FPS MOBILITY AND TRANSPORT
BELGIAN CIVIL AVIATION AUTHORITY

Belgian Airworthiness Code – Ultralight Motorised Helicopters – Compliance Checklist – *ULH – INITIAL – 28 February 2025*

Manufacturer:	
Aircraft Designation:	
MTOW:	

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
## Section A – GENERAL				
ULH.1 – Applicability				
This Airworthiness Code is applicable to helicopters which:				
a) are of a simple design;				
b) have a maximum take-off mass (MTOM) of not more than: (1) 300 kg for single seat helicopters (315 kg when equipped with an airframe mounted total recovery parachute); (2) 450 kg for two seat helicopters (475 kg when equipped with an airframe mounted total recovery parachute); or				
c) have no more than two seats and a maximum take-off mass (MTOM) of not more than 600 kg.				
For the purpose of this Airworthiness Code a helicopter design is assumed to be simple:				
a) when incorporating: (1) a single main rotor; (2) a single anti-torque device (typically a conventional tail rotor or fenestron); (3) a single engine spark or compression ignition (with or without electronic ignition, fuel injection or engine management systems as appropriate); (4) a simple fuel system (this relates to the fuel system components installed on the airframe, excluding those items normally comprising the engine assembly e.g. fuel injection systems); (5) a skid or fixed wheeled landing gear.				
b) but excluding: (1) hydraulic systems; (2) stability augmentation systems; (3) autopilots; (4) combustion heaters; and (5) external loads.				
The helicopters specified under paragraph ULH.1 b) will be referred to as ‘basic’ ultralight motorised helicopters, whereas the helicopters specified under paragraph ULH.1 c) will be referred to as ‘exempted’ ultralight motorised helicopters.				
Unless specifically stated otherwise, the requirements of this Airworthiness Code are applicable to all helicopters.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.3 – Permitted operations				
Helicopters authorised under this Airworthiness Code are limited to day-VFR and non-aerobatic operations.				
Non-aerobatic operations include: a) any manoeuvre incident to normal flying; b) steep turns in which the angle of bank is not more than 60 degrees; c) autorotational descents.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Section B - FLIGHT				
GENERAL				
ULH.21 – Proof of compliance				
a) Each requirement of this Section B must be met by tests upon a helicopter of the type for which an authorisation is requested at the most adverse combination of weight and centre of gravity within the range of loading conditions for which an authorisation is requested.				
b) Compliance must be established for all configurations at which the helicopter will be operated, except as otherwise stated.				
ULH.23 – Load distribution limits				
a) The ranges of weight and centre of gravity within which the helicopter may be safely operated must be selected by the applicant.				
b) The centre of gravity range within which the helicopter may be safely operated must not be less than that which corresponds to: (1) an occupant weight of 55 kg to 86 kg for single seat helicopters; or (2) an occupant weight of 55 kg to 172 kg for two seat helicopters. In each case the safe centre of gravity range should permit operation with a fuel load ranging from the lower limit of usable fuel up to fuel sufficient for 60 minutes of operation at maximum continuous power.				
ULH.25 – Weight limits				
a) *Maximum Weight.* The maximum weight must be established so that it is: (1) not more than: (i) the highest weight selected by the applicant; (ii) the design maximum weight, which is the highest weight at which compliance with each applicable structural loading condition of this Airworthiness Code is shown; or (iii) the highest weight at which compliance with each applicable flight requirement of this Airworthiness Code is shown.				
(2) not less than the weight which results from: (i) the empty weight determined under ULH.29; (ii) the weight of the required minimum equipment; (iii) a weight of occupant(s) of 86 kg for a single seat helicopter, or 172 kg for a two seat helicopter; and (iv) the weight of sufficient fuel for at least 60 minutes of operation at maximum continuous power.				
(3) not less than the weight which results from: (i) the empty weight determined under ULH.29; (ii) the weight of the required minimum equipment; (iii) a weight of one occupant of 86 kg; and (iv) the weight of fuel to full tank capacity.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) *Minimum weight.* The minimum weight must be established so that it is not more than the sum of: (1) the empty weight determined under ULH.29; (2) the weight of one occupant of 55 kg; and (3) the weight of the fuel necessary for 30 minutes of operation at maximum continuous power.				
ULH.27 – Centre of gravity limits				
The extreme forward and aft centres of gravity and, where critical, the extreme lateral centres of gravity must be established for each weight established in ULH.25.				
The extreme centres of gravity may not lie beyond: a) the extremes selected by the applicant; b) the extremes within which the structure is proven; or c) the extremes within which compliance with the applicable flight requirements is shown.				
ULH.29 – Empty weight and corresponding centre of gravity				
a) The empty weight and corresponding centre of gravity must be determined by weighing the helicopter: (1) with: (i) fixed ballast; (ii) required minimum equipment; and (iii) unusable fuel, maximum oil and, where appropriate, engine coolant; (2) excluding: (i) the weight of the occupant(s); and (ii) other readily removable items of load.				
b) The condition of the helicopter at the time of determining empty weight must be one that is well defined and can be easily repeated.				
