Ignition System

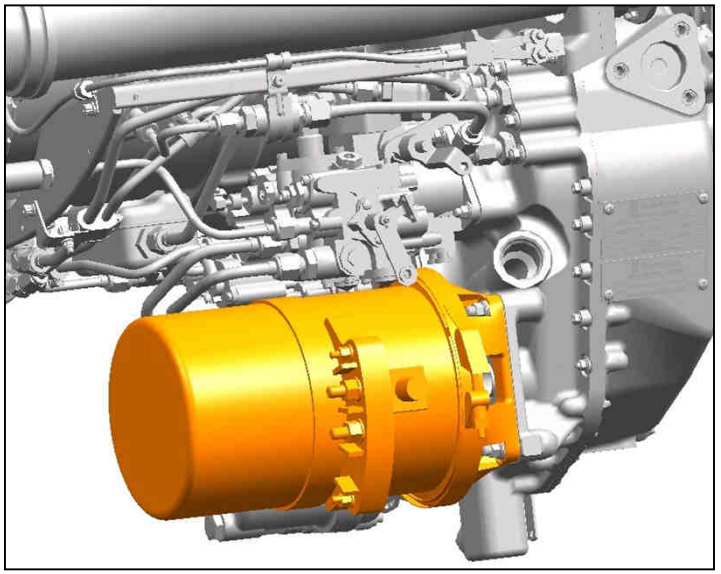
- Low tension capacitor discharge ignition system.
  - Powered from the aircraft power bus and energized during the start cycle.
  - Deactivates after N1 reaches 58% except if starter button is still depressed.
  - Engine combustion is self sustaining after ignition.




Ignition Exciter

# Starter/Generator

- 160 amp starter/generator starts the engine and provides electrical power after the engine is running.
- Generator Control Unit (GCU) controls mode of operation.
- During start, GCU latches starter on until N1 reaches 58%.
- Above 58%, GCU switches out of start mode.
- Starter latching is only enabled with igniter key switch in Enable position.
- Starter will motor when starter button depressed and key switch in Off position.

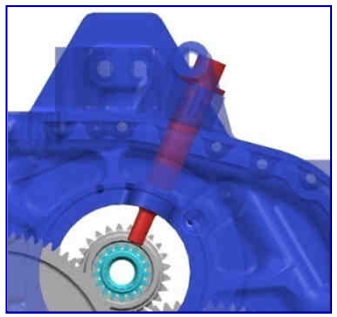


Generator Control Unit

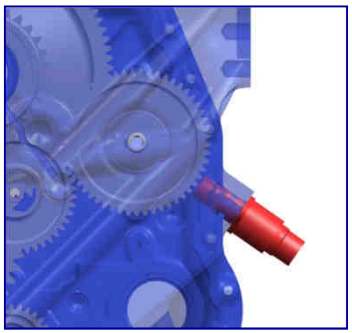
# Instrument Senders

## N1 & N2 Speed Sensors

Magnetic RPM pick-ups are used to sense N1 & N2 RPM. These are gearbox mounted and are excited by gear teeth.



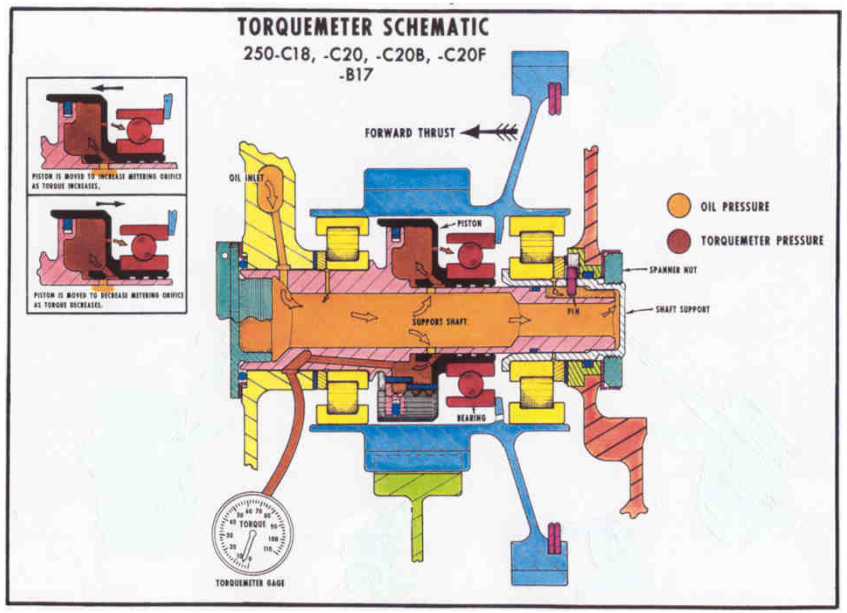
**N1 counts off Spur Adapter Gearshaft**



**N2 counts off Power Turbine Drive Gear**

## Hydraulic Torque Measurement

Oil pressure type torque measurement system. High pressure oil trapped inside a piston is used to oppose a mechanical axial force generated by helical cut gears in the power geartrain. The oil pressure is displayed on the torque indicator as a percentage.

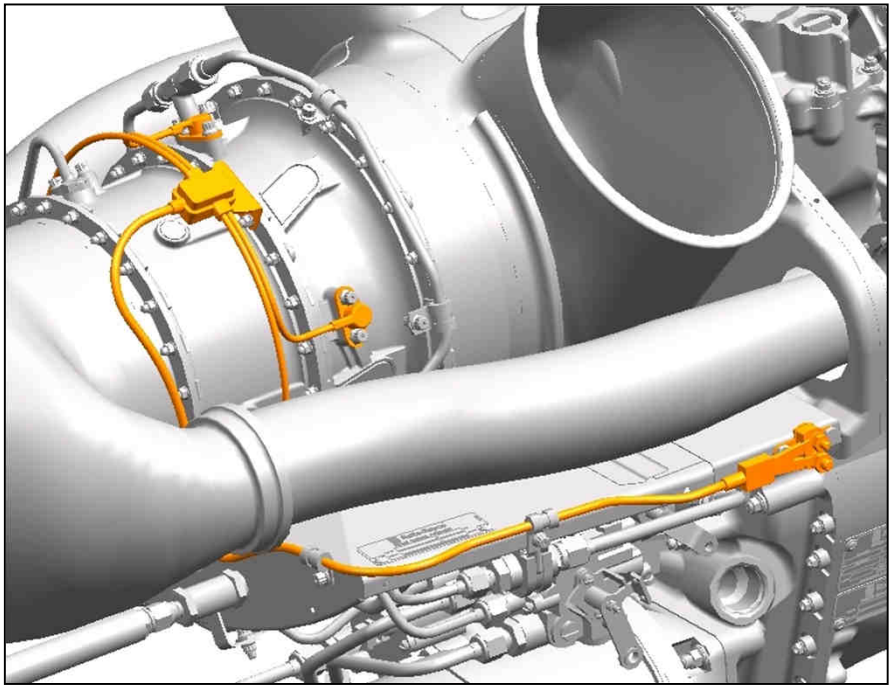


# Instrument Senders

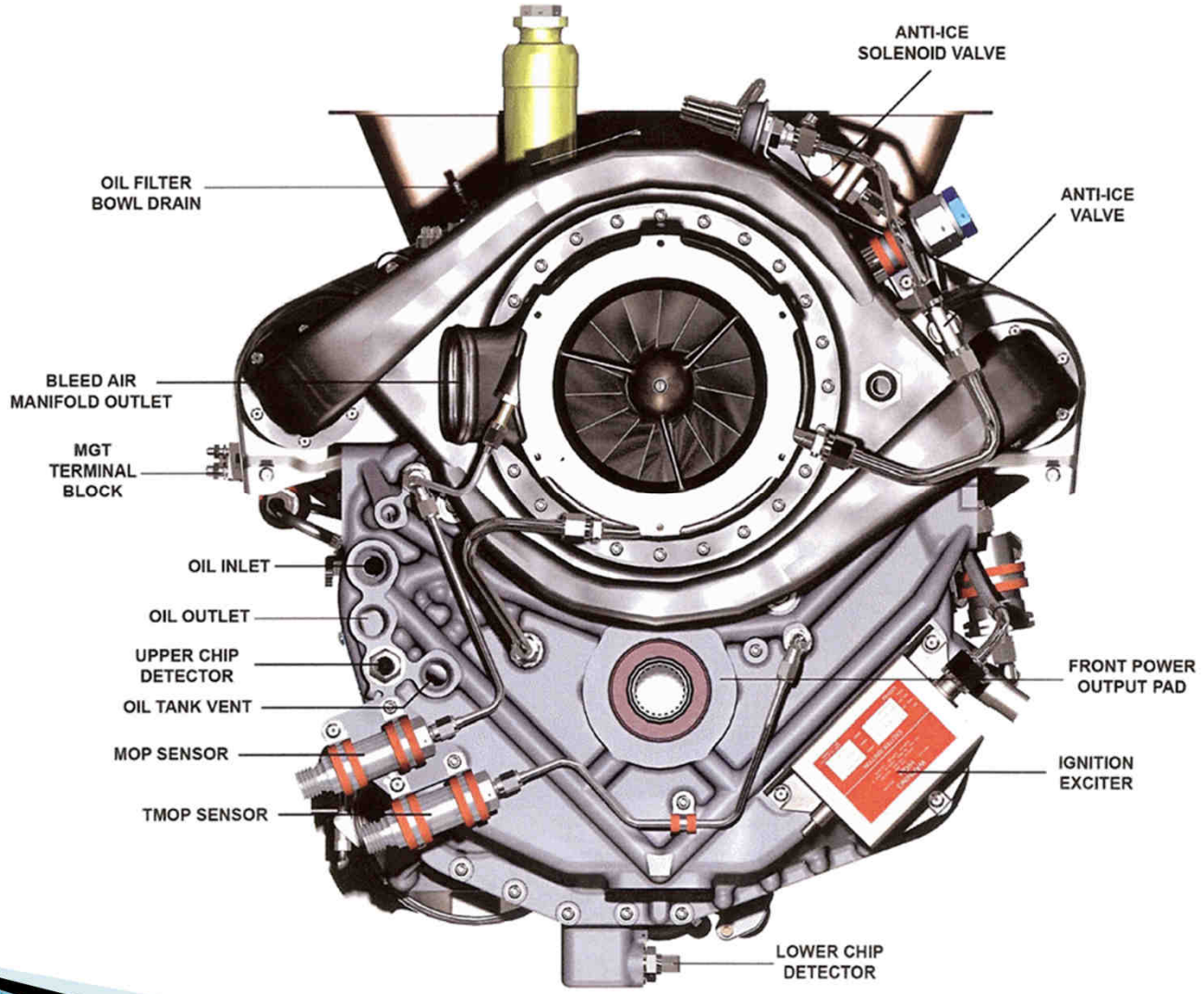
## Measured Gas Temperature (MGT)

Thermocouples are used to measure the gas path temperature. This is an averaging system with four Thermocouples wired in parallel.

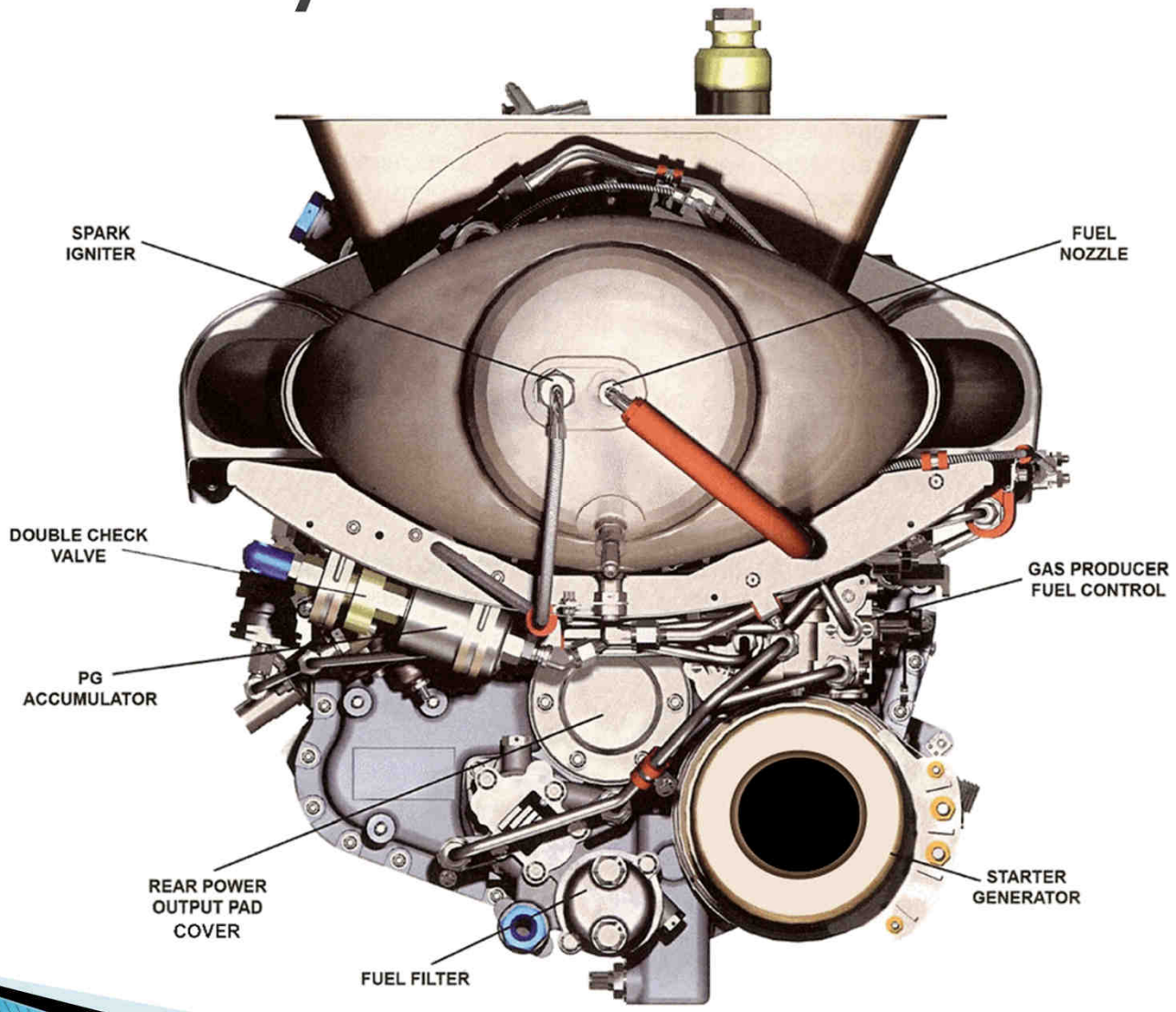
Thermocouples are mounted between gas producer and power turbine.