ULH.31 – Removable ballast				
Removable ballast may be used in showing compliance with the flight requirements of this Section B.				
ULH.33 – Main rotor speed and pitch limits				
a) *Main rotor speed limits.* A range of main rotor speeds must be established that: (1) with power-on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre, and is consistent with the kind of governor or synchroniser used; and (2) with power-off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and weight for which an authorisation is requested.				

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b) *Normal main rotor low pitch limits (power-off).* It must be shown, with power-off, that: (1) the normal main rotor low pitch limit provides sufficient rotor speed, in any autorotative condition, under the most critical combinations of weight and airspeed; and (2) it is possible to prevent overspeeding of the rotor without exceptional piloting skill.				
c) *Main rotor low speed warning.* There must be a main rotor low speed warning which meets the following requirements: (1) The warning must be furnished to the pilot in all flight conditions, including power-on and power-off flight, when the speed of the main rotor approaches a value that can jeopardise safe flight. (2) The warning may be furnished through the inherent aerodynamic qualities of the helicopter of by a device. (3) The warning must be clear and distinct under all conditions, and must be clearly distinguishable from all other warnings. A visual device that requires the attention of the crew within the cockpit is not acceptable by itself. (4) If a warning device is used, the device must automatically de-activate and reset when the low-speed condition is corrected.				
PERFORMANCE				
ULH.45 – General				
The performance requirements in this Section B must be determined: a) with normal piloting skill under average conditions; b) for still air and standard atmosphere at sea level; c) at the most critical weight; d) with the most unfavourable centre of gravity for each condition; and e) using engine power not in excess of the maximum declared for the engine type, and without exceeding powerplant and rotor limitations established under ULH.1521.				
ULH.51 – Take-off				
a) The take-off, with take-off power and rpm: (1) must not require exceptional piloting skill or exceptionally favourable conditions; and (2) must be made in such a manner that a landing can be made and demonstrated safely at any point along the flight path if the engine fails.				
b) Sub-paragraph a) of this paragraph must be met throughout the ranges of: (1) weight up to the maximum, and (2) altitude, from sea level conditions to the maximum altitude for which an authorisation is requested.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.65 – Climb				
The helicopter must meet the following requirements: a) The speed for best rate of climb V_Y must be determined: (1) for standard sea level conditions; (2) at maximum weight; and (3) with maximum continuous power.				
b) The steady rate of climb must be determined: (1) at V_Y; (2) corrected for standard sea level conditions within the range from sea level up to the maximum altitude for which an authorisation is requested; (3) at the maximum weight; and (4) with maximum continuous power.				
ULH.71 – Glide performance				
The minimum rate of descent airspeed and the best angle of glide airspeed must be determined in autorotation at: a) maximum weight; and b) rotor speed(s) selected by the applicant.				
ULH.73 – Performance at minimum operating speed				
The hovering ceiling must be determined over the ranges of weight, altitude, and temperature for which an authorisation is requested, with: a) take-off power; and b) the helicopter in ground effect at a height consistent with normal take-off procedures.				
ULH.75 – Landing				
The helicopter must be able to be landed with no excessive vertical acceleration and no tendency to bounce, nose over, ground loop, porpoise or water loop, and without exceptional piloting skill or exceptionally favourable conditions, with: a) approach or glide speeds appropriate to the type of helicopter and selected by the applicant; and b) the approach and landing made: (1) with power-on; and (2) in autorotation with power-off.				
ULH.79 – Limiting height-speed envelope				
If there is any combination of height and forward speed (including hover) under which a safe landing cannot be made following a sudden and complete loss of power, a limiting height-speed envelope must be established (including all pertinent information) for that condition throughout the ranges of: a) weight, up to the maximum, and b) altitude, from standard sea level conditions to the maximum altitude for which an authorisation is requested.				

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FLIGHT CHARACTERISTICS				
ULH.141 – General				
The helicopter must: a) except as specifically required in the applicable paragraph, meet the flight characteristics requirements of this Section B: (1) at the altitudes and temperatures expected in operation; (2) under any critical loading condition within the range of weights and centres of gravity for which an authorisation is requested; (3) for power-on operations, under any condition of speed, power, and rotor rpm for which an authorisation is requested; (4) for power-off operations, under any condition of speed and rotor rpm for which an authorisation is requested.				
b) be able to maintain any required flight condition and make a smooth transition from one flight condition to another without exceptional piloting skill, alertness or strength, and without danger of exceeding the limit load factor, under any probable operating condition, with the engine running at all allowable power settings, including the effect of power changes and sudden engine failure. Modest departures from any recommended techniques must not cause unsafe flight conditions.				