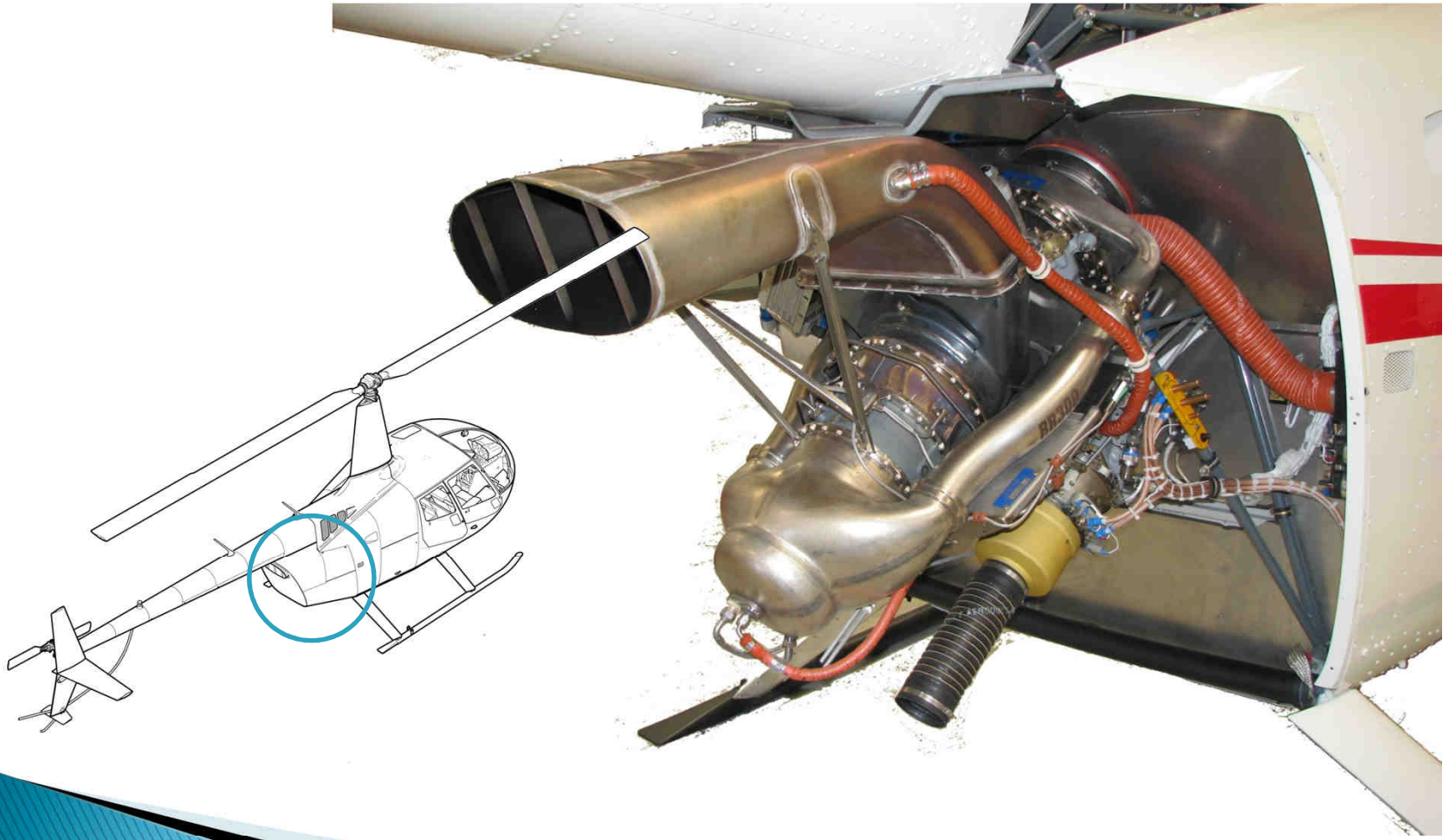
# Accessory Locations



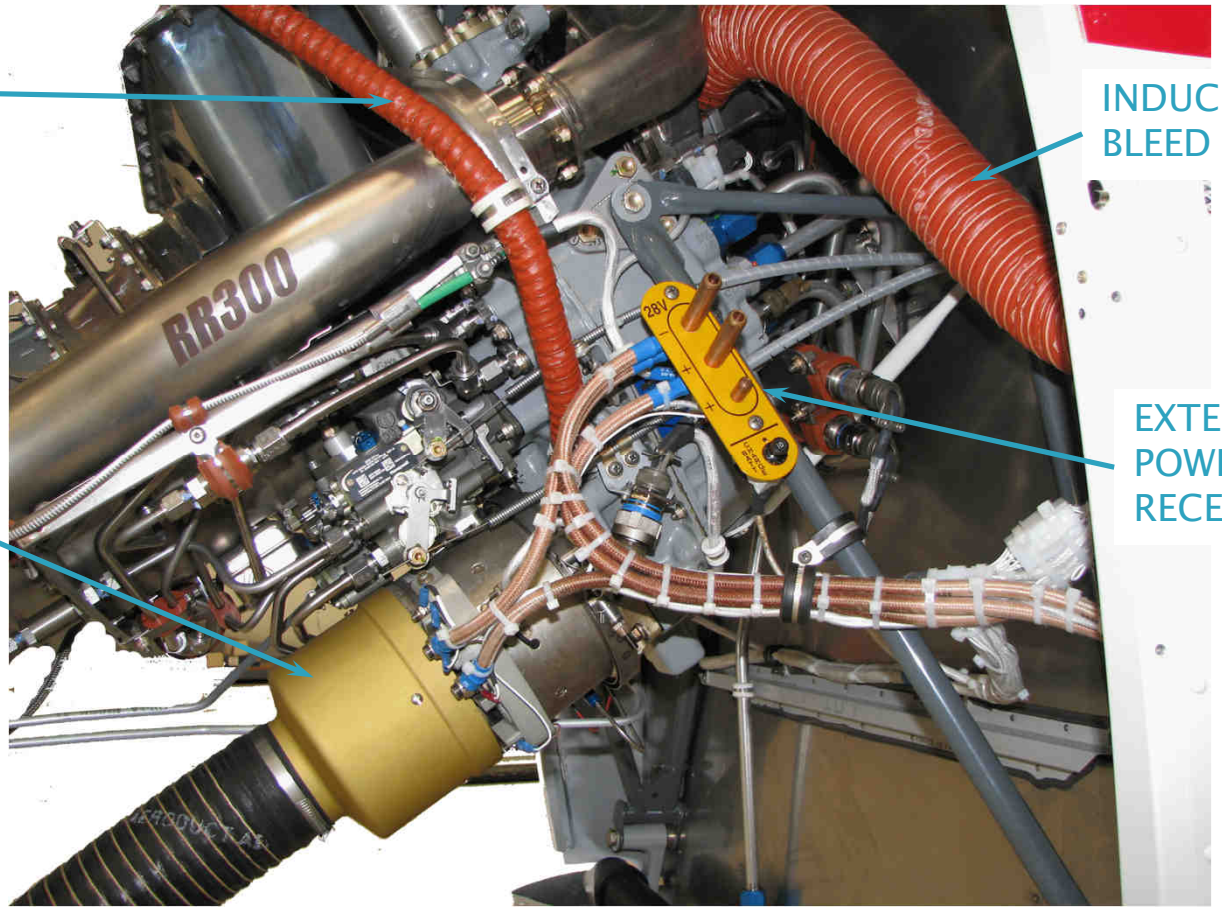
# Accessory Locations



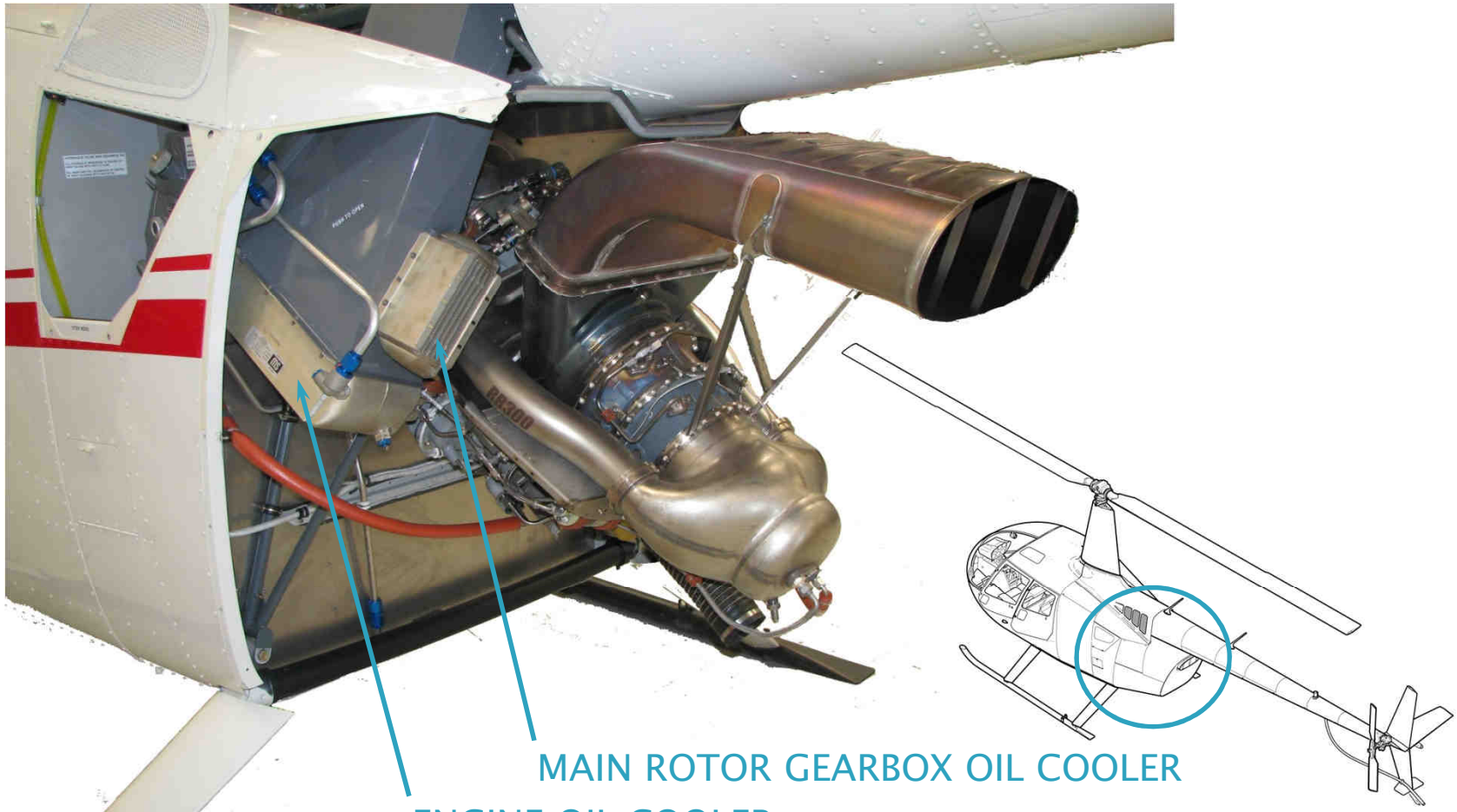
# R66 Engine Installation



# R66 Engine Right Side



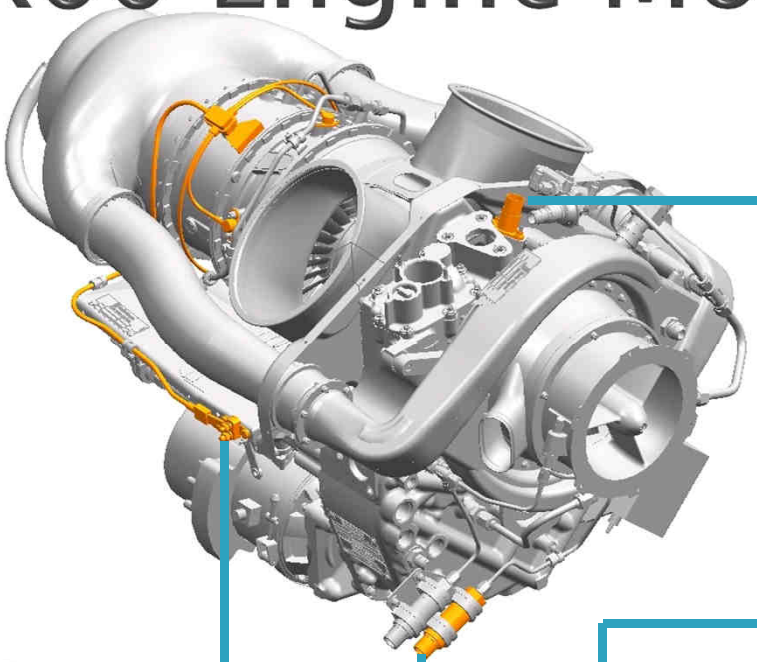
# R66 Engine Installation

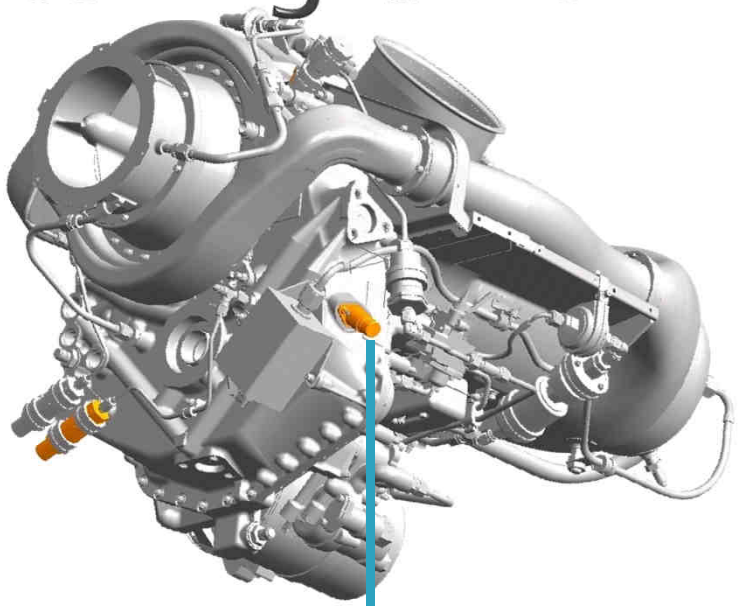


# R66 Engine Start Procedure

- Starter latches when Igniter (key switch) is set to enable
- Introduce full fuel at 15% N1
- Monitor MGT
  - Typically peaks at 750-800°C for cool engine.


# R66 Engine Monitoring Unit





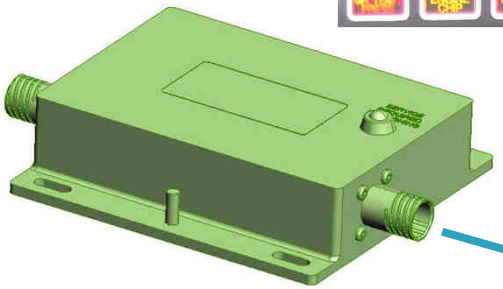
$N_1$

$N_2$

MGT

Q


DATA EXTRACTION & REMOTE LIGHT



Aircraft Power Supply

+28 VDC

# R66 Engine Monitoring Unit

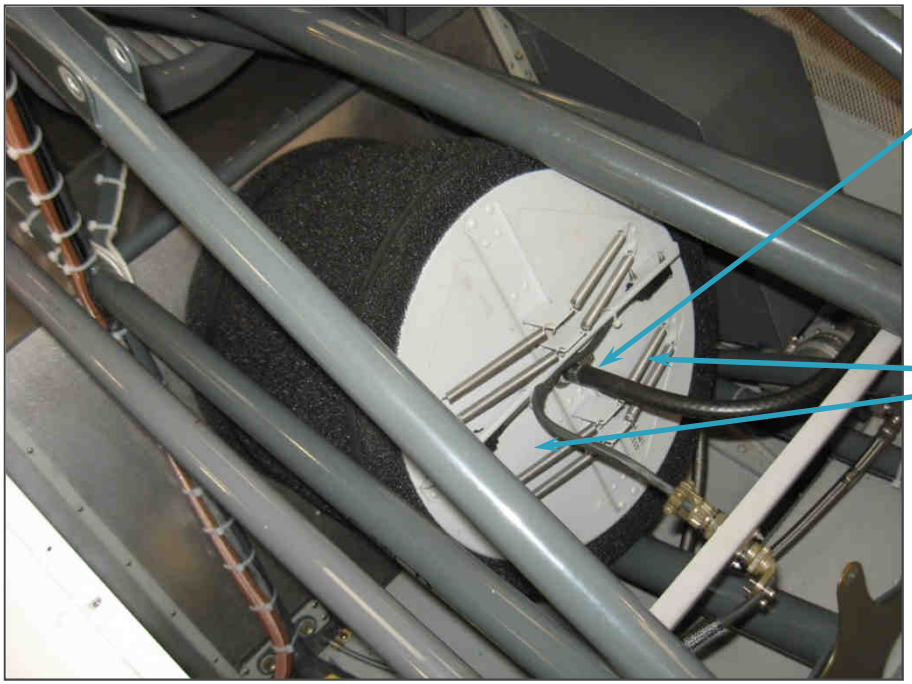
- Records data at one sample per second for entire life of engine
- Records at 16 samples per second for 20 seconds prior, & 40 seconds after an exceedance.
- EMU warning light only illuminates while push to test button is depressed.
  - Normal operation indicated by steady light.
  - Exceedance indicated by light blinking at 4 flashes per second.
  - Internal or sensor failure indicated by light blinking at 1 flash every two seconds.
  - EMU performs self-test when power turned on & takes approximately 10 seconds.
  - No indications available during self-test.
- Exceedances are based on Rolls-Royce engine limits.

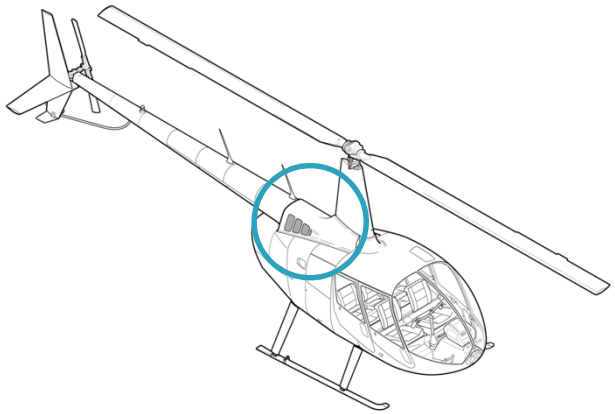
# R66 Engine Monitoring Unit

- Rolls-Royce values for EMU Exceedances:
  - MGT during start: 999°C, or 927°C for 1 sec., or 810°C for 10 sec.
  - MGT with engine running: 843°C, or 782°C for 6 sec., or 706°C for 5 min.
  - $N_1$: 106%, or 105% for 15 sec.
  - $N_2$: 110%, or 105% for 15 sec. 78 to 88% for 60 sec. over 38% torque
  - Torque: 122% for 15 sec, or 104% for 5 min.