CONTROLLABILITY AND MANOEUVRABILITY				
ULH.143 – General				
a) The helicopter must be safely controllable and manoeuvrable: (1) during steady flight; and (2) during any manoeuvre appropriate to the type, including: (i) take-off; (ii) climb; (iii) level flight; (iv) turning flight; (v) autorotation; (vi) landing (power-on and power-off); and (vii) recovery to power-on flight from a balked autorotative approach.				
b) The margin of cyclic control must allow satisfactory roll and pitch control at V_{NE} with: (1) critical weight; (2) critical centre of gravity; (3) critical rotor rpm; and (4) power-on and power-off.				

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c) A wind velocity of not less than 31 km / h must be established in which the helicopter can be operated without loss of control on or near the ground in any manoeuvre appropriate to the type (such as crosswind take-offs, sideward flight, and rearward flight), with: (1) critical weight; (2) critical centre of gravity; (3) critical rotor rpm; and (4) altitude from standard sea level conditions to the maximum altitude for which landing and take-off authorisation is requested.				
d) The helicopter, after complete engine failure, must be controllable over the range of speeds and altitudes for which an authorisation is requested, when such power failure occurs with maximum continuous power and critical weight. No corrective action time delay for any condition following power failure may be less than: (1) for the cruise condition, one second, or normal pilot reaction time (whichever is greater); and (2) for any other condition, normal pilot reaction time.				
e) For helicopters for which a $V_{NE\ (power\text{-}off)}$ is established under ULH.1505 c), compliance must be demonstrated with the following requirements with critical rotor rpm: (1) The helicopter must be safely slowed to $V_{NE\ (power\text{-}off)}$, without exceptional pilot skill, after the engine is made inoperative at power-on V_{NE}; (2) At a speed of 1.1 $V_{NE\ (power\text{-}off)}$, the margin of cyclic control must allow satisfactory roll and pitch control with power-off.				
ULH.151 – Flight controls				
a) Longitudinal, lateral, directional and collective controls may not exhibit excessive breakout force, friction, or preload.				
b) Control system forces and free play may not inhibit a smooth, direct helicopter response to control system input.				
ULH.161 – Trim control				
The trim control (if fitted): a) must trim any steady longitudinal, lateral and collective control forces to zero in level flight at any appropriate speed; and b) may not introduce any undesirable discontinuities in control force gradients.				
STABILITY				
ULH.171 – General				
The helicopter must be able to be flown, without undue pilot fatigue or strain, in any normal manoeuvre for a period of time as long as that expected in normal operation. At least three landings and take-offs must be made during this demonstration.				

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ULH.173 – Static longitudinal stability				
a) The longitudinal control must be designed so that a rearward movement of the control is necessary to obtain a speed less than the trim speed, and a forward movement of the control is necessary to obtain a speed more than the trim speed.				
b) With the throttle and collective pitch held constant during the manoeuvres specified in ULH.175 a) to c), the slope of the control position versus speed curve must be positive throughout the full range of altitude for which an authorisation is requested.				
c) During manoeuvre specified in ULH.175 d), the longitudinal control position versus speed curve may have a negative slope within the specified speed range if the negative motion is not greater than 10 % of the total control travel.				
ULH.175 – Demonstration of static longitudinal stability				
a) *Climb.* Static longitudinal stability must be shown in the climb condition at speeds from 0.85 V_Y to 1.2 V_Y, with: (1) critical weight; (2) critical centre of gravity; (3) maximum continuous power; and (4) the helicopter trimmed at V_Y.				
b) *Cruise.* Static longitudinal stability must be shown in the cruise condition at speeds from 0.7 V_H or 0.7 V_{NE}, whichever is less, to 1.1 V_H or 1.1 V_{NE}, whichever is less, with: (1) critical weight; (2) critical centre of gravity; (3) power for level flight at 0.9 V_H or 0.9 V_{NE}, whichever is less; and (4) the helicopter trimmed at 0.9 V_H or 0.9 V_{NE}, whichever is less.				
c) *Autorotation.* Static longitudinal stability must be shown in autorotation at airspeeds from 0.5 times the speed for minimum rate of descent to V_{NE}, or to 1.1 $V_{NE\ (power\text{-}off)}$ if $V_{NE\ (power\text{-}off)}$ is established in ULH.1505 c), and with: (1) critical weight; (2) critical centre of gravity; (3) power-off; and (4) the helicopter trimmed at appropriate speeds found necessary by the BCAA to demonstrate stability throughout the prescribed speed range.				
d) *Hovering.* The longitudinal cyclic control must operate with the sense and direction of motion prescribed in ULH.173 between the maximum approved rearward speed and a forward speed of 31 km / h with: (1) critical weight; (2) critical centre of gravity; (3) power required to maintain an approximate constant height in ground effect; and (4) the helicopter trimmed for hovering.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.177 – Static directional stability				
Static directional stability must be positive with throttle and collective controls held constant at the trim conditions specified in ULH.175 a) and b). This must be shown by steadily increasing directional control deflection for sideslip angles up to ±10 degrees from trim. Sufficient cues must accompany sideslip to alert the pilot when approaching sideslip limits.				