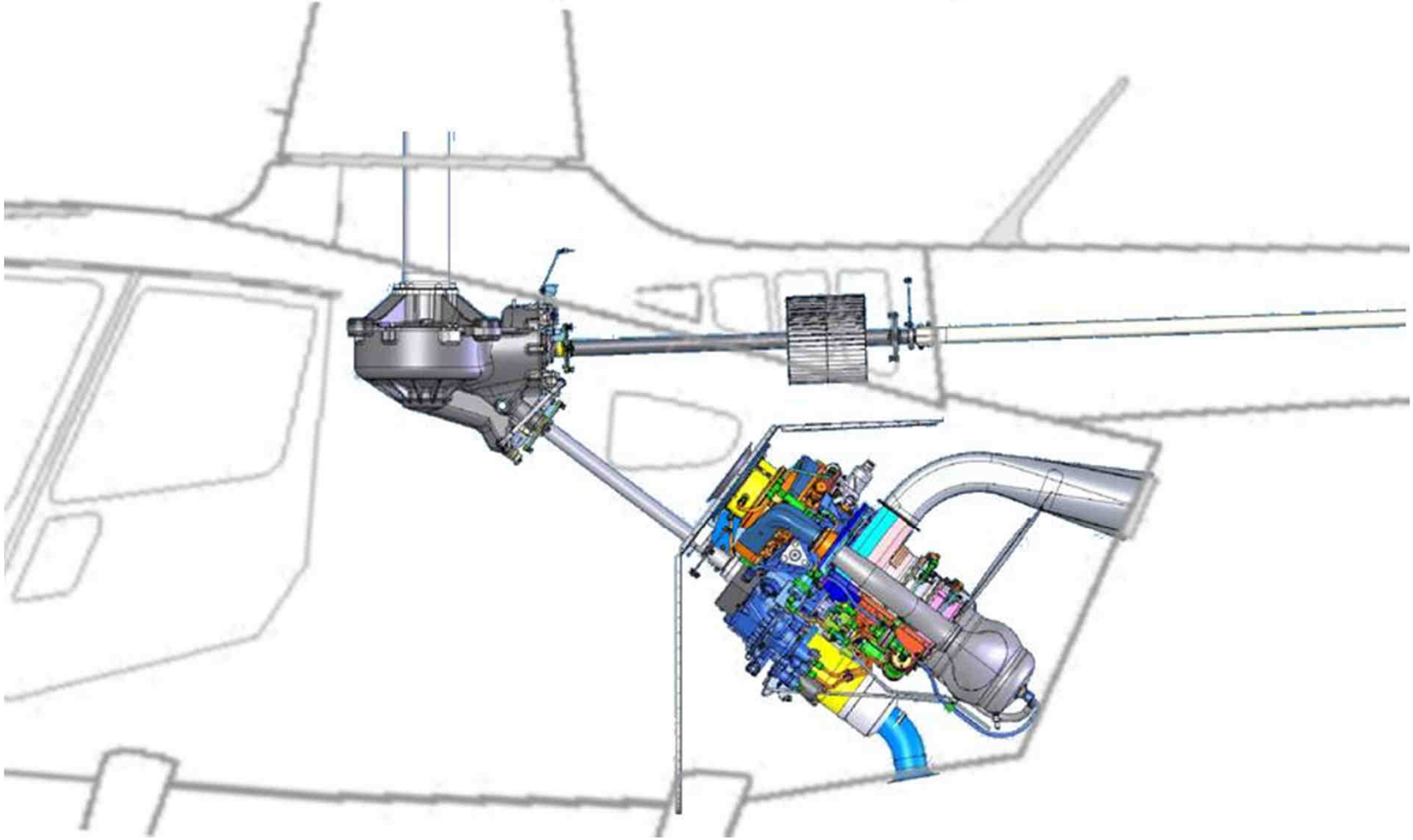
# R66 Engine Air Inlet

# R66 Engine Air Inlet

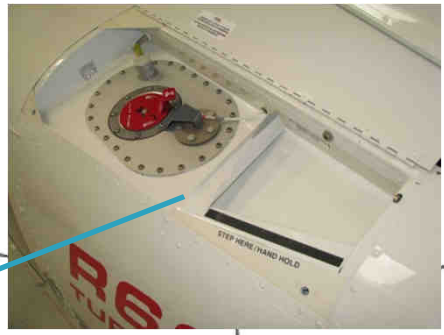


# R66 Drive System Layout

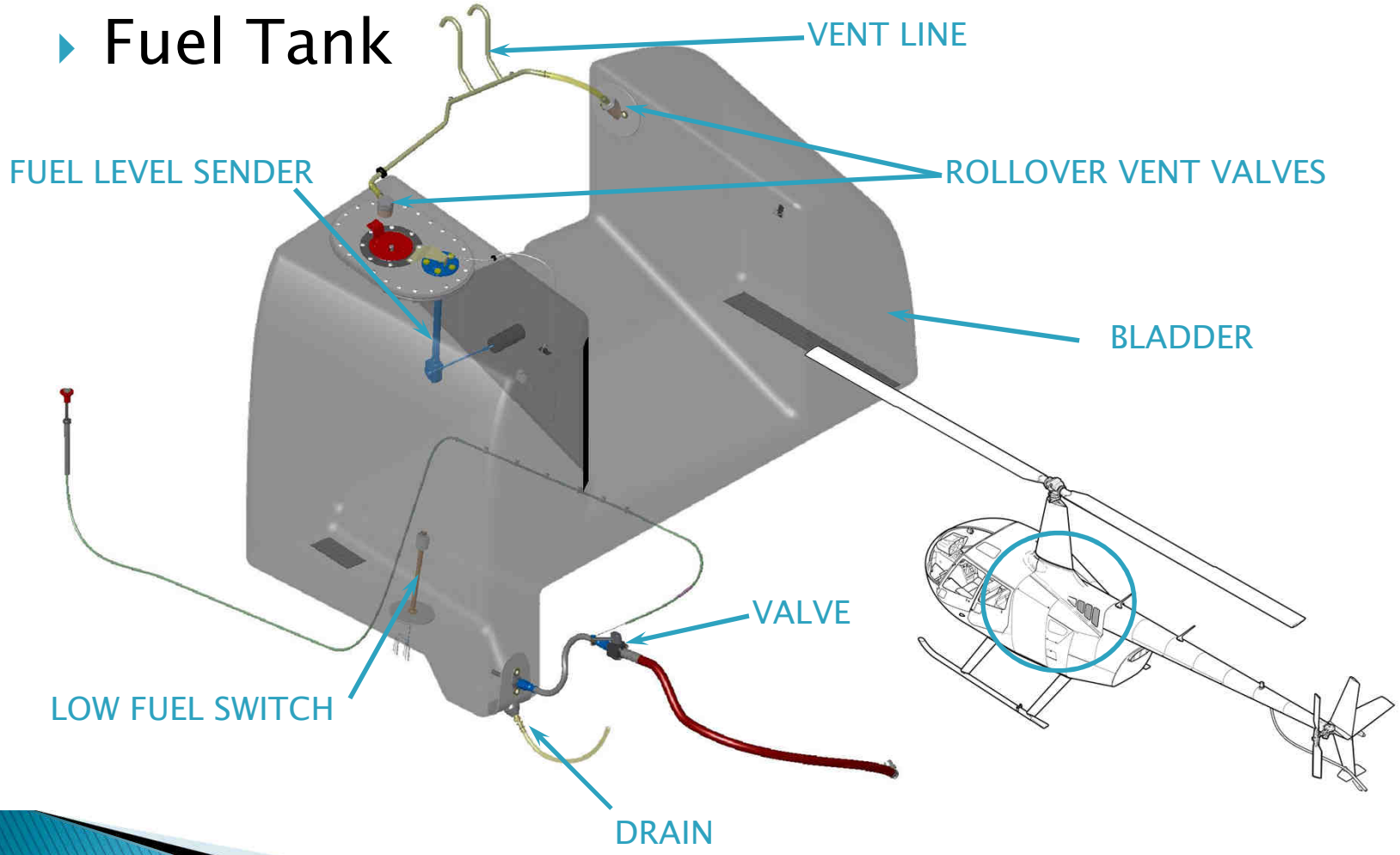


# R66 Fuel System Layout

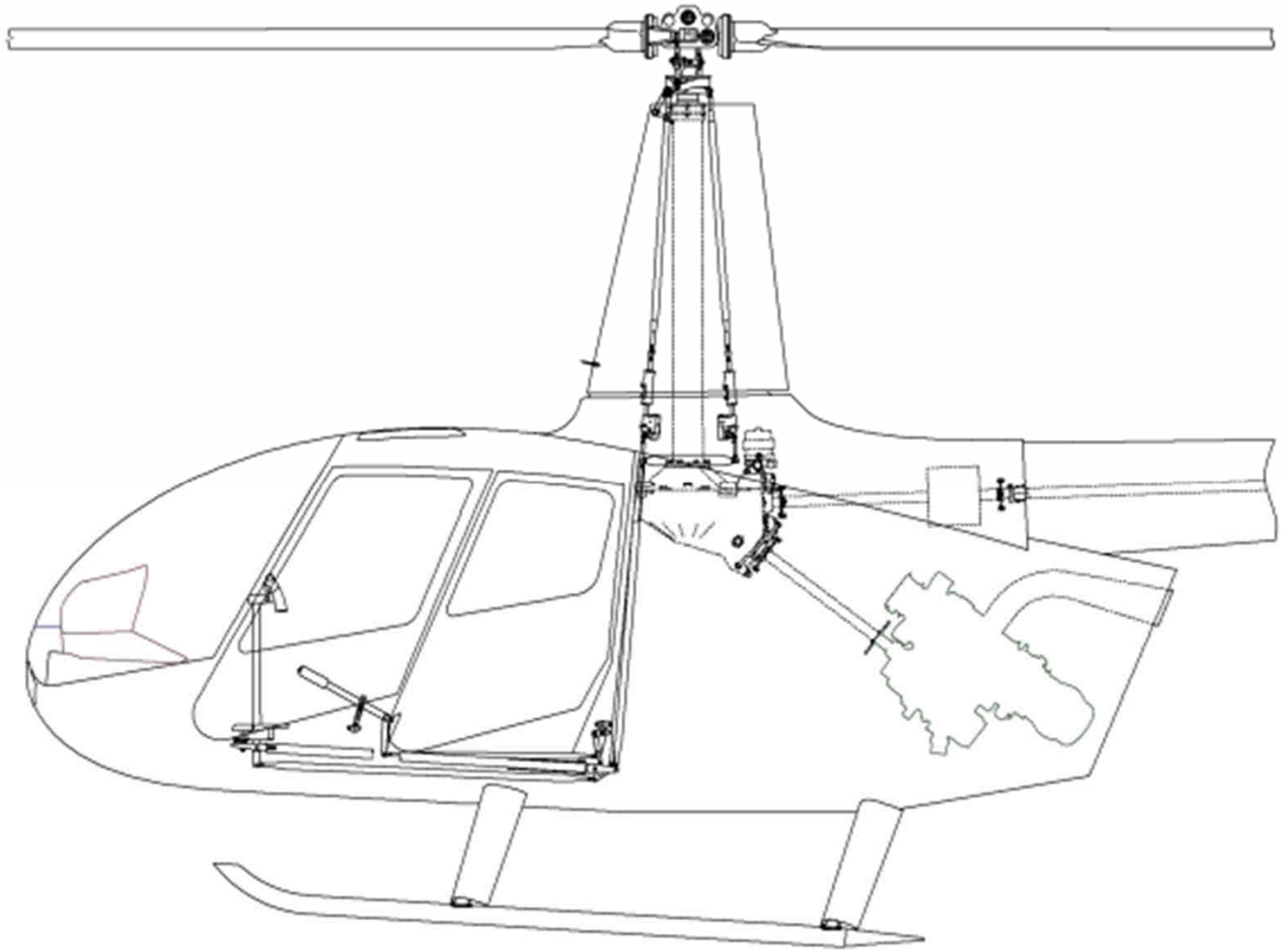


# R66 Fuel System Layout

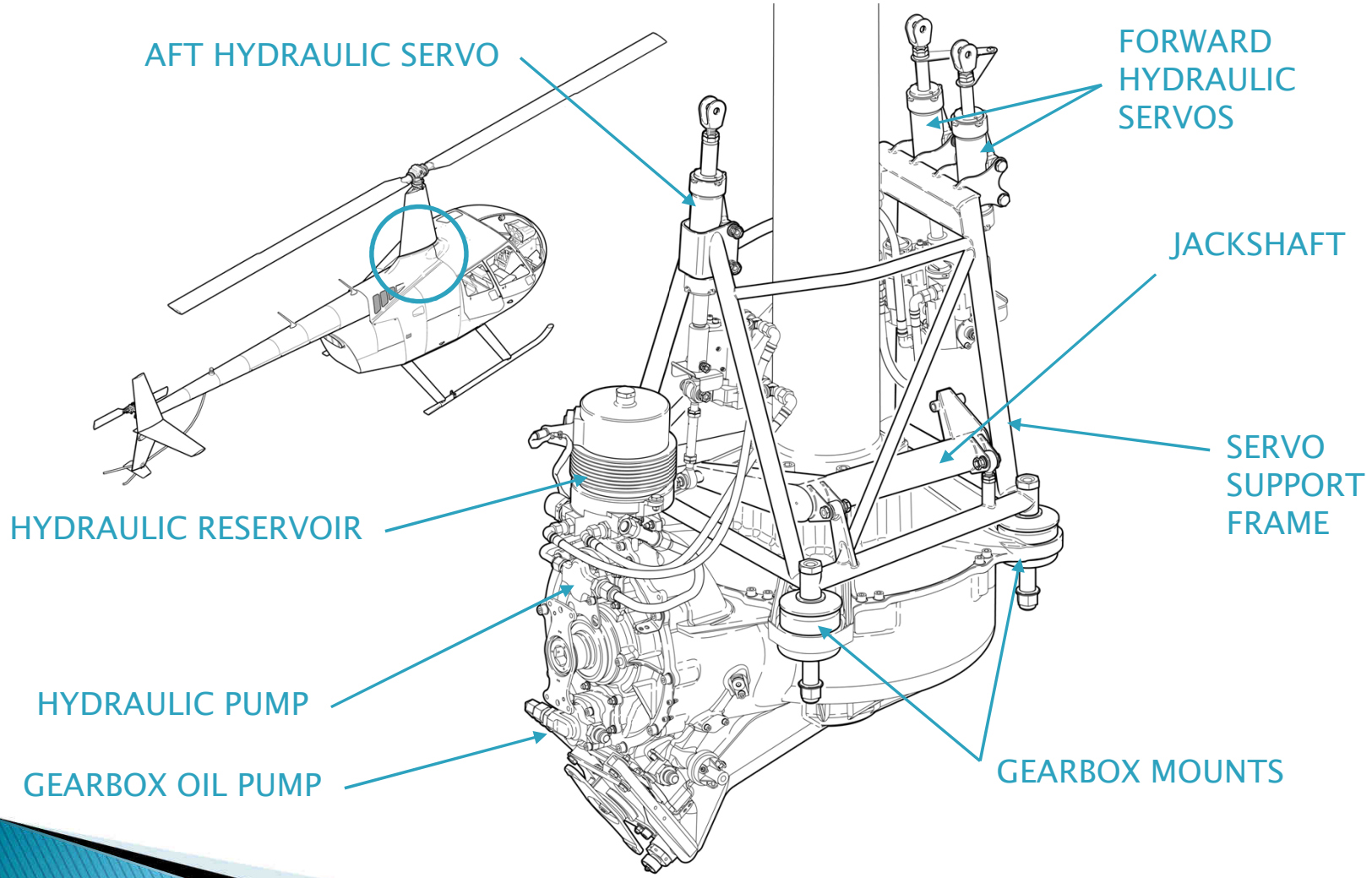
- Fuel Tank



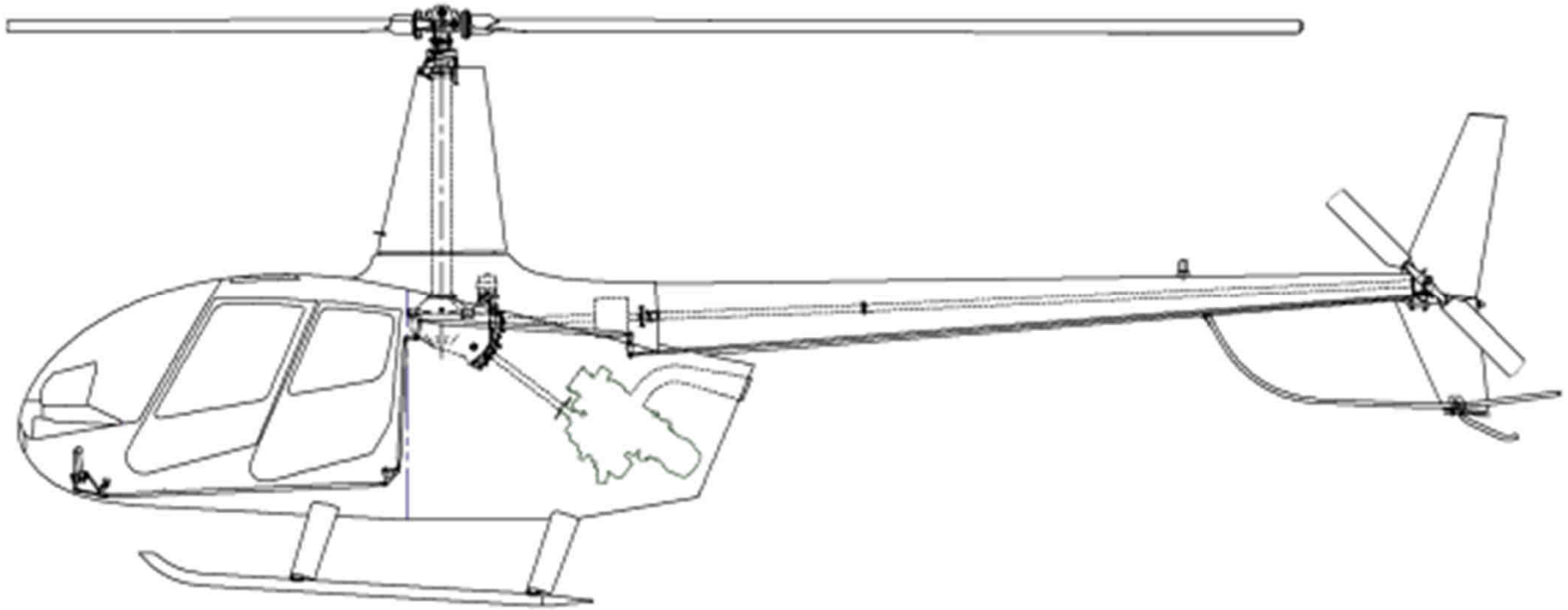
# Main Rotor Controls Overview



# R66 Hydraulic Servos

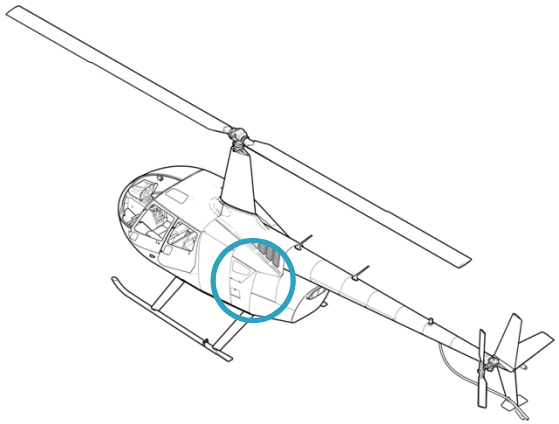


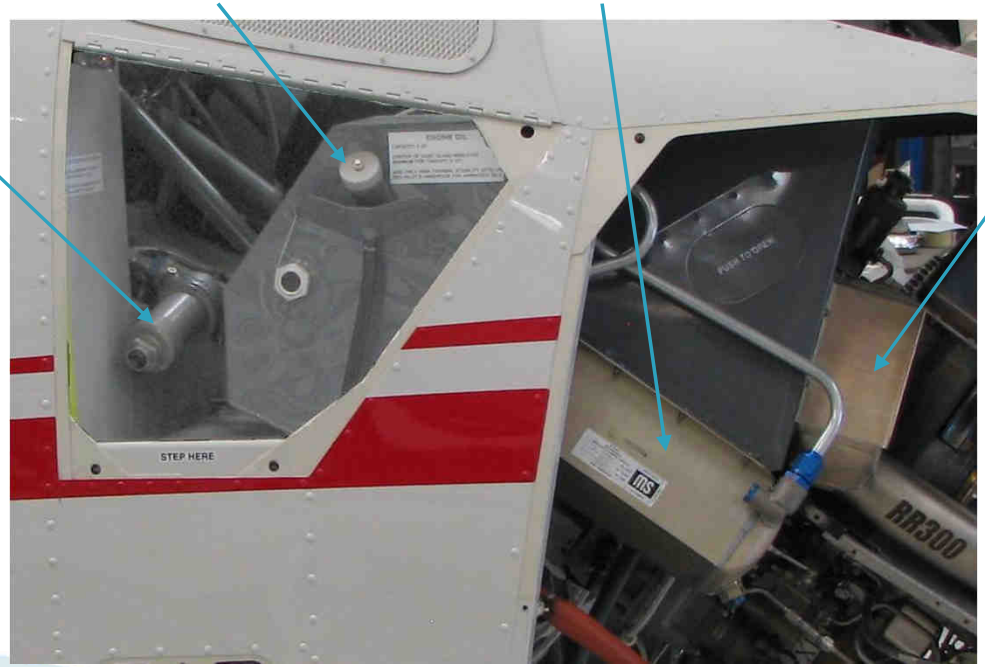
# Tail Rotor Controls Overview



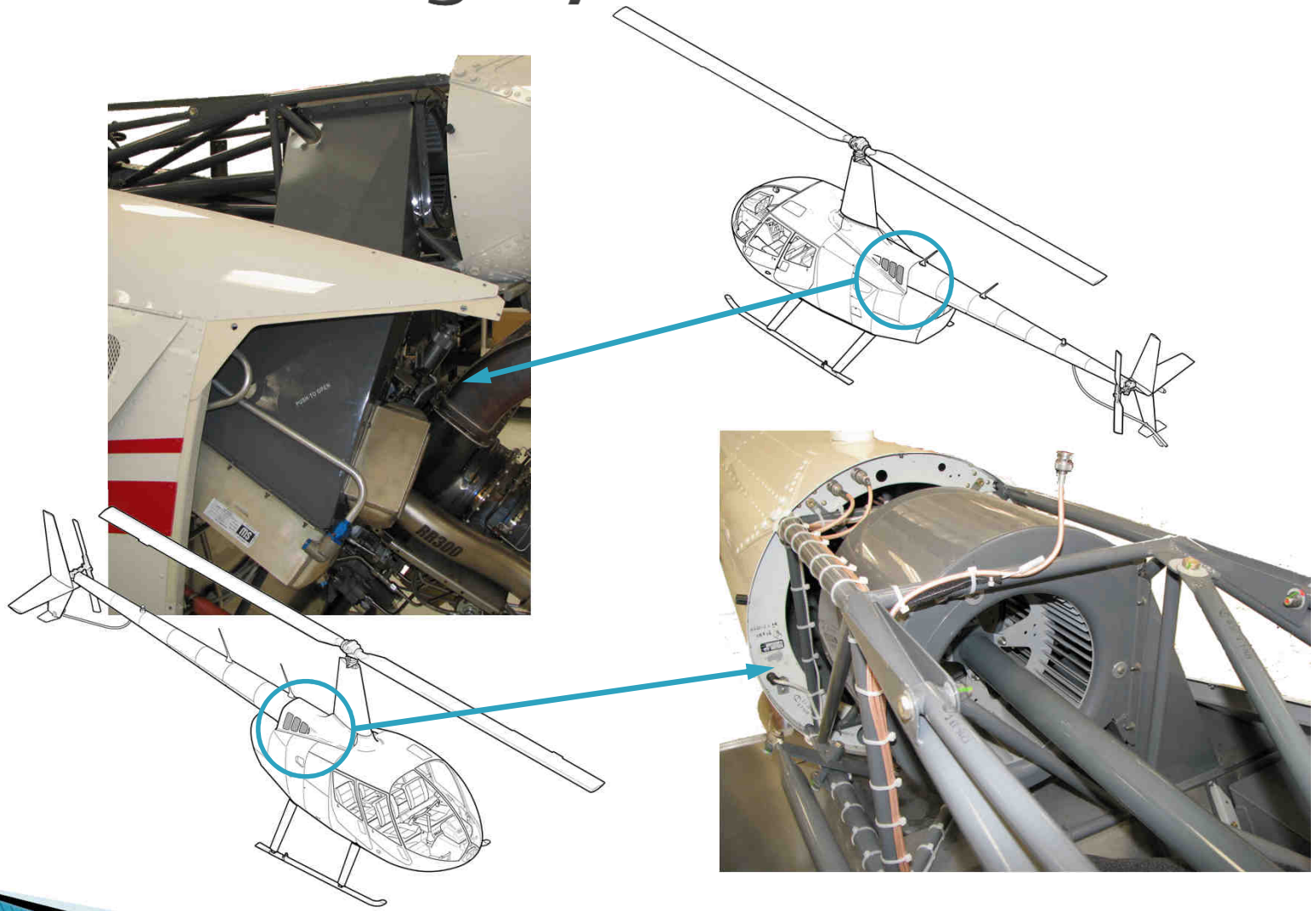
# R66 Oil Systems

- 2 Systems:
  - Engine Oil
  - Main Rotor Gearbox Oil

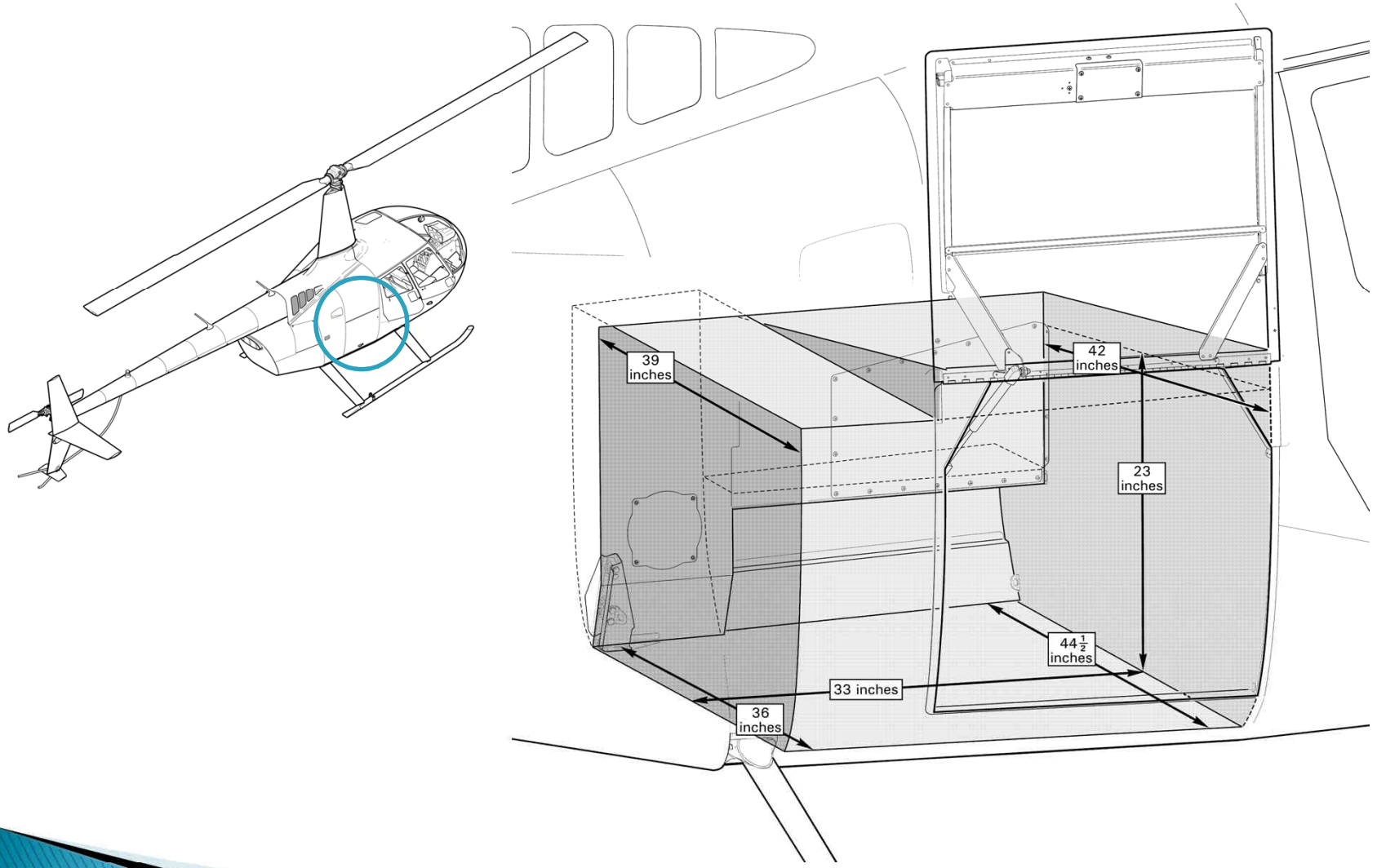




# R66 Cooling System



# R66 Baggage Compartment



# R66 Cockpit


7-INSTRUMENT CONSOLE
(9- INSTRUMENT CONSOLE
OPTIONAL)
OPTIONAL
PILOT'S SIDE
CONSOLE
T-BAR CYCLIC
ADJUSTABLE
PEDALS

# R66 Console


AIRSPEED INDICATOR
WARNING & CAUTION ANNUNCIATOR PANEL
VSI
DUAL TACHOMETER
ALTIMETER
TORQUE METER
VERTICAL SPEED
100 FEET PER MINUTE
KNOTS
TEST
N2 R
%RPM
ALT
ENGINE %TORQUE
N4512G
CHRONOMETER
SELECT
CONTROL
OIL TEMP
MGT
OIL PRESS

# R66 Console

- Annunciator Panel, Push-to-Test Button


# R66 Console


ENGINE OIL TEMPERATURE

CLOCK (ANALOG STANDARD)

ENGINE OIL PRESSURE

GENERATOR OUTPUT CURRENT

FUEL QUANTITY

MEASURED GAS TEMPERATURE

GAS GENERATOR SPEED

ROTOR BRAKE ANNUNCIATOR

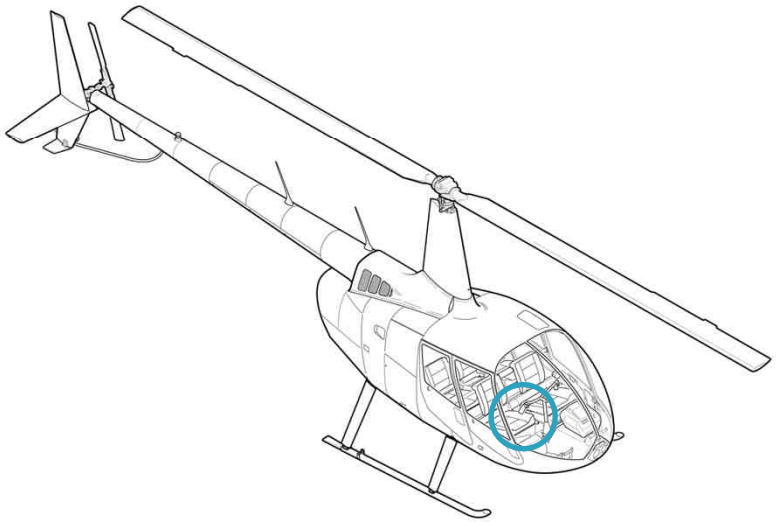
IGNITER SWITCH

# R66 Pilot's Cyclic Grip

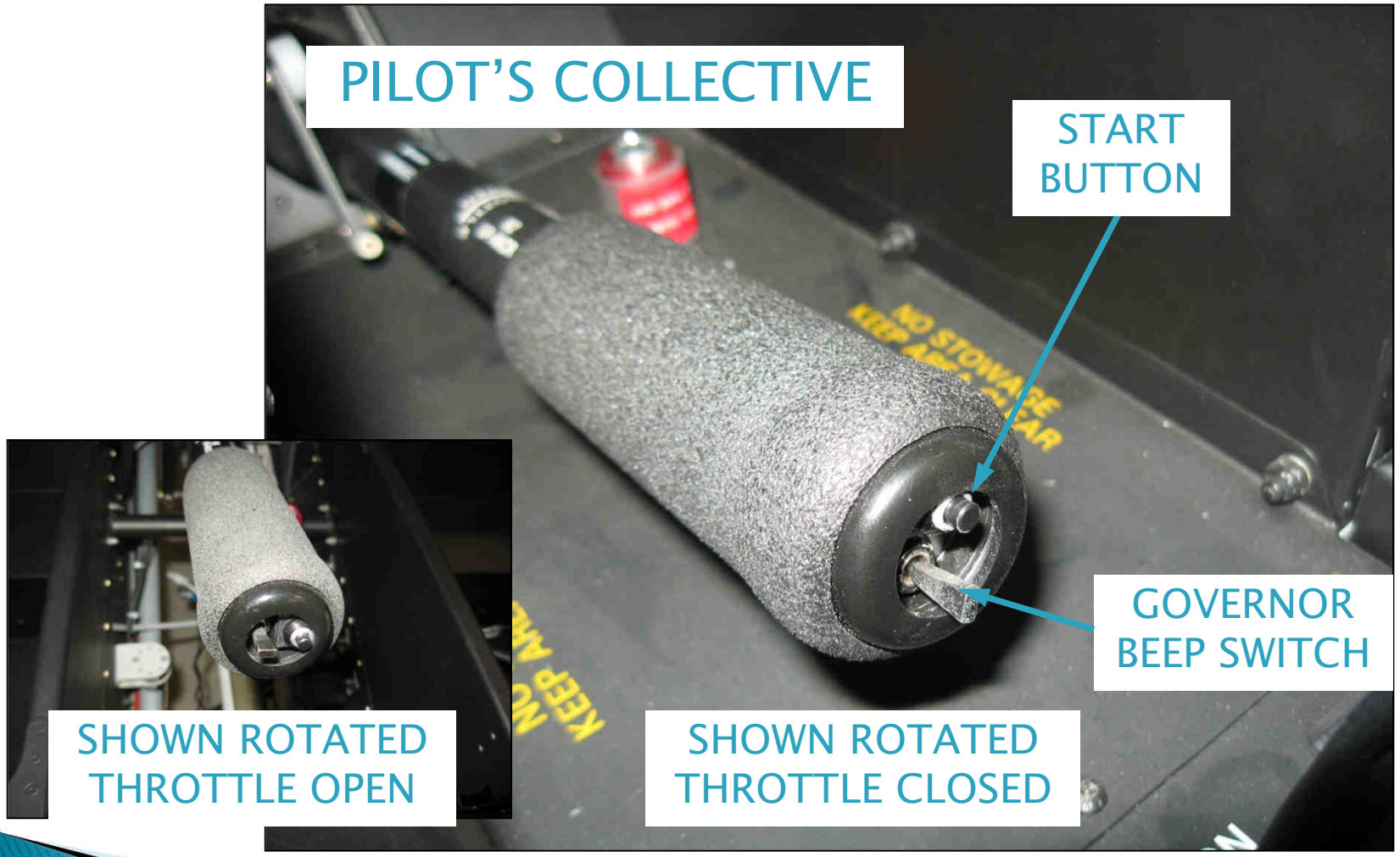

HYDRAULICS SWITCH

ACTIVE/STANDBY FREQUENCY TOGGLE

PRESET COMM FREQ SELECT



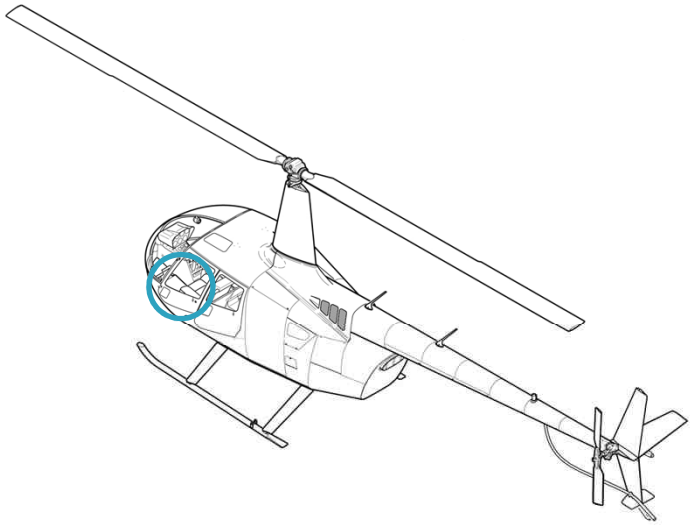
# R66 Engine Controls



# R66 Seats

- 3-Point Harness Standard

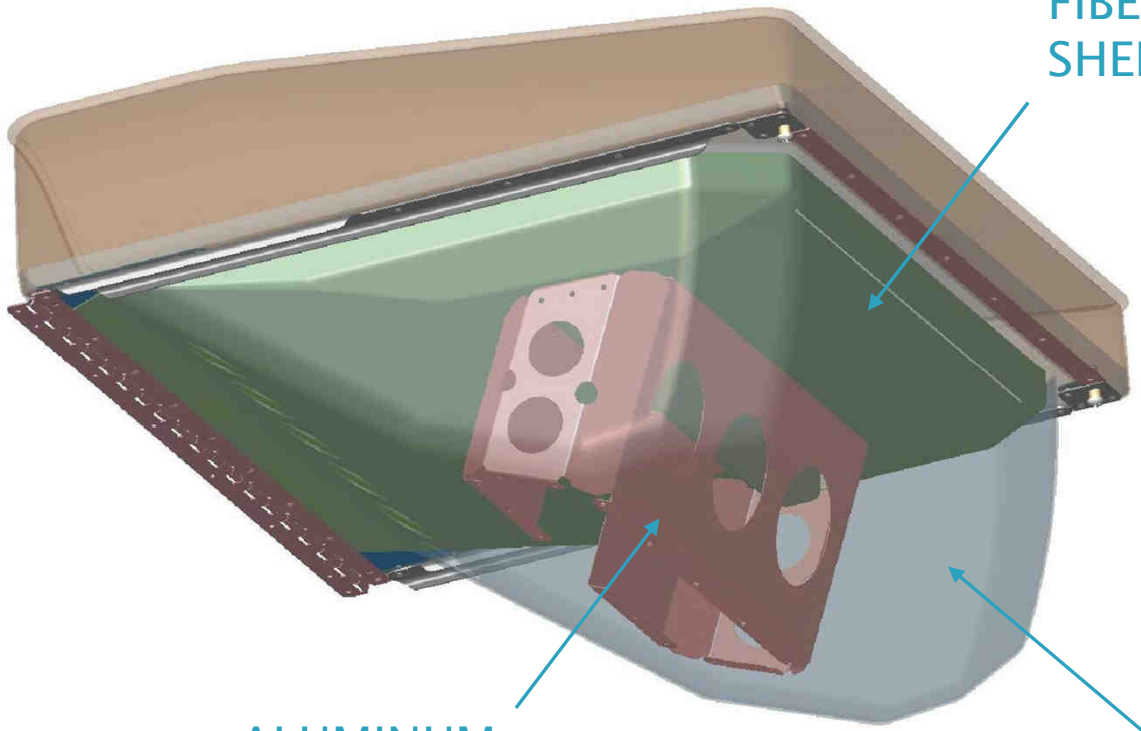
# R66 Circuit Breaker Panel



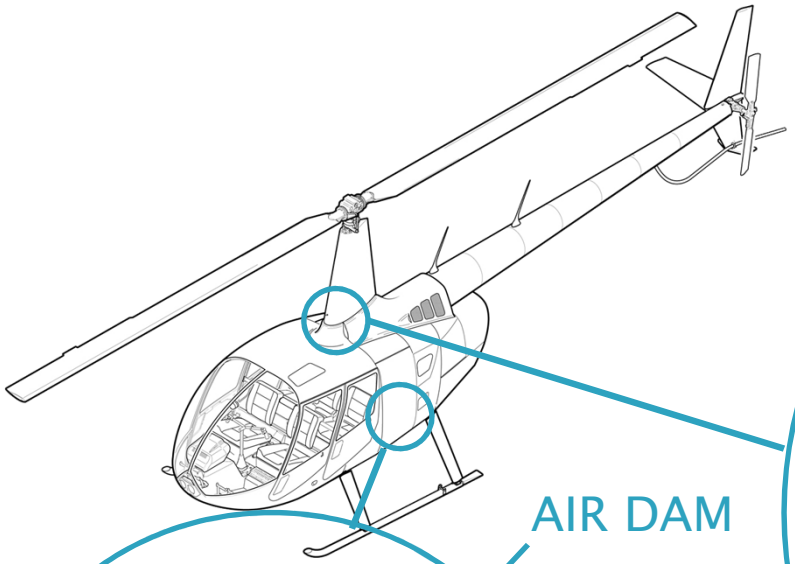
# R66 Seats

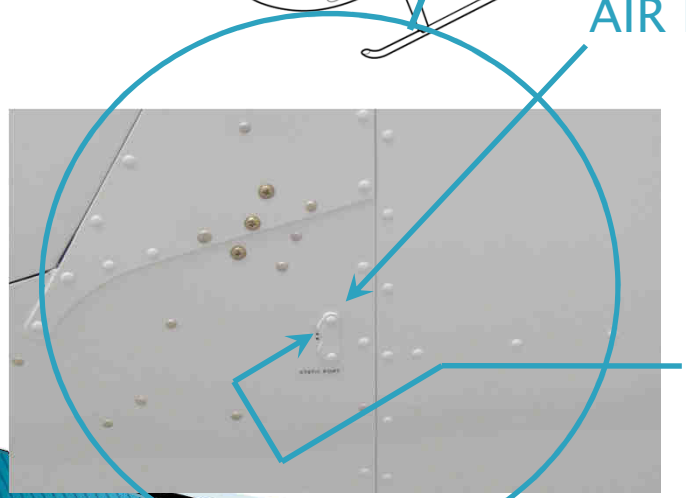
- Fwd and Aft Outboard Seats Open for Baggage Space:

# R66 Energy Absorbing Seats



# R66 Pitot-Static System





AIR DAM

STATIC PORT

# R66 Required Documents

- The Airworthiness Certificate (FAA form 8100-2) must be displayed in the aircraft at all times. The following additional documents must be carried in the aircraft:
  - 1. Registration Certificate (FAA Form 8050-3)
  - 2. Pilot's Operating Handbook
  - 3. Current Weight and Balance

- The following documents should not be carried in the aircraft, but must be available for use by any mechanic or pilot servicing the aircraft:
  - 1. Aircraft Logbook
  - 2. Engine Logbook

***NOTE***

*Required documents may vary in countries other than the United States.*

# Handling & Maintenance

- REQUIRED INSPECTIONS
  - Federal Aviation Regulations require that all civil aircraft of U.S. registry undergo a complete (annual) inspection every twelve months. This annual inspection must be signed off by a mechanic with Inspection Authorization (IA). This inspection is required whether the helicopter is used commercially or privately.
  - In addition to the annual inspection, the R66 Maintenance Manual requires a complete inspection after every 100 hours of operation. The helicopter also incorporates a number of fatigue life-limited components which must be retired at specified time intervals. A list of these components is contained in the Airworthiness Limitations section of the R66 Maintenance Manual and Instructions for Continued Airworthiness.

# Handling & Maintenance

- REQUIRED INSPECTIONS
  - The R66 helicopter includes many unique features. Even with a maintenance manual, an Airframe and Powerplant (A & P) mechanic is not qualified to perform the above inspections of the R66 helicopter without additional training. Therefore, these inspections must be performed only by properly rated personnel who have successfully completed a factory-approved maintenance course of instruction on the R66 helicopter.

  - The factory occasionally publishes Service Bulletins and the Federal Aviation Administration (FAA) occasionally publishes Airworthiness Directives (ADs) that apply to specific groups of aircraft. They are mandatory changes or inspections which must be complied with within the time limit specified. Owners should periodically check with Robinson Service Centers to be sure that the latest Service Bulletins and ADs issued have been complied with.