GROUND HANDLING CHARACTERISTICS				
ULH.231 – General				
The helicopter must have satisfactory ground handling characteristics, including freedom from uncontrollable tendencies in any condition expected in operation.				
ULH.235 – Taxying condition				
If equipped with a fixed wheeled landing gear, the helicopter must be designed to withstand the loads that would occur when the helicopter is taxied over the roughest ground that may reasonably be expected in normal operation.				
ULH.241 – Ground resonance				
The helicopter may have no dangerous tendency to oscillate on the ground with the rotor turning.				
MISCELLANEOUS FLIGHT REQUIREMENTS				
ULH.251 – Vibration				
Each part of the helicopter must be free from excessive vibration under each appropriate speed and power condition.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Section C - STRUCTURE				
GENERAL				
ULH.301 – Loads				
a) Strength requirements are specified in terms of limit loads (the maximum loads to be expected in service) and ultimate loads (limit loads multiplied by prescribed factors of safety). Unless otherwise provided, prescribed loads are limit loads.				
b) Unless otherwise provided, the air and ground loads must be placed in equilibrium with inertia loads, considering each major item of mass in the helicopter. These loads must be distributed so as to represent actual conditions or a conservative approximation to them.				
c) If deflections under load would significantly change the distribution of external or internal loads, this redistribution must be taken into account.				
ULH.303 – Factor of safety				
Unless otherwise provided, a factor of safety of 1.5 must be used.				
ULH.305 – Strength and deformation				
a) The structure and control systems must be able to support limit loads without detrimental permanent deformation. At any load up to limit loads, the deformation may not interfere with safe operation.				
b) The structure must be able to support ultimate loads without failure for at least three seconds. However, when proof of strength is shown by dynamic tests simulating actual load conditions, the three second limit does not apply.				
ULH.307 – Proof of structure				
a) Compliance with the strength and deformation requirements of ULH.305 must be shown for each critical load condition. Theoretical structural analysis may be used only if the structure conforms to those for which experience has shown this method to be reliable. In other cases, substantiating load tests must be made.				
b) Proof of compliance with the strength requirements of this Section C must include: (1) dynamic and endurance tests of rotors, rotor drives, and rotor controls; (2) limit load tests of the control system, including control surfaces; (3) operation tests of the control system; (4) landing gear drop tests; and (5) any additional tests required for new or unusual design features.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.309 – Design limitations				
The following values and limitations must be established to show compliance with the structural requirements of this Section C: a) the design maximum weight; b) the main rotor rpm ranges power-on and power-off; c) the maximum forward speeds for each main rotor rpm within the ranges determined in sub-paragraph b) of this paragraph; d) the maximum rearward and sideward flight speeds; e) the centre of gravity limits corresponding to the limitations determined in paragraphs b), c) and d) of this paragraph; f) the rotational speed ratios between the engine and each connected rotating component; and g) the positive and negative limit manoeuvring load factors.				
FLIGHT LOADS				
ULH.321 – General				
a) Flight load factors represent the ratio of the aerodynamic force component (acting normal to the flight path of the helicopter) to the weight of the helicopter. A positive flight load factor is one in which the aerodynamic force acts upward, with respect to the helicopter.				
b) Compliance with the flight load requirements of this Section C must be shown: (1) at each weight from the design minimum weight to the design maximum weight; and (2) with any practical distribution of disposable load within the operating limitations in the Pilot's Handbook.				
ULH.337 – Limit manoeuvring load factor				
The helicopter must be designed for: a) a limit manoeuvring load factor ranging from a positive limit of 3.5 to a negative limit of -1.0; or				
b) any positive limit manoeuvring load factor not less than 2.0 and any negative limit manoeuvring load factor of not less than -0.5 for which: (1) the probability of being exceeded is shown by analysis and flight tests to be extremely remote; and (2) the selected values are appropriate to each weight condition between the design maximum and design minimum weights.				
ULH.339 – Resultant limit manoeuvring loads				
The loads resulting from the application of limit manoeuvring load factors are assumed to act at the centre of each rotor hub and each auxiliary lifting surface, and to act in directions, and with distributions of load among the rotors and auxiliary lifting surfaces, so as to represent each critical manoeuvring condition, including power-on and power-off flight with the maximum design rotor tip speed ratio.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
The rotor tip speed ratio is the ratio of the helicopter flight velocity component in the plane of the rotor disc to the rotational tip speed of the rotor blades, and is expressed as follows: $\mu = \frac{V \cos a}{\Omega R}$ where: V = the airspeed along the flight path (m / s); a = the angle between the projection, in the plane of symmetry, of the axis of no feathering and a line perpendicular to the flight path (rad, positive when the axis is pointing aft); Ω = the angular velocity of the rotor (rad / s); and R = the rotor radius (m).				
ULH.341 – Gust loads				
The helicopter must be designed to withstand, at each critical airspeed including hovering, the loads resulting from a vertical gust of 9.1 m / s.				
ULH.351 – Yawing conditions				
a) The helicopter must be designed for the loads resulting from the manoeuvres specified in sub-paragraphs b) and c) of this paragraph with: (1) unbalanced aerodynamic moments about the centre of gravity which the helicopter reacts to in a rational or conservative manner considering the principal masses furnishing the reacting inertia forces; and (2) maximum main rotor speed.				
b) To produce the load required in sub-paragraph a) of this paragraph, in unaccelerated flight with zero yaw, at forward speeds from zero up to 0.6 V_{NE}: (1) displace the cockpit directional control suddenly to the maximum deflection limited by the control stops or by the pilot force specified in ULH.395 a); (2) attain a resulting sideslip angle or 90 degrees, whichever is less; and (3) return the directional control suddenly to neutral.				
c) To produce the load required in sub-paragraph a) of this paragraph, in unaccelerated flight with zero yaw, at forward speeds from 0.6 V_{NE} up to V_{NE} or V_H, whichever is less: (1) displace the cockpit directional control suddenly to the maximum deflection limited by the control stops or by the pilot force specified in ULH.395 a); (2) attain a resulting sideslip angle or 15 degrees, whichever is less, at the lesser speed of V_{NE} or V_H; (3) vary the sideslip angles of sub-paragraphs (b) (2) and (c) (2) directly with speed; and (4) return the directional control suddenly to neutral.				

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ULH.361 – Engine torque				
a) The engine mount and its supporting structure must be designed for the effects of: (1) the limit torque corresponding to take-off power and rotor speed, acting simultaneously with 75 % of the limit loads of ULH.337; and (2) the limit torque corresponding to the maximum continuous power and rotor speed, acting simultaneously with the limit loads of ULH.337.				
b) The limit torque to be accounted for in ULH.361 a) and ULH.547 d) is obtained by multiplying the mean torque by the appropriate factor from the following table:				

Two-stroke engines					
cylinders	**1**	**2**	**3 or more**	—	—
factor	6	3	2		
Four-stroke engines					
cylinders	**1**	**2**	**3**	**4**	**5 or more**
factor	8	4	3	2	1.33

ULH.363 – Side load on engine mount				
a) The engine mount and its supporting structure must be designed for a limit load factor in a lateral direction, for the side load on the engine mount, of not less than one third of the limit load factor of ULH.337. b) The side load prescribed in sub-paragraph a) may be assumed to be independent of other flight conditions.				
CONTROL SURFACE AND SYSTEM LOADS				
ULH.391 – General				
Each auxiliary rotor, each fixed or movable stabilising or control surface, and each system operating any flight control must meet the requirements of ULH.395, ULH.397, ULH.399, ULH.411 and ULH.427.				
ULH.395 – Control system				
a) The part of each control system from the pilot's controls to the control stops must be designed to withstand pilot forces of not less than the forces specified in ULH.397.				
b) Each primary control system, including its supporting structure, must be designed to withstand loads resulting from the limit pilot forces prescribed in ULH.397.				
c) If the system design or the normal operating loads are such that a part of the system cannot react to the limit forces prescribed in ULH.397, that part of the system must be designed to withstand the maximum loads that can be obtained in normal operation. The minimum design loads must, in any case, provide a rugged system for service use, including consideration of fatigue, jamming, ground gusts, control inertia and friction loads. In the absence of rational analysis, the design loads resulting from 0.60 times the specified limit pilot forces are acceptable minimum design loads.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.397 – Limit pilot forces and torques				
For primary flight controls the limit pilot forces are as follows: a) for foot controls, 580 N; b) for stick controls: (1) 450 N fore and aft, and vertically; and (2) 300 N laterally; and c) For twist controls, 356 R N mm, where R = twist radius in mm.				
ULH.399 – Dual control system				
Dual control systems must be designed to withstand the loads resulting from each pilot applying 0.75 times the forces specified in ULH.397, with: a) the pilots acting together in the same direction; and b) the pilots acting in opposition.				
ULH.405 – Secondary control systems				
Secondary control systems such as those for brakes, trim controls, etc. must be designed to withstand the maximum forces that a pilot is likely to apply to those controls.				
ULH.411 – Ground clearance: tail rotor guard				
a) It must be impossible for the tail rotor to contact the landing surface during a normal landing.				
b) If a tail rotor guard is required to show compliance with sub-paragraph a) of this paragraph: (1) suitable design loads must be established for the guard; and (2) the guard and its supporting structure must be designed to withstand these loads.				