# Handling & Maintenance

- PREVENTIVE MAINTENANCE BY THE PILOT
  - Part 43 of the Federal Aviation Regulations (FAR) allows a certified pilot who owns or operates an aircraft to obtain a maintenance manual and perform certain limited maintenance functions. These functions are defined in the above regulations, and, as they apply to the R66 helicopter, generally include the following:
    1. Remove or replace any cowling or inspection panels.
    2. Replace bulbs, reflectors, and lenses of position and landing lights.
    3. Replace the following filters: Engine air, engine oil, fuel, main gearbox oil, and hydraulic fluid.
    4. Change or replenish the following fluids: Engine oil, main and tail gearbox oil, and hydraulic.
    5. Inspect and clean chip detectors.
    6. Service or replace battery.
    7. Replace wear shoes on landing gear skids.
    8. Clean or refinish exterior of aircraft.

# Handling & Maintenance

- PREVENTIVE MAINTENANCE BY THE PILOT
  - Although the work is allowed by law, it should only be performed by pilots confident that they are qualified to reliably complete the work. All work must be done in accordance with the maintenance manual. After completing the work, when required, the pilot must enter the following in the appropriate logbook:
    1. Date work accomplished.
    2. Description of work.
    3. Total hours on aircraft.
    4. Pilot certificate number.
    5. Signature of pilot.

# Handling & Maintenance

- GROUND HANDLING
  - For leveling, hoisting, or jacking, see appropriate sections of the maintenance manual.
  - The helicopter is normally maneuvered on the ground using ground handling wheels. Ground handling wheels are attached inboard of the landing gear skid tubes forward of the rear struts. Wheels must be removed for flight.
  - To attach wheels:
    1. Hold handle and wheel with protruding spindle in its lowest position.
    2. Insert spindle into support mounted on skid. Make sure spindle is all the way in.
    3. Pull handle over center to raise helicopter and lock wheel in position.

***CAUTION***

*When lowering helicopter, handle has a tendency to snap over.*

# Handling & Maintenance

- GROUND HANDLING
  - Ground handling generally requires two people: one to hold the tail down and steer by holding the tail rotor gearbox and a second to push on the fuselage. Keep feet clear of skid tubes. Alternately, a Robinson electric tow cart may be used per the instructions provided.

*CAUTION*

*Do not move helicopter by gripping tail rotor guard, outboard part of horizontal stabilizer, tail rotor, or tail rotor controls.*

# Handling & Maintenance

- PARKING
  1. Place cyclic control in neutral and apply friction.
  2. Put collective full down and apply friction.
  3. Align rotor blades approximately fore and aft. In windy conditions, align blades slightly offset from fore and aft to prevent aft blade from flapping into tailcone. Apply rotor brake.
  4. If using rotor blade tie-downs, do not overtighten tiedown straps (5 lb max tension). Do not pull down on blades to teeter rotor. To lower a blade, push up on opposite blade.
  5. During storm conditions, helicopter should be hangared or moved to a safe area.

# Questions

# LESSON 2

- Limitations
- Normal & Emergency Procedures
- Performance
- Weight & Balance
- Safety Tips/Safety Notices

# R66 Limitations

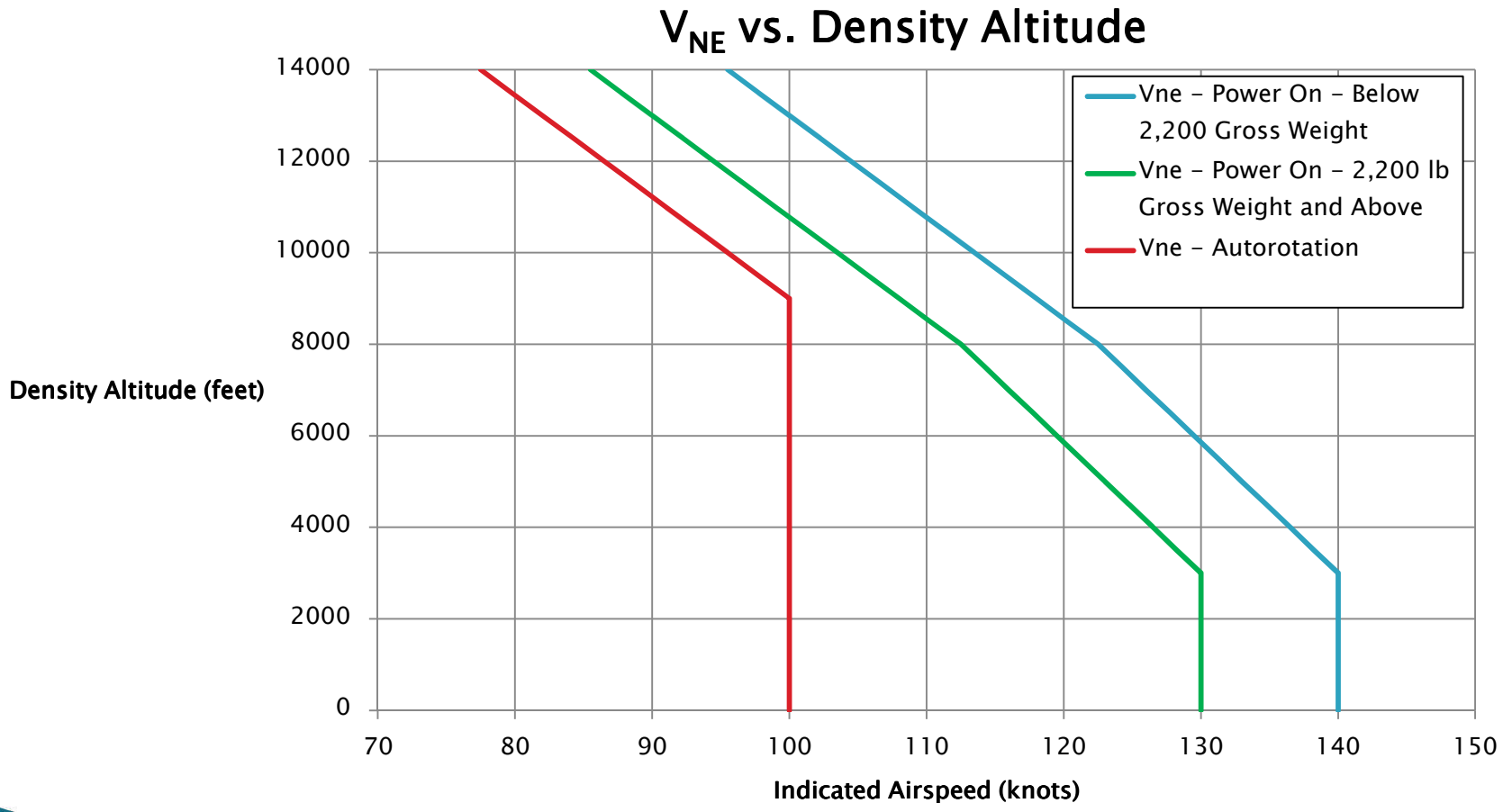
- COLOR CODE FOR INSTRUMENT MARKINGS
  - Red
    - Operating limit. Edge of red line indicates limit. Pointer should not enter red during normal operation.
  - Red Cross Hatch
    - Power-off $V_{NE}$.
  - Yellow
    - Precautionary or special operating procedure range.
  - Green
    - Normal operating range.

# R66 Limitations

- AIRSPEED LIMITS
  - NEVER-EXCEED AIRSPEED ($V_{NE}$)
    - Up to 3000 feet density altitude:
      - 2200 lb TOGW & above 130 KIAS
      - Below 2200 lb TOGW 140 KIAS
    - Up to 9000 feet density altitude
      - Autorotation 100 KIAS
    - For higher altitudes see placard
  - ADDITIONAL AIRSPEED LIMITS
    - 65 KIAS maximum above 83% torque (MCP).
    - 100 KIAS maximum with any door(s) removed.

# R66 Limitations

- AIRSPEED LIMITS



# R66 Limitations

- AIRSPEED LIMITS
  - NEVER-EXCEED AIRSPEED ($V_{NE}$)

**POWER-ON $V_{ne}$ - KIAS**

| PRESS ALT-FT | OAT- °C | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 |
| SL | | | | | | | | | | 127 |
| 2000 | | | | 130 | | | | 126 | 122 | |
| 4000 | | | | | 129 | 125 | 121 | 117 | 114 | |
| 6000 | | | | 125 | 121 | 117 | 113 | 108 | | |
| 8000 | | 125 | 121 | 116 | 112 | 107 | 102 | 97 | | |
| 10000 | 121 | 117 | 112 | 106 | 101 | 96 | 91 | 86 | | |
| 12000 | 112 | 106 | 101 | 95 | 90 | | | | | |
| 14000 | 101 | 95 | 89 | | | | NO FLIGHT | | | |
| 16000 | 90 | | | | | | | | | |

BELOW 2200 LB TOGW, ADD 10 KIAS

NOTE: 65 KIAS MAXIMUM ABOVE 83% TORQUE

**AUTOROTATION $V_{ne}$ - KIAS**

| PRESS ALT-FT | OAT- °C | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 |
| SL | | | | | | | | | | |
| 2000 | | | | | 100 | | | | | |
| 4000 | | | | | | | | | | |
| 6000 | | | | | | | | | | |
| 8000 | | | | | | 99 | 94 | 89 | | |
| 10000 | | | | 98 | 93 | 88 | 83 | 78 | | |
| 12000 | | 98 | 93 | 87 | 82 | | | | | |
| 14000 | 93 | 87 | 81 | | | | NO FLIGHT | | | |
| 16000 | 82 | | | | | | | | | |

# R66 Limitations

- ROTOR SPEED LIMITS

| | TACHOMETER READING | ACTUAL RPM |
|---|---|---|
| Power On | | |
| Maximum | 101% | 412 |
| Minimum | 99% | 404 |
| Power Off | | |
| Maximum | 106% | 432 |
| Minimum | 88% | 359 |

# R66 Limitations

- ENGINE OPERATING LIMITATIONS
  - Output shaft speed ($N_2$)
    - Maximum 101% (6076 RPM)
    - Minimum power on 99% (5956 RPM)

YELLOW ARC:
Only applicable with Torque greater than 38% & held for more than 60 seconds.

# R66 Limitations

- OPERATING LIMITATIONS
  - Gas generator speed ($N_1$)
    - Maximum 105% (53519 RPM)

# R66 Limitations

- OPERATING LIMITATIONS
  - Measured Gas Temperature
    - Maximum during start — 927°C (10 second limit above 810°C)
    - Maximum during operation — 782°C (5 minutes)
      706°C (continuous)

# R66 Limitations

- OPERATING LIMITATIONS
  - Oil Maximum Temperature 107°C
  - Oil Pressure
    - Below 78% N1 50 – 130 psi
    - 78% to 94% N1 90 – 130 psi
    - Above 94% N1 115 – 130 psi
    - Max during start & warm up 150 psi
  - Oil Quantity, minimum for takeoff 4 qt


# R66 Limitations

- OPERATING LIMITATIONS
  - Torque
    - 5 minute limit 100% (236 lb-ft)
    - Continuous limit 83% (196 lb-ft)

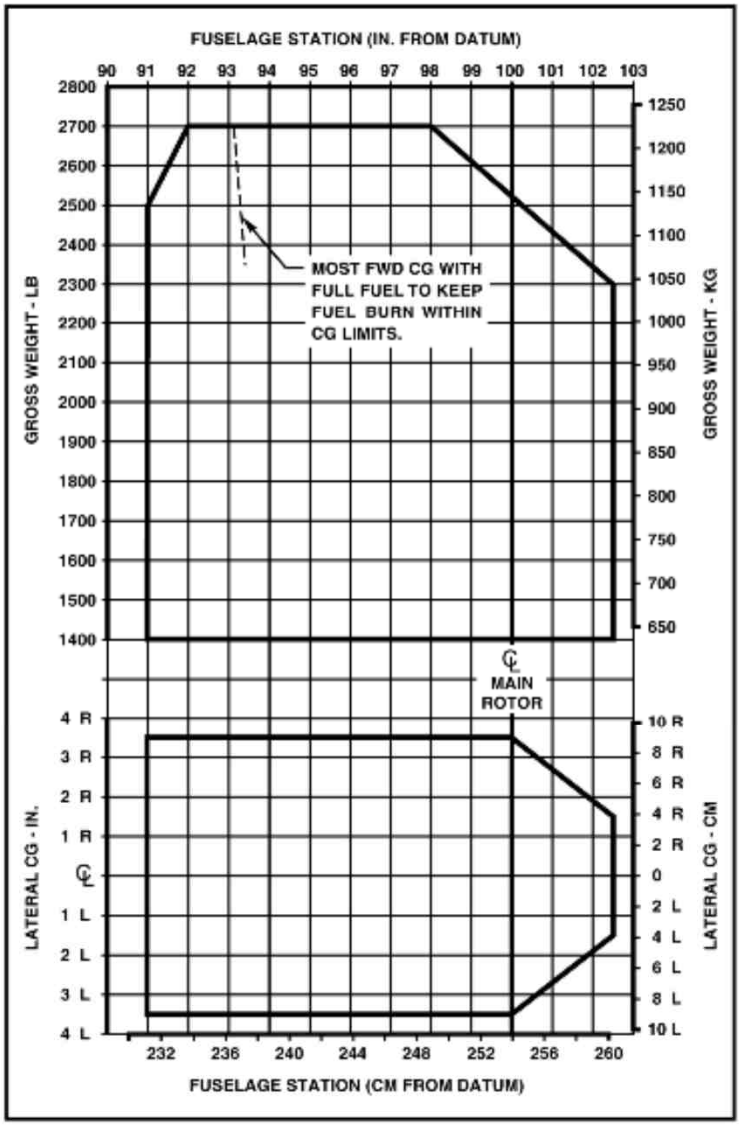
# R66 Limitations

- Weight Limits
  - Maximum gross weight — 2700 lb (1225 kg)
  - Minimum gross weight — 1400 lb (635 kg)
  - Maximum per seat including under-seat compartment — 300 lb (136 kg)
  - Maximum in any under-seat compartment — 50 lb (23 kg)
  - Baggage Compartment
    - Maximum distributed load — 50 lb/ft$^2$ (244 kg/m$^2$)
    - Maximum total load — 300 lb (136 kg)
  - *NOTE:*

    *With all doors installed and no load in baggage compartment, a solo pilot weight of 160 lb 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 instruction of POH Section 6).*

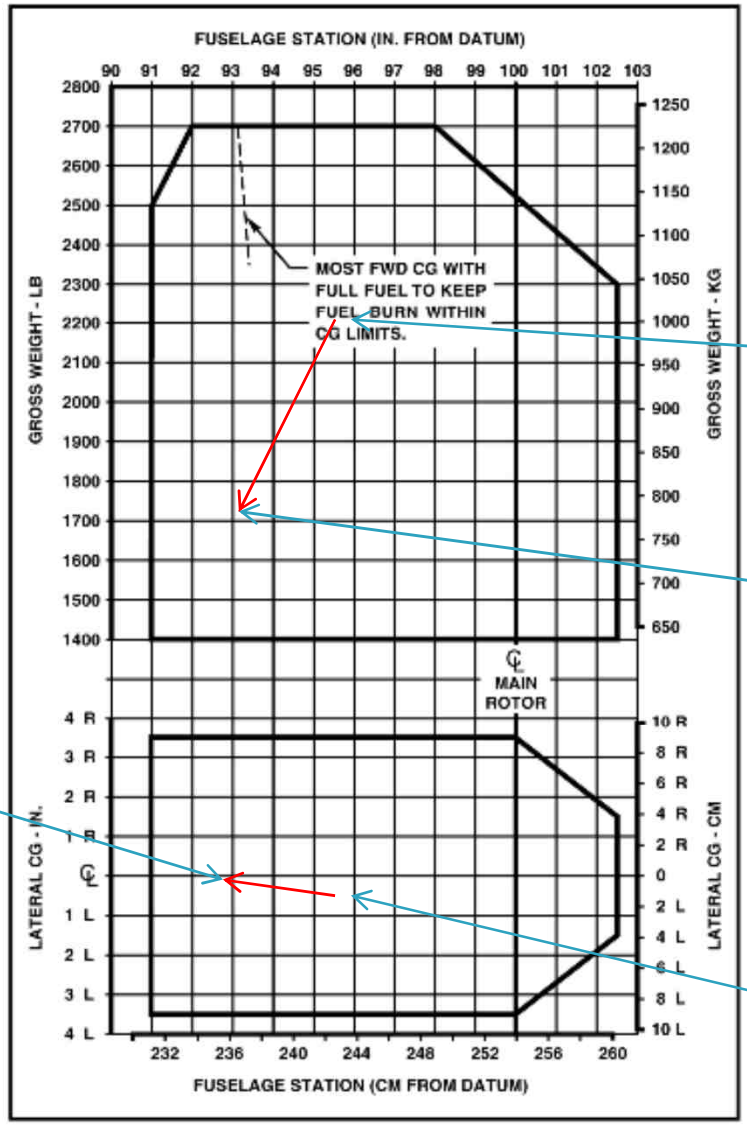
# R66 Limitations

- Weight Limits



# R66 Limitations

- Weight Limits
  - Example:
    - 200 lb Pilot
    - 200 lb Copilot
    - R66 S/N 0003




Full Fuel

Empty Fuel

Empty Fuel

Full Fuel

# R66 Limitations

- 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 the roll.*
  - Maximum operating density altitude 14,000 feet.

# R66 Limitations

- FLIGHT AND MANEUVER LIMITATIONS
  - Maximum operating altitude 9000 feet AGL to allow landing within 5 minutes in case of fire.
  - Closing throttle (twist grip) in flight prohibited above 10,000 feet density altitude to avoid possible engine flameout.
  - Closing throttle (twist grip) in flight prohibited with cabin heat ON to avoid possible engine flameout.
  - Minimum crew is one pilot. Solo from right seat only.
  - Forward left seat belt must be buckled.
  - Operation up to 100 KIAS approved with any or all cabin doors removed. All seat belts must be buckled and loose items in cabin must be properly secured during doors-off flight.
  - When installed, the appropriate GPS unit pilot's guide must be available for the flight crew when navigation is based on its use.
  - Traffic information provided by a multifunction GPS unit is advisory only. Do not use this information alone for traffic avoidance maneuvers.

# R66 Limitations

- KINDS OF OPERATION LIMITATIONS
  - VFR day
  - 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.*

# R66 Limitations

- ENVIRONMENTAL LIMITATIONS
  - Maximum ambient temperature for operation is ISA plus 35°C (ISA plus 63°F), limited to 50°C (122°F).
  - Minimum ambient temperature for operation is -10°C (14°F) at all altitudes.
    - *NOTE: See fuel limitations for temperature restrictions.*
  - Flight in known icing conditions is prohibited.
  - Flight in falling or blowing snow is prohibited.
  - Engine anti-ice must be on for operation in visible moisture in ambient temperatures at or below 4°C (40°F).