ULH.427 – Unsymmetrical loads				
a) Horizontal tail surfaces and their supporting structure must be designed for unsymmetrical loads arising from yawing and rotor wake effects in combination with the prescribed flight conditions.				
b) To meet the design criteria of sub-paragraph a) of this paragraph, in the absence of more rational data, both of the following must be met: (1) 100 % of the maximum loading from the symmetrical flight conditions acts on the surface on one side of the plane of symmetry and no loading acts on the other side. (2) 50 % of the maximum loading from the symmetrical flight conditions acts on the surface on each side of the plane of symmetry but in opposite directions.				
c) For empennage arrangements where the horizontal tail surfaces are supported by the vertical tail surfaces, the vertical tail surfaces and supporting structure must be designed for the combined vertical horizontal surface loads resulting from each prescribed flight condition, considered separately. The flight conditions must be selected so the maximum design loads are obtained on each surface. In the absence of more rational data, the unsymmetrical horizontal tail surface loading distributions described in this paragraph must be assumed.				

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GROUND LOADS				
ULH.471 – General				
a) *Loads and equilibrium.* The limit ground loads specified in this Section C must be considered to be external loads that act upon a helicopter structure. In each specified landing condition, the external reactions must be placed in equilibrium by the linear and angular inertia forces in a rational or conservative manner.				
b) *Critical centres of gravity.* The critical centres of gravity within the range for which an authorisation is requested must be selected so that the maximum design loads are obtained in each landing gear element.				
ULH.473 – Ground loading conditions and assumptions				
a) For specified landing conditions, the maximum weight as established under ULH.25 must be used. The rotor lift may be assumed to act through the centre of gravity throughout the landing impact. This lift may not exceed two-thirds of the design maximum weight.				
b) Unless otherwise prescribed, for each specified landing condition, the helicopter must be designed for a limit load factor of not less than the limit inertia load factor substantiated in ULH.725.				
ULH.475 – Shock absorbers				
Unless otherwise prescribed, for each specified landing condition, the tyres must be assumed to be in their static position and the shock absorbers to be in their most critical position.				
ULH.477 – Landing gear arrangement				
Paragraphs ULH.235, ULH.479 to ULH.485 and ULH.493 apply to landing gear with two wheels aft, and one or more wheels forward, of the centre of gravity.				
ULH.479 – Level landing conditions				
a) *Attitudes.* Under each of the loading conditions prescribed in sub-paragraph b), the helicopter is assumed to be in each of the following level landing attitudes: (1) an attitude in which all wheels contact the ground simultaneously; (2) an attitude in which the aft wheels contact the ground with the forward wheels just clear of the ground.				
b) *Loading conditions.* The helicopter must be designed for the following landing loading conditions: (1) vertical loads applied under ULH.471; (2) the loads resulting from a combination of the loads applied under sub-paragraph b) (1) with drag loads at each wheel of not less than 25 % of the vertical load at that wheel; (3) if there are two wheels forward, a distribution of the loads applied to those wheels under sub-paragraphs b) (1) and (2) in a ratio of 40 : 60.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
c) *Pitching moments.* Pitching moments are assumed to be resisted by: (1) in the case of the attitude in sub-paragraph a) (1), the forward landing gear; and (2) in the case of the attitude in sub-paragraph a) (2), the angular inertia forces.				
ULH.481 – Tail-down landing conditions				
a) The helicopter is assumed to be in the maximum nose-up attitude allowing ground clearance by each part of the helicopter. b) In this attitude, ground loads are assumed to act perpendicular to the ground.				
ULH.483 – One-wheel landing conditions				
For the one-wheel landing condition, the helicopter is assumed to be in the level attitude and to contact the ground on one aft wheel. In this attitude: a) the vertical load must be the same as that obtained on that side under ULH.479 b) (1); and b) the unbalanced external loads must be reacted by helicopter inertia.				
ULH.485 – Lateral drift landing conditions				
a) The helicopter is assumed to be in the level landing attitude, with: (1) side loads combined with one-half of the maximum ground reactions obtained in the level landing conditions of ULH.479 b) (1); and (2) the loads obtained under sub-paragraph a) (1) applied: (i) at the ground contact point; or (ii) for full-swivelling gear, at the centre of the axle.				
b) The helicopter must be designed to withstand, at ground contact: (1) when only the aft wheels contact the ground, side loads of 0.8 times the vertical reaction acting inward on one side, and 0.6 times the vertical reaction acting outward on the other side, all combined with the vertical loads specified in sub-paragraph a); and (2) when all wheels contact the ground simultaneously: (i) for the aft wheels, the side loads specified in sub-paragraph b) (1); and (ii) for the forward wheels, a side load of 0.8 times the vertical reaction combined with the vertical load specified in sub-paragraph a).				