# R66 Limitations

- FUEL LIMITATIONS
  - APPROVED FUEL GRADES

| Grade (Specification) | Operating Limits |
|---|---|
| Jet A or Jet A1 (ASTM D 1655) | Anti-icing additive may be required (see below). Not approved for ambient temperatures below -32°C (-25°F). |
| Jet B (ASTM D 6615) | Anti-icing additive may be required (see below). Not approved for ambient temperatures above 32°C (90°F) at altitudes above 5000 feet. |
| JP-4 (MIL-DTL-5624) | Not approved for ambient temperatures above 32°C (90°F) at altitudes above 5000 feet. |
| JP-5 (MIL-DTL-5624) | Not approved for ambient temperatures below -32°C (-25°F). |
| JP-8 (MIL-DTL-83133) | Not approved for ambient temperatures below -32°C (-25°F). |

  - Anti-icing additive conforming to MIL-DTL-85470 must be added to Jet A, Jet A1, or Jet B when ambient temperature is below 4°C (40°F). Check with fuel supplier to determine if supply includes additive. If not, add per manufacturer's instructions.
    - NOTE: For consistent starts below 4°C, it may be necessary to pre-heat aircraft, use external power, and/or use fuels optimized for cold weather (Jet B, JP-4).
- FUEL CAPACITY
  - Total capacity: 74.6 US gallons (282 liters)
  - Usable capacity: 73.6 US gallons (279 liters)

# R66 Emergency Procedures

- DEFINITIONS
  - Land Immediately – Land on the nearest clear area where a safe normal landing can be performed. Be prepared to enter autorotation during approach, if required.
  - Land as soon as practical – Land at the nearest airport or other facility where emergency maintenance may be performed.
- POWER FAILURE – GENERAL
  - A power failure may be caused by either an engine or drive system failure and will usually be indicated by the low RPM horn. An engine failure may be indicated by a change in noise level, nose left yaw, an engine oil pressure light, or decreasing $N_1$ or $N_2$ RPM. A drive system failure may be indicated by an unusual noise or vibration, nose right or left yaw, or decreasing rotor RPM while $N_2$ RPM is increasing.
  - In case of power failure, immediately lower collective to enter autorotation and allow airspeed to reduce to power-off $V_{NE}$ or below.
    - *CAUTION: Aft cyclic is required when collective is lowered at high speed.*
    - *CAUTION: Avoid using aft cyclic during touchdown or ground slide to prevent possible blade strike to tailcone.*

# R66 Emergency Procedures

- POWER FAILURE ABOVE 500 FEET AGL
  1. Lower collective immediately to maintain RPM and enter normal autorotation.
  2. Establish a steady glide at 60 to 70 KIAS (See “Maximum Glide Distance Configuration”, slide 127).
  3. Adjust collective to keep RPM between 95 and 106% or apply full down collective if light weight prevents attaining above 95%.
  4. Select landing spot and, if altitude permits, maneuver so landing will be into wind.
  5. A restart may be attempted at pilot’s discretion if sufficient time is available (See “Air Restart Procedure”, slide 94).
  6. If unable to restart, turn unnecessary switches and fuel valve off.
  7. At about 40 feet AGL, begin cyclic flare to reduce rate of descent and forward speed.
  8. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down in level attitude with nose straight ahead.

# R66 Emergency Procedures

- POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL
  1. Lower collective immediately to maintain rotor RPM.
  2. Adjust collective to keep RPM between 95 and 106% or apply full down collective if light weight prevents attaining above 95%.
  3. Maintain airspeed until ground is approached, then begin cyclic flare to reduce rate of descent and forward speed.
  4. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down in level attitude with nose straight ahead.

# R66 Emergency Procedures

- POWER FAILURE BELOW 8 FEET AGL
  1. Apply right pedal as required to prevent yawing.
  2. Allow rotorcraft to settle.
  3. Raise collective just before touchdown to cushion landing.

# R66 Emergency Procedures

- AIR RESTART PROCEDURE
  - An immediate restart may be attempted by pressing the start button if N1 is above 20% (within approximately 10 seconds of power loss). It is not necessary to close throttle or pull fuel cutoff for immediate restart. If N1 has decayed to 20% or below, use the following procedure:
    1. Fuel cutoff – Pull OFF.
    2. Throttle – Closed.
    3. Start button – Push and release.
    4. N1 15% or above – push fuel cutoff ON.
    5. After peak MGT – throttle full open.

*CAUTION: Do not attempt restart if engine malfunction is suspected or before safe autorotation is established.*

# R66 Emergency Procedures

- EMERGENCY WATER LANDING – POWER OFF
  1. Follow same procedures as for power failure over land until contacting water. If time permits, unlatch doors prior to water contact.
  2. Apply lateral cyclic when aircraft contacts water to stop rotors.
  3. Release seat belt and quickly clear aircraft when rotors stop.

# R66 Emergency Procedures

- EMERGENCY WATER LANDING – POWER ON
  1. Descend to hover above water.
  2. Unlatch doors.
  3. Passengers exit aircraft.
  4. Fly to safe distance from passengers to avoid possible injury by blades.
  5. Switch battery and generator to OFF.
  6. Close throttle.
  7. Keep aircraft level and apply full collective as aircraft contacts water.
  8. Apply lateral cyclic to stop rotors.
  9. Release seat belt and quickly clear aircraft when rotors stop.

# R66 Emergency Procedures

- LOSS OF TAIL ROTOR THRUST IN FORWARD FLIGHT
  1. Failure is usually indicated by nose right yaw which cannot be corrected by applying left pedal.
  2. Immediately enter autorotation.
  3. Maintain at least 70 KIAS if practical.
  4. Select landing site, close throttle, and perform autorotation landing.

  - *NOTE: When a suitable landing site is not available, the vertical stabilizers may permit limited controlled flight at low power settings and airspeeds above 70 KIAS; however, prior to reducing airspeed, re-enter full autorotation.*

# R66 Emergency Procedures

- LOSS OF TAIL ROTOR THRUST IN HOVER
  1. Failure is usually indicated by right yaw which cannot be stopped by applying left pedal.
  2. Immediately close throttle to reduce yaw rate and allow aircraft to settle.
  3. Raise collective just before touchdown to cushion landing.

# R66 Emergency Procedures

- ENGINE FIRE DURING START OR SHUTDOWN
  - Fire may be indicated by excessive MGT or by engine fire warning light.

1. Fuel cutoff – Pull OFF.
2. Start button – Push and release.
3. Fuel valve knob – Pull OFF.
4. Battery switch – OFF when MGT decreases to 150°C or if fire worsens.
5. If time permits, apply rotor brake to stop rotors.
6. Exit aircraft.

- ENGINE FIRE IN FLIGHT

1. Immediately enter autorotation.
2. **If engine is running,** land immediately, then pull fuel cutoff OFF and pull fuel valve knob OFF.

   **If engine stops running,** pull fuel cutoff OFF, pull fuel valve knob OFF, and complete autorotation landing.
3. If time permits, apply rotor brake to stop rotors.
4. Exit aircraft.

# R66 Emergency Procedures

- ELECTRICAL FIRE
  1. Battery and generator switches – OFF.
  2. Open cabin vents.
  3. Land Immediately.
  4. Pull fuel cutoff OFF and pull fuel valve knob OFF.
  5. If time permits, apply rotor brake to stop rotors.
  6. Exit aircraft.

  - *CAUTION: Low RPM warning system is inoperative with battery and generator switches both OFF.*

# R66 Emergency Procedures

- TACHOMETER FAILURE
  - If rotor or N2 tachometer malfunctions in flight, use remaining tach to monitor RPM. If it is not clear which tach is malfunctioning or if both tachs malfunction allow power turbine governor to control RPM and land as soon as practical.
    - NOTE: The rotor tach, $N_2$ tach, and low RPM warning horn are each on separate circuits. A special circuit allows the battery to supply power to the tachs with the battery and generator switches both OFF.

# R66 Emergency Procedures

- HYDRAULIC SYSTEM FAILURE
  - Hydraulic system failure is indicated by heavy or stiff cyclic and collective controls. Loss of hydraulic fluid may cause intermittent and/or vibrating feedback in the controls. Control will be normal except for the increase in stick forces.
    1. Adjust airspeed and flight condition as desired for comfortable control.
    2. HYD Switch – Verify ON.
    3. If hydraulics not restored, HYD Switch – OFF.
    4. Land as soon as practical. A run-on landing is recommended if a suitable landing surface is available.

# R66 Emergency Procedures

- POWER TURBINE GOVERNOR FAILURE
  - Governor failure is indicated by a rise or fall of $N_2$ RPM. If $N_2$ overspeeds, attempt to control RPM with throttle. If $N_2$ underspeeds, verify throttle is full open and reduce collective to control RPM. If governor failure is suspected, land as soon as practical.
  - If manual RPM control is not possible, lower collective, close throttle, and complete autorotation landing per power failure procedures.

# R66 Emergency Procedures

- WARNING/CAUTION INDICATORS
  - MR TEMP/PRESS
    - Indicates excessive temperature or low oil pressure in main rotor gearbox. Land immediately.
  - MR CHIP
    - Indicates metallic particles in main gearbox. See note below.
  - TR CHIP
    - Indicates metallic particles in tail gearbox. See note below.
  - ENGINE CHIP
    - Indicates metallic particles in engine. See note below.

  - *NOTE:*
    - *If chip light is accompanied by any indication of a problem such a noise, vibration, or temperature rise, land immediately. If there is no other indication of a problem, land as soon as practical.*
    - *Break-in fuzz will occasionally activate chip lights. If no metal chips or slivers are found on detector plug, clean and reinstall (tail gearbox must be refilled with new oil). Hover for at least 30 minutes. If chip light comes on again, have affected gearbox serviced before further flight.*

# R66 Emergency Procedures

- WARNING/CAUTION INDICATORS
  - ENGINE FIRE
    - Indicates possible fire in engine compartment. See procedures on R66 RFM page 3-6 (Slide 99).
  - ENGINE OIL
    - Indicates loss of engine oil pressure. $N_1$ below 50% RPM indicates a possible flameout and an air restart may be attempted. If oil pressure gage confirms pressure loss, land immediately.
  - GEN
    - Indicates generator failure. Turn off nonessential electrical equipment and switch GEN to RESET and back to ON. If light stays on, land as soon as practical.
  - LOW FUEL
    - Indicates approximately five gallons of usable fuel remaining. The engine will run out of fuel after 10 minutes at cruise power.

      *CAUTION: Do not use low fuel warning as a working indication of fuel quantity.*
  - FUEL FILTER
    - Indicates fuel filter contamination. If no other indication of a problem exists, land as soon as practical. If light is accompanied by erratic engine operation, land immediately.
  - LOW RPM
    - A horn and caution light indicate that rotor speed is below 95% RPM. To restore RPM, immediately lower collective, verify throttle full open and, in forward flight, apply aft cyclic. Horn is disabled when collective is full down.

# R66 Emergency Procedures

- WARNING/CAUTION INDICATORS
  - COWL DOOR
    - Indicates fuel filler cowl door, right engine cowl door, or baggage compartment door is not closed. Land as soon as practical.
  - AIR FILTER
    - Indicates air filter contamination or blockage. Engine is operating on unfiltered air via a filter bypass door. Land as soon as practical and inspect filter.
  - ROTOR BRAKE
    - Indicates rotor brake is engaged. Release immediately in flight or before starting engine.

# R66 Normal Procedures

- RECOMMENDED AIRSPEEDS
  - Takeoff & Climbs 60 KIAS
  - Maximum Range 100 KIAS*
  - Landing Approach 60 KIAS
  - Autorotation 70 KIAS

  * Certain conditions may require lower airspeed. See $V_{NE}$ placard in Section 2.

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  - Remove all covers and tiedowns. Remove even small accumulations of frost, ice, or snow, especially from rotor blades and engine intake area. An 8-foot step ladder is recommended for preflight inspection of the main rotor; however, the main rotor hub may be reached by using the steps built into three cowl doors on the left side of the cabin.
  - Check general condition of aircraft and verify no visible damage, fluid leakage, or wear beyond normal limits. Also verify no fretting at seams where parts are joined together. Fretting of aluminum parts produces a fine black powder while fretting of steel parts produces a reddish-brown or black residue. Verify tail gearbox Telatemp shows no unexplainable temperature increase (indicated by darkened squares beyond the reference line) during prior flight.

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  1. Pilot's Station
     - Battery switch ON
     - Check fuel quantity
     - MR temp/press, engine oil, gen, low RPM lights on
     - Test annunciator panel, all lights on
     - Check strobe, nav, landing lights
     - Battery switch OFF
     - Release rotor brake
     - Adjust tail rotor pedals, pins secure

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  2. Fuselage Right Side and Engine Compartment
     - Verify no visible damage
     - Verify door hinge cotter rings installed
     - Check landing gear strut fairings, skid, skid shoes
     - Verify static port clear
     - Check baggage compartment loading and security
     - Verify baggage door latched
     - Verify engine air filter clean
     - Verify no fluid leaks
     - Verify all air ducts secure
     - Check engine oil filter impending bypass indicator
     - Check engine fuel control linkage
     - Verify exhaust secure and no cracks
     - Verify cowl door latched

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  3. Tailcone, Empennage, and Tail Rotor
     - Verify all antennas and lights secure
     - Verify empennage secure, no cracks
     - Verify tail rotor guard secure, no cracks
     - Verify tail skid secure, no damage
     - Check tail rotor gearbox oil quantity and Telatemp
     - Verify drive system continuity by rotating tail rotor
     - Verify no damage to tail rotor blades
     - Verify no looseness at pitch links, bellcrank
     - Check condition of elastomeric teeter bearing
     - Verify teeter bearing bolt does not rotate
  4. Belly
     - Verify all antennas and panels secure
     - Verify aft crosstube cover properly installed
     - Verify generator cooling air filter clean

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  5. Main Rotor
     - Verify no damage to blades
     - Verify paint covers bond line
     - Verify no leaks at pitch change boots
     - Verify all fasteners secure
     - Verify no excessive looseness at scissors, rod ends

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  6. Fuselage Left Side and Engine Compartment
     - Verify no visible damage
     - Verify door hinge cotter rings installed
     - Check landing gear strut fairings, skid, skid shoes
     - Verify static port clear
     - Verify fuel quantity and fuel cap secure
     - Verify engine air filter clean and secure
     - Check engine, main gearbox, hydraulic oil levels
     - Check gearbox oil filter impending bypass indicator
     - Check engine and gearbox oil coolers
     - Check engine governor control linkage
     - Verify no fluid leaks
     - Sample fuel, drain water and contaminants
     - Verify all cowl doors latched

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  7. Nose
     - Verify pitot tube clear
     - Verify windshield clean and undamaged
  8. Cabin Area
     - Verify no loose items
     - Verify all items clear of controls
     - Verify left seat controls removed or properly installed
     - Verify seatbelts for unoccupied seats buckled

# R66 Normal Procedures

- DAILY OR PREFLIGHT CHECKS
  - *CAUTION: Remove left seat controls if person in that seat is not a rated helicopter pilot.*
  - *CAUTION: Fill compartments under unoccupied seats before using compartments under occupied seats. Do not exceed fill line for occupied seats. Avoid placing hard objects in compartment which could injure occupant if seat collapses during a hard landing.*
  - *CAUTION: Ensure all cabin doors are unlocked before flight to allow rescue or exit in an emergency. Aft door locks have a green stripe to indicate door unlocked.*
  - *CAUTION: Shorter pilots may require cushion to obtain full travel of all controls. Verify aft cyclic travel is not restricted.*

# R66 Normal Procedures

- BEFORE STARTING ENGINE
  - Seat belts ---------- Fastened
  - Fuel valve ---------- ON, guard installed
  - Cyclic/collective friction ---------- OFF
  - Cyclic, collective, pedals ---------- Full travel free
  - Collective ---------- Full down, friction ON
  - Cyclic ---------- Neutral, friction ON
  - Pedals ---------- Neutral
  - Rotor brake ---------- Disengaged
  - Circuit breakers ---------- In
  - Cabin heat, anti-ice, pitot heat ---------- OFF
  - Landing lights ---------- OFF
  - Avionics, generator switches ---------- OFF
  - Altimeter ---------- Set
  - Hydraulic switch ---------- ON

# R66 Normal Procedures

- GROUND POWER START
  - Have ground personnel connect ground power to external receptacle prior to engaging starter and disconnect once idle is stabilized prior to switching generator ON. Ground power is connected to the helicopter's electrical system when master switch is ON. Starts using ground power assist follow the same procedure as normal starts.

  - *NOTE: If generator is switched ON prior to disconnecting ground power, high generator loads and reduction in idle speed may occur.*

# R66 Normal Procedures

- STARTING ENGINE AND RUN-UP
  - Battery, strobe switches ..... ON
  - Igniter (key) ..... Enable
  - Area ..... Clear
  - **Fuel cutoff** ..... **Pull OFF**
  - **Throttle** ..... **Closed**
  - Start button ..... Push and release
  - $N_1$ ..... 12 to 15%, increasing
  - MGT ..... Below 150°C
  - Fuel cutoff ..... Push on
  - Light-off ..... Within three seconds
  - MGT ..... Monitor, observe limits

# R66 Normal Procedures

- STARTING ENGINE AND RUN-UP
  - *CAUTION: Excessive MGT will cause severe engine damage. Do not push fuel cutoff ON unless $N_1$ has reached adequate speed and is increasing. 15% $N_1$ is recommended; 12% $N_1$ minimum may be used in cold weather. If MGT reaches limit during start or light-off does not occur within three seconds, immediately pull fuel cutoff OFF, wait ten seconds, then switch igniter OFF to stop starter.*

# R66 Normal Procedures

- STARTING ENGINE AND RUN-UP
  - Oil pressure ---------- Increasing
  - $N_1$ ---------- Stable at 65 to 67%
  - Fuel cutoff guard ---------- Installed
  - Ground power (if used) ---------- Disconnect
  - Generator ---------- ON
  - Avionics switch, headsets ---------- ON
  - Annunciator panel test ---------- All lights on
  - Engine anti-ice check ---------- Annunciator light
  - Doors ---------- Closed and latched
  - Cyclic/collective friction ---------- OFF
  - Hydraulic system ---------- Check
  - Lift collective slightly ---------- Low RPM horn
  - Warm-up ---------- One minute idle
  - Throttle ---------- Increase slowly to full open
  - N2/R ---------- Stable at 100% (beep as required)
  - Annunciator lights ---------- Out
  - Engine gages ---------- Normal operating range

# R66 Normal Procedures

- STARTING ENGINE AND RUN-UP
  - *CAUTION: When opening throttle, avoid exceeding 50% torque. On slippery surfaces, be prepared to counter nose-right rotation with left pedal.*
  - *NOTE: For hydraulic system check, use small cyclic inputs. With hydraulics OFF, there should be approximately one half inch of freeplay before encountering control stiffness and feedback. With hydraulics ON, controls should be free with no feedback or uncommanded motion.*
  - *NOTE: Time between starter engagement and stabilized idle should normally not exceed one minute. If time exceeds one minute and engine has stopped accelerating, pull fuel cutoff OFF, wait for MGT drop, and turn igniter (key) switch OFF to stop starter. To avoid overheating, starter time should be limited to: one minute on, one minute off, one minute on, 30 minutes off. One minute limit may be exceeded if engine is accelerating.*

# R66 Normal Procedures

- TAKEOFF PROCEDURE
  1. Verify doors latched, hydraulics ON, and RPM stabilized at 100%.
  2. Engine anti-ice as required per RFM Limitations Section.
  3. Clear area. Slowly raise collective until aircraft is light on skids. Reposition cyclic as required for equilibrium, then gently lift aircraft into hover. Note hover torque.
  4. Beep RPM as required to 100%.
  5. Check gages in green, lower nose, and accelerate to climb speed following profile shown by height-velocity diagram in Section 5 of RFM. Takeoff torque should not exceed 10% above hover torque.
     - *NOTE: Takeoff portion of height-velocity diagram was demonstrated at 10% above hover torque to prevent excessive nose-down attitude.*
     - *NOTE: Periodically performing power assurance check (see Section 5 of RFM) may provide indication of engine deterioration or air filter blockage.*

# R66 Normal Procedures

- CRUISE
  - Beep RPM as required to 100%.
  - Set torque as desired with collective. Observe torque, MGT, and $V_{NE}$ limits.
  - Verify gages in green, no cautions or warnings.
  - Engine anti-ice as required.

    - *NOTE: Slight yaw oscillation during cruise can be stopped by applying a small amount of pedal.*

# R66 Normal Procedures

- DOORS-OFF OPERATION
  - Maximum airspeed with any door(s) off is 100 KIAS. Warn passengers to secure loose objects and to keep head and arms inside cabin to avoid high velocity airstream.