ULH.493 – Braked roll conditions				
Under braked roll conditions, with the shock absorbers in their static positions: a) the limit vertical load must be based on a load factor of at least: (1) 1.33 for the attitude specified in ULH.479 a) (1); and (2) 1.0 for the attitude specified in ULH.479 a) (2); and				
b) the structure must be designed to withstand at the ground contact point of each wheel with brakes, a drag load at least the lesser of: (1) the vertical load multiplied by a coefficient of friction of 0.8; and (2) the maximum value based on limiting brake torque.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.497 – Ground loading conditions: landing gear with tail wheels				
a) *General.* Helicopters with landing gear with two wheels forward, and one wheel aft of the centre of gravity must be designed for loading conditions as prescribed in this paragraph.				
b) *Level landing attitude with only the forward wheels contacting the ground.* In this attitude: (1) the vertical loads must be applied under ULH.471 to ULH.475; (2) the vertical load at each axle must be combined with a drag load at that axle of not less than 25 % of that vertical load; and (3) unbalanced pitching moments are assumed to be resisted by angular inertia forces.				
c) *Level landing attitude with all wheels contacting the ground simultaneously.* In this attitude, the helicopter must be designed for landing loading conditions as prescribed in sub-paragraph b).				
d) *Maximum nose-up attitude with only the rear wheel contacting the ground.* The attitude for this condition must be the maximum nose-up attitude expected in normal operation, including autorotative landings. In this attitude: (1) the appropriate ground loads specified in sub-paragraphs b) (1) and (2) must be determined and applied, using a rational method to account for the moment arm between the rear wheel ground reaction and the helicopter centre of gravity; or (2) the probability of landing with initial contact on the rear wheel must be shown to be extremely remote.				
e) *Level landing attitude with only one forward wheel contacting the ground.* In this attitude, the helicopter must be designed for ground loads as specified in sub-paragraphs b) (1) and (3).				
f) *Sideloads in the level landing attitude.* In the attitudes specified in sub-paragraphs b) and c) the following apply: (1) The sideloads must be combined at each wheel with one-half of the maximum vertical ground reactions obtained for that wheel under sub-paragraphs b) and c). In this condition the side loads must be: (i) for the forward wheels, 0.8 times the vertical reaction (on one side) acting inward, and 0.6 times the vertical reaction (on the other side) acting outward; and (ii) for the rear wheel, 0.8 times the vertical reaction. (2) The loads specified in sub-paragraph f) (1) must be applied: (i) at the ground contact point with the wheel in the trailing position (for non-full swivelling landing gear or for full-swivelling landing gear with a lock, steering device, or shimmy damper to keep the wheel in the trailing position); or (ii) at the centre of the axle (for full-swivelling landing gear without a lock, steering device, or shimmy damper).				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
g) *Braked roll conditions in the level landing attitude.* In the attitudes specified in sub-paragraphs b) and c), and with shock absorbers in their static positions, the helicopter must be designed for braked roll loads as follows: (1) The limit vertical load must be based on a limit vertical load factor of not less than: (i) 1.0 for the attitude specified in sub-paragraph b); and (ii) 1.33 for the attitude specified in sub-paragraph c). (2) For each wheel with brakes, a drag load must be applied, at the ground contact point, of not less than the lesser of: (i) 0.8 times the vertical load; and (ii) the maximum based on limiting brake torque.				
h) *Rear wheel turning loads in the static ground attitude.* In the static ground attitude, and with the shock absorbers and tyres in their static positions, the helicopter must be designed for rear wheel turning loads as follows: (1) A vertical ground reaction equal to the static load on the rear wheel must be combined with an equal sideload. (2) The load specified in sub-paragraph h) (1) must be applied to the rear landing gear: (i) through the axle, if there is a swivel (the rear wheel being assumed to be swivelled 90 degrees to the longitudinal axis of the helicopter); or (ii) at the ground contact point, if there is a lock, steering device or shimmy damper (the rear wheel being assumed to be in the trailing position).				
i) *Taxying condition.* The helicopter and its landing gear must be designed for loads that would occur when the helicopter is taxied over the roughest ground that may reasonably be expected in normal operation.				
ULH.501 – Ground loading conditions: landing gear with skids				
a) *General.* Helicopters with landing gear with skids must be designed for the loading conditions specified in this paragraph. In showing compliance with this paragraph, the following apply: (1) The design maximum weight, centre of gravity, and load factor must be determined under ULH.471 to ULH.475. (2) Structural yielding of elastic spring members under limit loads is acceptable. (3) Design ultimate loads for elastic spring members need not exceed those obtained in a drop test of the gear with: (i) a drop height of 1.5 times that specified in ULH.725; and (ii) an assumed rotor lift of not more than 1.5 times that used in the limit drop tests prescribed in ULH.725. (4) Compliance with sub-paragraphs b) to e) must be shown with: (i) the gear in its most critically deflected position for the landing condition being considered; and (ii) the ground reactions rationally distributed along the bottom of the skid tube.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) *Vertical reactions in the level landing attitude.* In the level attitude, and with the helicopter contacting the ground along the bottom of both skids, the vertical reactions must be applied as prescribed in sub-paragraph a) of this paragraph.				
c) *Drag reactions in the level landing attitude.* In the level attitude, and with the helicopter contacting the ground along the bottom of both skids, the following apply: (1) The vertical reactions must be combined with horizontal drag reactions of 50 % of the vertical reaction applied at the ground. (2) The resultant ground loads must equal the vertical load specified in sub-paragraph b) of this paragraph.				