    - *CAUTION: Ensure all seat belts are buckled during door-off flight. Rear outboard seat bottoms may lift if not restrained.*

    - *CAUTION: Flight with left door(s) removed is not recommended. Loose objects exiting left doors may damage tail rotor.*

    - *NOTE: Door removal on opposite sides of aircraft allows cross flow in cabin and increases noise levels.*

# R66 Normal Procedures

- PRACTICE AUTOROTATION – POWER RECOVERY

  - *CAUTION: Verify a recent N1 deceleration check was performed prior to conducting autorotations. Observe cabin heat and altitude limitation for closing throttle per RFM Limitations Section.*

1. Close throttle and lower collective to down stop.
2. Adjust collective to keep rotor RPM in green arc.
3. Airspeed 60 to 70 KIAS.
4. At about 40 feet AGL, begin cyclic flare to reduce rate of descent and forward speed and roll throttle smoothly on to recover engine power.
5. At about 8 feet AGL, apply forward cyclic to level aircraft, and raise collective to control descent.

  - *CAUTION: Engine may require several seconds to spool up to full power during power recoveries.*
  - *CAUTION: Simualted engine failures require prompt lowering of collective to avoid dangerously low rotor RPM. Catastrophic rotor stall could occur if rotor RPM drops below 80% plus 1% per 1000 feet of altitude.*

# R66 Normal Procedures

- PRACTICE AUTOROTATION – WITH GROUND CONTACT
  - If practice autorotations with ground contact are required for demonstration purposes, perform in same manner as power recovery autorotations except keep throttle closed throughout maneuver. Always contact ground with skids level and nose straight ahead.

    - *NOTE: Have landing gear skid shoes inspected more frequently when practicing autorotations with ground contact. Rapid wear of skid shoes may occur.*

# R66 Normal Procedures

- MAXIMUM GLIDE DISTANCE CONFIGURATION
  1. Airspeed approximately 90 KIAS.
  2. Rotor RPM approximately 90%.
  3. Best glide ratio is about 5.5:1 or one nautical mile per 1100 feet AGL.
- MINIMUM RATE OF DESCENT CONFIGURATION
  1. Airspeed approximately 60 KIAS.
  2. Rotor RPM approximately 90%.
  3. Minimum rate of descent is about 1300 feet per minute. Glide ratio is about 4.5:1 or one nautical mile per 1350 feet AGL.

  - *CAUTION: Increase rotor RPM to 95% minimum or full down collective when autorotating below 500 feet AGL.*
  - *Note: Low RPM horn will sound when RPM is below 95% unless collective is full down.*

# R66 Normal Procedures

- HYDRAULICS-OFF TRAINING
  - Hydraulic system failure may be simulated using cyclic-mounted hydraulic switch.

    - *CAUTION: With hydraulics switch OFF< controlling helicopter in a hover may be difficult due to control system feedback forces.*
    - *CAUTION: To avoid overcontrolling, relax force on cyclic and collective before switching hydraulics from OFF to ON.*

# R66 Normal Procedures

- APPROACH AND LANDING
  1. Make final approach into wind at lowest practical rate of descent with initial airspeed of 60 knots.
  2. Reduce airspeed and altitude smoothly to hover. (Be sure rate of descent is less than 300 FPM before airspeed is reduced below 30 KIAS).
  3. From hover, lower collective gradually until ground contact.
  4. After initial ground contact, lower collective to full down position.

  - *CAUTION: When landing on a slope, return cyclic control to neutral before closing throttle.*

  - *CAUTION: Never leave helicopter flight controls unattended while engine is running.*

# R66 Normal Procedures

- SHUTDOWN PROCEDURE
  - Collective down ---------- Friction ON
  - Throttle closed ---------- N1 deceleration check
  - Cyclic and pedals neutral ---------- Friction ON
  - Cool down ---------- Two minute idle
  - Fuel cutoff ---------- Pull OFF, monitor MGT

    - *CAUTION: Rapid MGT increase following shutdown indicates residual fire in combustor. Follow "Engine Fire During Start or Shutdown" procedure per RFM Emergency Procedures Section.*

  - Sprag clutch check ---------- Verify $N_2$/R needles split
  - Wait one minute ---------- Apply rotor brake
  - Avionics, generator, battery, igniter switches ---------- OFF

    - *CAUTION: Do not slow rotor by raising collective during shutdown. Blades may flap and strike tailcone.*

    - *NOTE: HYD switch should be left ON for start-up and shutdown to reduce possibility of unintentional hydraulics-off liftoff. Switch OFF only for pre-takeoff controls check or hydraulics-off training.*

# R66 Normal Procedures

- N1 Deceleration Check
  - The deceleration check is performed on the ground to confirm proper fuel control operation. The check should be performed after the last flight of the day. Improper deceleration may cause engine flameout during an autorotation entry. Perform check as follows:
    1. Collective full down.
    2. Throttle open, N2/R at 100% RPM.
    3. Rapidly close throttle and measure time for N1 to reach 67% RPM. Minimum allowable time is five seconds.
  - If deceleration is less than 5 seconds, switch generator OFF and perform two more checks to confirm time. If confirmed time is less than five seconds, have helicopter serviced.

# R66 Normal Procedures

- NOISE ABATEMENT
  - To improve the quality of our environment and to dissuade overly restrictive ordinances against helicopters, it is imperative that every pilot minimize noise irritation to the public. Following are several techniques which should be employed when possible.
    1. Avoid flying over outdoor assemblies of people. When this cannot be avoided, fly as high as practical, preferably over 2000 feet AGL.
    2. Avoid blade slap. Blade slap generally occurs at airspeeds below 100 KIAS. It can usually be avoided by maintaining 100 KIAS until rate of descent is over 1000 FPM, then using a fairly steep approach until airspeed is below 65 KIAS. With the right door vent open, the pilot can easily determine those flight conditions which produce blade slap and develop piloting techniques to eliminate or reduce it.
    3. When departing from or approaching a landing site, avoid prolonged flight over noise sensitive areas. Always fly above 500 feet AGL and preferably above 1000 feet AGL.
    4. Repetitive noise is far more irritating than a single occurrence. If you must fly over the same area more than once, vary your flight path to not overly the same buildings each time.
    5. When overflying populated areas, look ahead and select the least noise-sensitive route.

    - *NOTE: Above procedures do not apply where they would conflict with Air Traffic Control clearances or when, in the pilot's judgment, they would result in an unsafe flight path.*

# R66 Performance

- Hover controllability has been substantiated in 17 knot wind from any direction up to 11,000 feet density altitude. Refer to hover performance charts for allowable gross weight.
- Indicated airspeed (KIAS) shown on graphs assumes zero instrument error.

# R66 Performance

- Power assurance chart shows maximum allowable MGT at specified torque.
- If observed MGT is greater than indicated by the chart, the engine may not produce power necessary to achieve published performance data without exceeding MGT limits.
- Chart assumes stabilized conditions and no generator load.
- Temperature stabilization may take up to two minutes.
- Higher torque settings will give more accurate results.
- The chart may also be read in reverse (minimum allowable torque for a specified MGT).

*CAUTION*

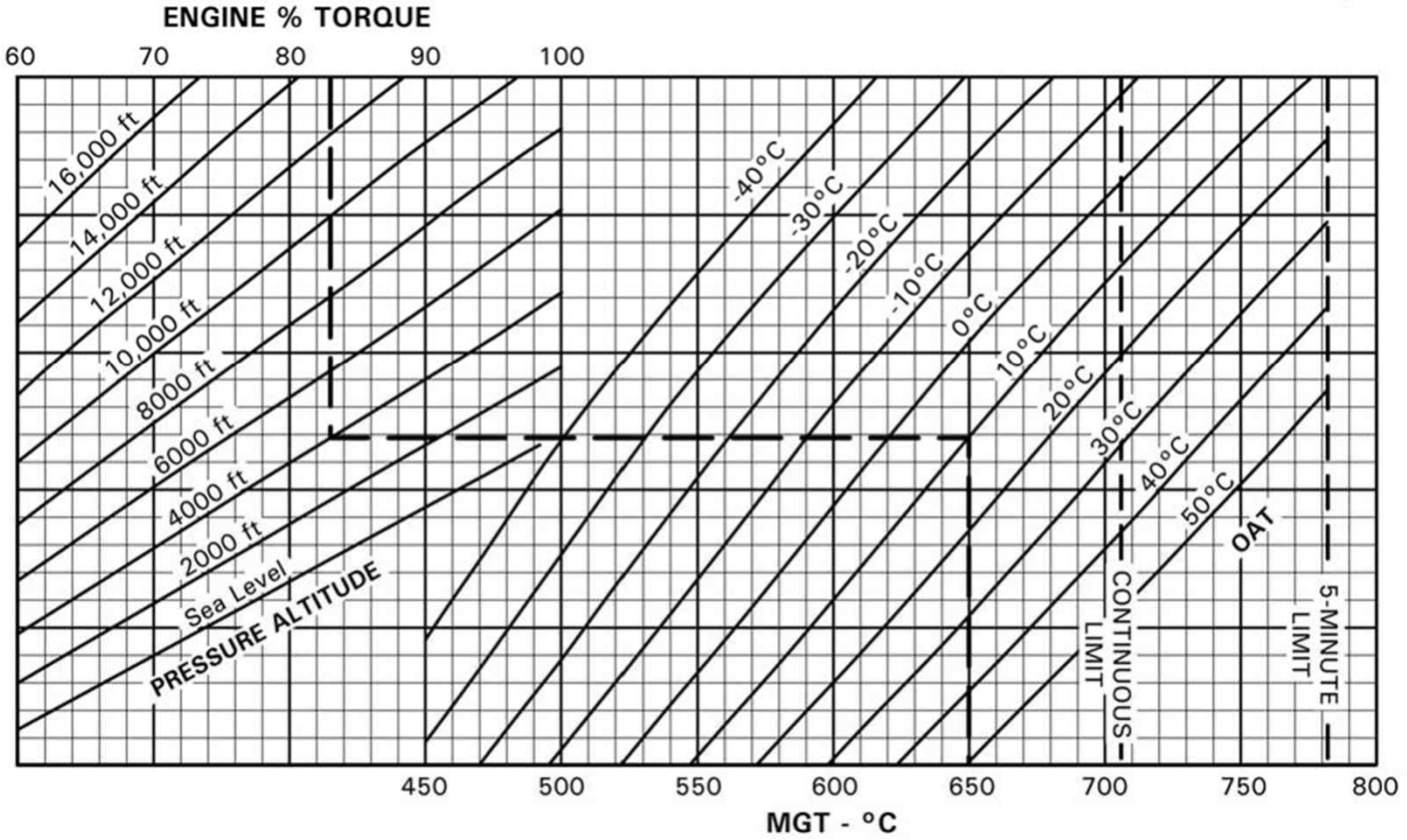
Performance data was obtained under ideal conditions.
Performance under other conditions may be substantially less.

# R66 Performance

- Power Assurance Chart

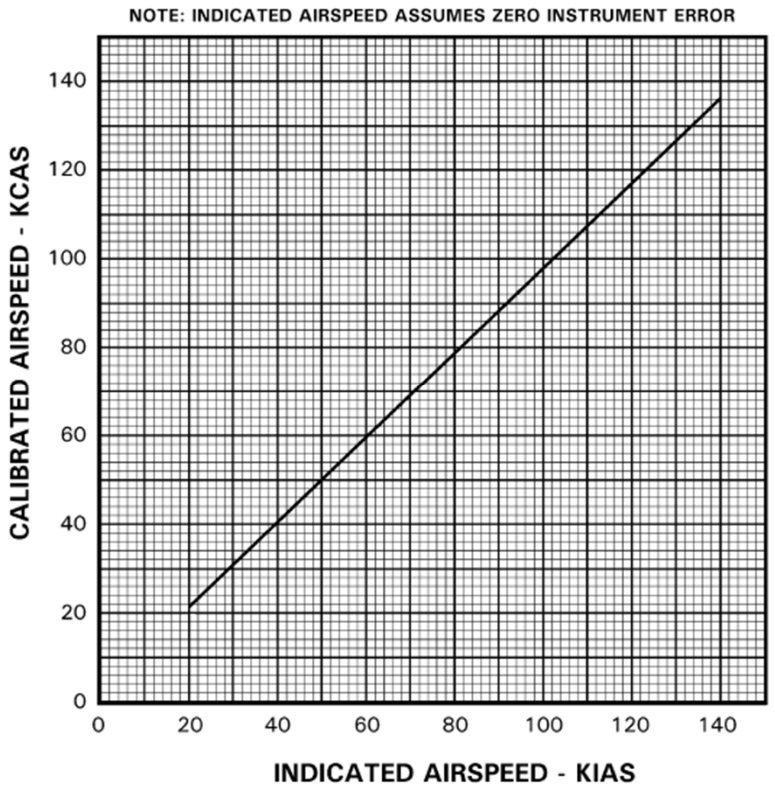
NOTES: USE CHART IN HOVER OR LEVEL FLIGHT
HEATER AND ANTI-ICE OFF
NO GENERATOR LOAD

EXAMPLE: ENTER CHART AT OBSERVED TORQUE (83%)
READ DOWN TO PRESSURE ALTITUDE (4000 ft)
READ ACROSS TO OBSERVED OAT (10°C)
READ DOWN TO MAX ALLOWABLE MGT (650°C)



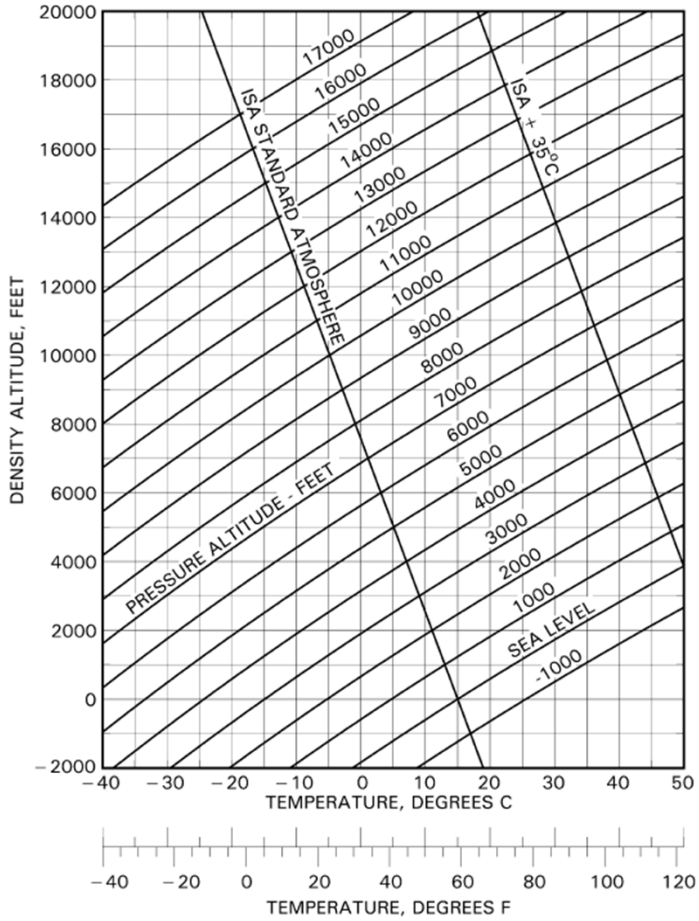
# R66 Performance

- Calibrated Airspeed Chart



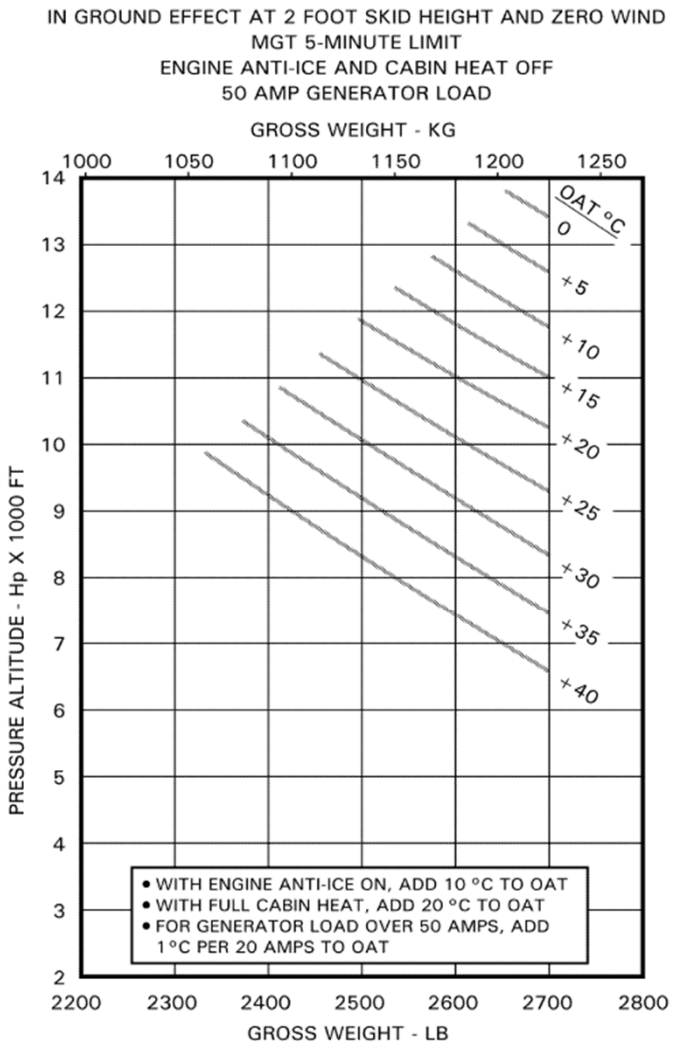
# R66 Performance

- Density Altitude Chart



# R66 Performance

- In Ground Effect Hover Ceiling

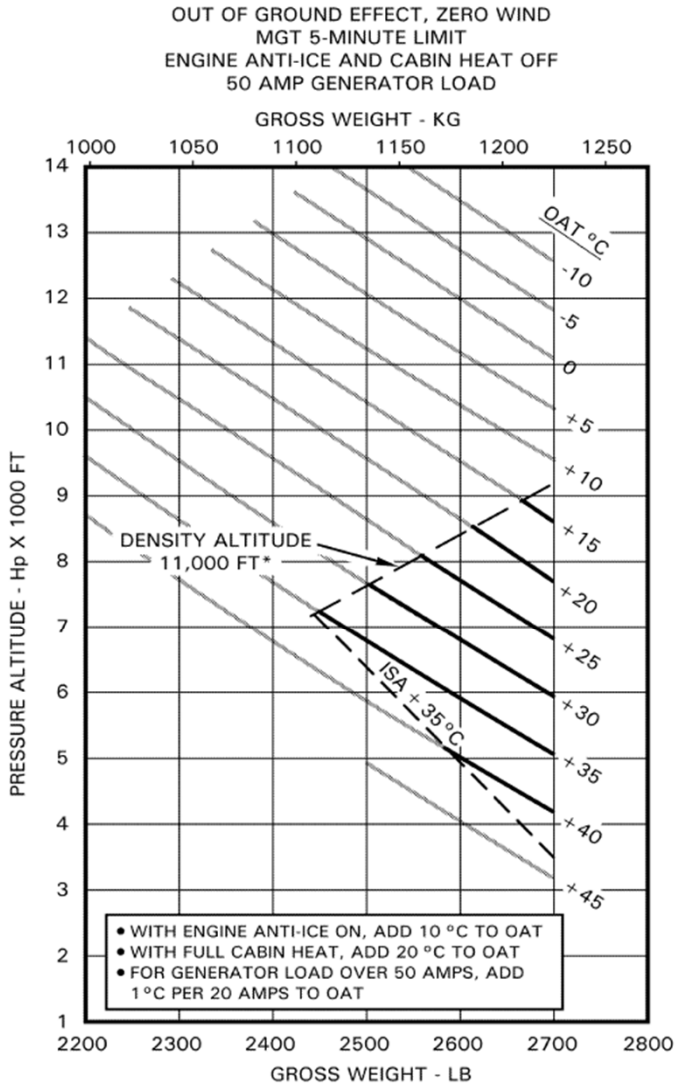



**IGE HOVER CEILING VS. GROSS WEIGHT**

**NOTE:** Hover performance substantiated up to 11,000 feet density altitude. Data is presented only to determine performance with engine anti-ice, cabin heat and/or generator loads over 50 amps.

# R66 Performance

- Out of Ground Effect Hover Ceiling

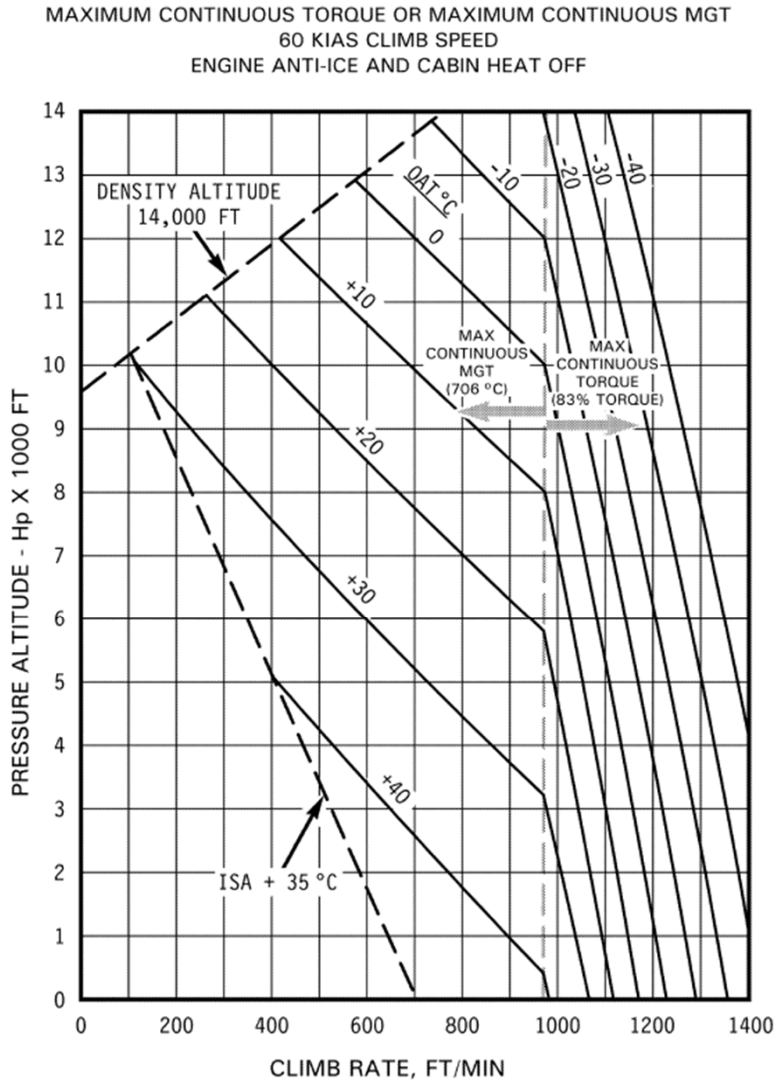



**OGE HOVER CEILING VS. GROSS WEIGHT**

*Hover performance substantiated up to 11,000 feet density altitude. Data beyond ISA+35°C and above 11,000 feet density altitude is presented only to determine performance with engine anti-ice, cabin heat, and/or generator loads over 50 amps.

# R66 Performance

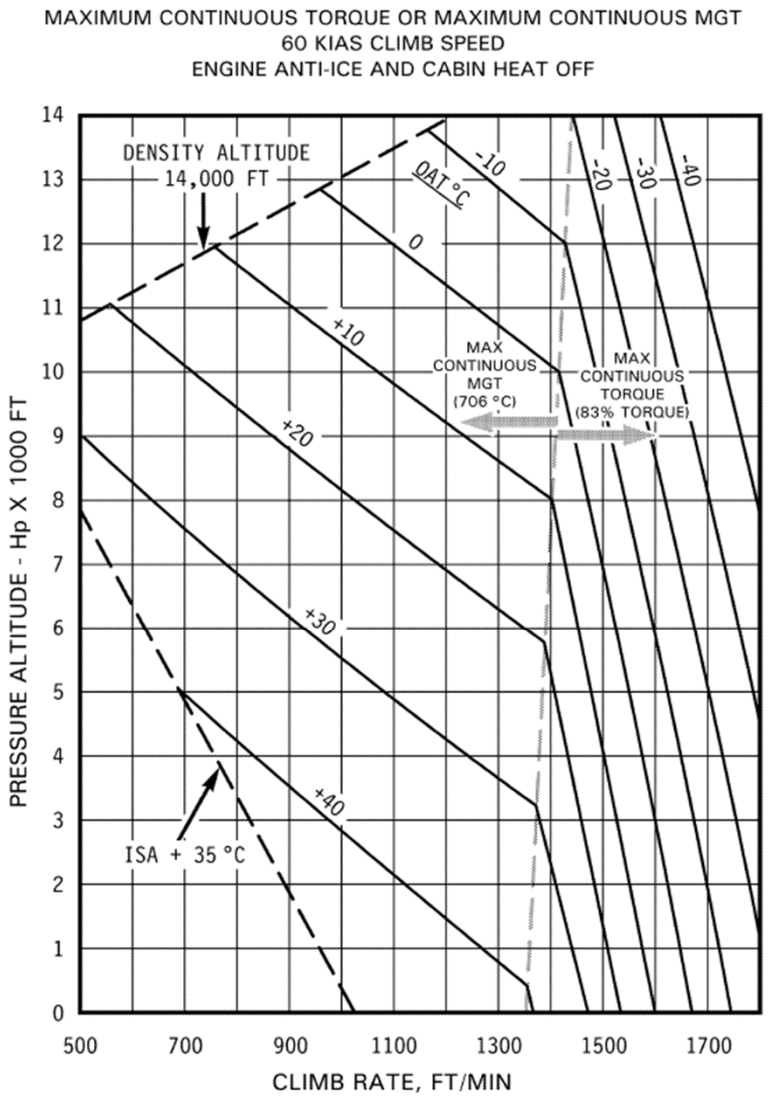
- Climb Performance at 2700 lb Gross Weight




**CLIMB PERFORMANCE, 2700 LB GROSS WEIGHT**

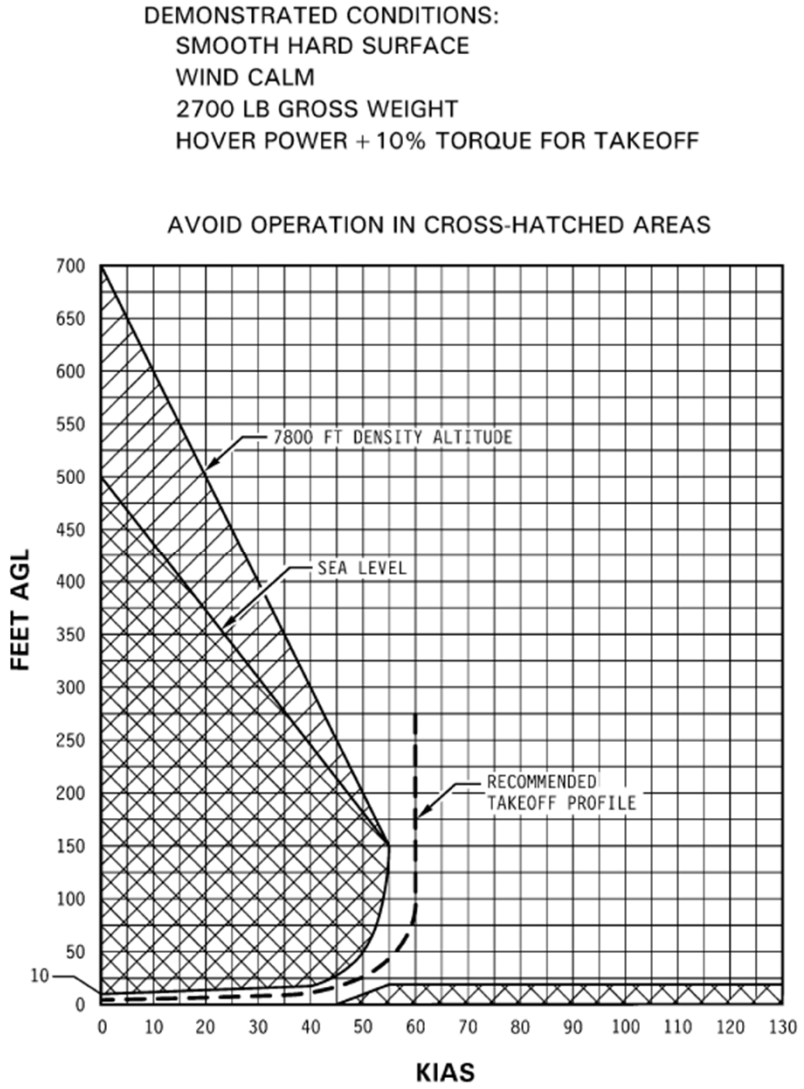
# R66 Performance

- Climb Performance at 2200 lb Gross Weight



# R66 Performance

- Height-Velocity Diagram



# R66 Performance

- NOISE CHARACTERISTICS
  - The following noise level complies with FAR Part 36, Appendix J noise requirements and was obtained from FAA approved data from actual noise tests.
    - Model: R66
    - Engine: Rolls-Royce Model 250-C300/A1
    - Gross Weight: 2700 lb

| Configuration | $V_H$ (KIAS) | SEL* (dBA) |
|---|---|---|
| Clean with standard doors | 114 | 82.4 |
| Landing gear strut fairings and rear landing gear cross-tube cover removed, and four doors with bubble windows installed. | 106 | 83.0 |

*Sound Exposure Level for a level flyover at 492 feet AGL.

***NOTE***

*No determination has been made by the Federal Aviation Administration that the noise level is or should be acceptable or unacceptable for operation at, into, or out of any airport.*

# R66 Weight & Balance

- GENERAL
  - The helicopter must be flown only within weight and balance limits specified in Section 2. Loadings outside these limits can result in insufficient control travel for safe operation.
  - The center of gravity may be adjusted by adding removable ballast (any appropriate item of mass) to the baggage compartment and any under seat stowage area. Recalculate weight and balance after adding ballast, and verify ballast meets baggage compartment/stowage area limits given in Section 2.
  - Loaded helicopter weight and balance can be determined using the method given under LOADING INSTRUCTIONS.

***CAUTION***

*Fuel burn causes CG to move forward during flight. Always determine safe loading with empty fuel as well as with takeoff fuel. Payload may be limited by forward CG with empty fuel.*

# R66 Weight & Balance

- WEIGHT AND BALANCE RECORD
  - The following form should be used to maintain a continuous record of your helicopter's weight and balance. Each time an item of equipment is removed or installed, an entry must be made and the new empty CG determined. The original factory weight and configuration is supplied with each helicopter on the Weight and Balance Summary/Equipment List (RF 134) at the end of this section. The RF 134 Weight and Balance Summary provides the first entry in the Weight and Balance Record.

***CAUTION***

*Calculated CG of empty weight plus 160 lb pilot must be STA 102.5 or forward. Following modification, adjustment to fixed nose ballast may be required. See R66 Maintenance Manual.*

# R66 Weight & Balance

- WEIGHT AND BALANCE RECORD
  - Continuous History of Changes in Structure or Equipment Affecting Weight and Balance.

| HELICOPTER MODEL R66 | | SERIAL NUMBER: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DESCRIPTION OF ARTICLE OR MODIFICATION | WEIGHT CHANGE | | | | | RUNNING BASIC EMPTY WEIGHT | | | | |
| | | ADDED (+) REMOVED (–) WEIGHT (lb) | LONGITUDINAL | | LATERAL (+ = RIGHT SIDE) | | WEIGHT (lb) | LONGITUDINAL | | LATERAL | |
| | | | Arm (in.) | Moment (in-lb) | Arm (in.) | Moment (in-lb) | | Arm (in.) | Moment (in-lb) | Arm (in.) | Moment (in-lb) |
| | HELICOPTER AS WEIGHED | | | | | | | | | | |
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# R66 Weight & Balance

- Loading Instructions
  - The following table may be used when calculating loaded helicopter weight and CG position.

| Item | Weight (lb) | Longitudinal arm (in.) | Lateral arm (in.) (+ = right side) |
|---|---|---|---|
| Pilot (right forward seat) | | 49.0* | 12.2 |
| Left forward passenger | | 49.0* | −12.2 |
| Aft outboard passengers | | 80.0 | ±16.0 |
| Aft center passenger | | 78.0 | 0.0 |
| Baggage under forward seats | | 42.0 | ±12.2 |
| Baggage under aft seats | | 82.0 | ±15.0 |
| Baggage in baggage compartment | | 107.0 | 0.0 |
| Fuel | | 102.5 | −3.0 |
| Forward doors | 7.5 each | 49.5 | ±26.8 |
| Aft doors | 7.0 each | 75.2 | ±27.2 |
| Removable cyclic | 0.6 | 35.3 | −8.0 |
| Removable collective | 0.8 | 46.5 | −21.0 |
| Removable pedals (both pedals) | 0.8 | 16.3 | −9.5 |

*If additional backrest cushion is used, subtract thickness of compressed cushion.

# R66 Weight & Balance

- Loading Instructions
  - The following sample calculation demonstrates how to determine loaded helicopter weight and longitudinal center of gravity.
  - A worksheet is provided on the page following the sample calculation for a weight and balance calculation for your helicopter.
  - These may be compared with the CG limits given in Section 2 to determine safe loading.
  - Both takeoff and empty fuel conditions must be within limits.
  - Lateral CG usually falls well within limits for conventional loadings.
  - If an unusual lateral installation or loading occurs, lateral CG should be checked against the CG limits given in R66 POH Section 2.
  - The lateral reference datum is the aircraft centerline with items to the right positive and items to the left negative.

# R66 Weight & Balance

- Sample calculation

| Item | Weight (lb) | Location | | Moment | |
|---|---|---|---|---|---|
| | | Long. Arm (in.) | Lat. Arm (in.) +=Right Side | Long. (in-lb) | Lat. (in-lb) |
| Basic empty weight | 1290 | | | 140610 | 431 |
| Remove fwd. right door | -7.5 | 49.5 | 26.8 | -371 | -201 |
| Remove fwd. left door | | 49.5 | -26.8 | | |
| Remove aft right door | | 75.2 | 27.2 | | |
| Remove aft left door | | 75.2 | -27.2 | | |
| Remove cyclic | | 35.3 | -8.0 | | |
| Remove collective | | 46.5 | -21.0 | | |
| Remove pedals (both) | | 16.3 | -9.5 | | |
| Pilot (forward right seat) | 170 | 49.0 | 12.2 | 8330 | 2074 |
| Left forward passenger | 170 | 49.0 | -12.2 | 8330 | -2074 |
| Aft right passenger | 170 | 80.0 | 16.0 | 13600 | 2720 |
| Aft center passenger | 130 | 78.0 | 0.0 | 10140 | 0 |
| Aft left passenger | 170 | 80.0 | -16.0 | 13600 | -2720 |
| Baggage under forward right seat | 10 | 42.0 | 12.2 | 420 | 122 |
| Baggage under forward left seat | 10 | 42.0 | -12.2 | 420 | -122 |
| Baggage under aft right seat | 10 | 82.0 | 15.0 | 820 | 150 |
| Baggage under aft left seat | 10 | 82.0 | -15.0 | 820 | -150 |
| Baggage in main baggage comp. | 50 | 107.0 | 0.0 | 5350 | 0 |
| **Zero usable fuel weight and CG** | **2182.5** | **92.4** | **0.1** | **202069** | **230** |
| Usable fuel quantity at 6.7 lb/gal | 493.1 | 102.5 | -3.0 | 50543 | -1479 |
| **Takeoff Gross Weight and CG** | **2675.6** | **94.4** | **-0.5** | **252612** | **-1249** |

Note: CG location (arm) for loaded helicopter is determined by dividing total moment by total weight.

# SAFETY TIPS

1. Never push the cyclic forward to descend or to terminate a pull-up (as you would in an airplane). This may produce a low-G (weightless) condition which can result in a main rotor blade striking the cabin. Always use the collective to initiate a descent.
2. Never intentionally allow the fuel quantity to become so low in flight that the low fuel warning light comes on.
3. Never leave the helicopter unprotected where curious onlookers may inadvertently damage critical parts, such as the tail rotor blades.
4. Turn on the strobe light before starting the engine and leave on after shut down until the rotors stop turning. The strobe light is located near the tail rotor and provides a warning to ground personnel.

# SAFETY TIPS

5. Operation of all external lights even during daylight is recommended to promote collision avoidance. Strobe, position, and landing lights are long-life and suitable for continuous use.
6. Never carry any external load except when using an approved hook, and never attach anything to the outside of the helicopter. Also, be sure no loose articles are in the cabin, particularly when flying with any doors removed. Even a small, lightweight object can damage the tail rotor in flight.
7. Avoid abrupt control inputs or accelerated maneuvers, particularly at high speed. These produce high fatigue loads and, over time, could lead to failure of a critical component.

# SAFETY TIPS

8. A change in the sound or vibration of the helicopter may indicate an impending failure of a critical component. If unusual sound or vibration begins in flight, make a safe landing and thoroughly inspect aircraft before flight is resumed. Hover helicopter close to the ground to verify problem is resolved, and then re-inspect before resuming free flight.
9. Take steps to ensure ground personnel or onlookers remain well clear of tail rotor and exhaust. Main rotor blades can also be dangerous, especially if personnel may be up-slope from helicopter.

# SAFETY TIPS

10. Never allow rotor RPM to become dangerously low. Most hard landings will be survivable as long as the rotor is not allowed to stall.
11. Never make takeoffs or landings downwind, especially at high altitude. The resulting loss of translational lift can cause the aircraft to settle into the ground or obstacles.
12. A vertical descent or steep approach downwind can result in "settling with power." This happens when the rotor is settling in its own downwash and additional power will not stop the descent. Should this occur, reduce collective and lower the nose to increase airspeed. Settling with power can be very dangerous near the ground as the recovery results in a substantial loss of altitude.

# SAFETY TIPS

13. The helicopter is stable on its landing gear as long as ground contact is made vertically or with the aircraft moving forward. Should ground contact be made with the helicopter moving rearward or sideward, damage and possibly a rollover could occur. Low time pilots and students should practice landings and hovering with the aircraft slowly moving forward.
14. Although the engine is equipped with an RPM governor, RPM control will not be exact for large or rapid power changes. If entering autorotation with a rapid collective input, close throttle before lowering collective to avoid an overspeed.

# SAFETY TIPS

15. Engine may take several seconds to spool up from low to high power. Power should be applied early during power-recovery autorotations and other power-critical maneuvers.
16. Do not attempt an engine start while distracted. Hot starts may result from improper positioning of twist grip or fuel cutoff or from low battery power. Continuously monitor MGT and be prepared to pull fuel cutoff OFF at any time during a start until reaching idle RPM.
17. Do not use collective pitch to slow the rotor during shut-down. Collective pitch produces lift on the blades which can disengage the droop stop friction and allow the blades to strike the tailcone. Also, do not slow or stop the rotors by grabbing the tail rotor. Stopping the tail rotor by hand can damage the tail rotor drive.

# SAFETY TIPS

18. Do not land in tall dry grass. The exhaust is very hot; a grass fire may be ignited.
19. Always check area for wires or other obstructions before practicing autorotations.

# Questions