d) *Sideloads in level landing attitude.* In the level attitude, and with the helicopter contacting the ground along the bottom of both skids, the following apply: (1) The vertical ground reaction must be: (i) equal to the vertical loads obtained in the condition specified in sub-paragraph b) of this paragraph; and (ii) divided equally among the skids. (2) The vertical ground reactions must be combined with a horizontal sideload of 25 % of their value. (3) The total sideload must be applied equally between the skids and along the length of the skids. (4) The unbalanced moments are assumed to be resisted by angular inertia. (5) The skid gear must be investigated for: (i) inward acting sideloads; and (ii) outward acting sideloads.				
e) *One-skid landing loads in the level attitude.* In the level attitude, and with the helicopter contacting the ground along the bottom of one skid only, the following apply: (1) The vertical load on the ground contact side must be the same as that obtained on that side in the condition specified in sub-paragraph b) of this paragraph. (2) The unbalanced moments are assumed to be resisted by angular inertia.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
f) *Special conditions.* In addition to the conditions specified in sub-paragraphs b) and c) of this paragraph, the helicopter must be designed for the following ground reactions: (1) A ground reaction load acting up and aft at an angle of 45 degrees to the longitudinal axis of the helicopter. This load must be: (i) equal to 1.33 times the maximum weight; (ii) distributed symmetrically among the skids; (iii) concentrated at the forward end of the straight part of the skid tube; and (iv) applied only to the forward end of the skid tube and its attachment to the helicopter. (2) With the helicopter in the level landing attitude, a vertical ground reaction load equal to one-half of the vertical load determined in sub-paragraph b) of this paragraph. This load must be: (i) applied only to the skid tube and its attachment to the helicopter; and (ii) distributed equally over 33.3 % of the length between the skid tube attachments and centrally located midway between the skid tube attachments.				
MAIN COMPONENT REQUIREMENTS				
ULH.547 – Main rotor structure				
a) Each main rotor assembly (including rotor hubs and blades) must be designed as prescribed in this paragraph.				
b) The main rotor structure must be designed to withstand the following loads prescribed in ULH.337 to ULH.341: (1) critical flight loads; (2) limit loads occurring under normal conditions of autorotation. For this condition, the rotor rpm must be selected to include the effects of altitude.				
c) The main rotor structure must be designed to withstand loads simulating: (1) for the rotor blades, hubs, and flapping hinges, the impact force of each blade against its stop during ground operation; and (2) any other critical condition expected in normal operation.				
d) The main rotor structure must be designed to withstand the limit torque at any rotational speed including zero. In addition: (1) the limit torque need not be greater than the torque defined by a torque limiting device (where provided), and may not be less than the greater of: (i) the maximum torque likely to be transmitted to the rotor structure in either direction; and (ii) the limit engine torque specified in ULH.361. (2) the limit torque must be distributed to the rotor blades in a rational manner.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.549 – Fuselage, landing gear, rotor pylon and engine structures				
a) Each fuselage, landing gear, rotor pylon and engine structure must be designed as prescribed in this paragraph. Resultant rotor forces may be represented as a single force applied at the rotor hub attachment point.				
b) Each structure must be designed to withstand: (1) the critical loads prescribed in ULH.337, ULH.339 and ULH.341; (2) the applicable ground loads prescribed in ULH.471, ULH.473, ULH.501, ULH.505 and ULH.521; and (3) the loads prescribed in ULH.547 c) (2) and d).				
c) Auxiliary rotor thrust, and the balancing air and inertia loads occurring under accelerated flight conditions, must be considered.				
d) The engine mount and adjacent fuselage structure must be designed to withstand the loads occurring under accelerated flight and landing conditions, including engine torque.				
EMERGENCY LANDING CONDITIONS				
ULH.561 – General				
a) The helicopter, although it may be damaged in emergency landing conditions, must be designed as prescribed in this paragraph to protect each occupant under those conditions.				
b) The structure must be designed to give each occupant every reasonable chance of escaping serious injury in a crash landing when proper use is made of belts and harnesses provided for in the design, in the following conditions: Each occupant experiences ultimate inertia forces corresponding to the following load factors: upward: 4.0 g; forward: 9.0 g; sideward: 3.0 g; downward: 4.5 g; rearward: 1.5 g These forces are independent of each other and are relative to the surrounding structure.				
c) The supporting structure must be designed to restrain, under loads up to those specified in sub-paragraph b) of this paragraph, each item of mass that could injure an occupant if it came loose in a minor crash landing.				
d) For a helicopter with the engine located behind an occupants seat, the engine mounting structure must be able to restrain the engine, transmission and any other items supported by the engine mounting structure, when they experience an ultimate inertial force in the forward direction corresponding to a load factor of 15 g.				
e) Fuel tanks, fuel lines, oil tanks and oil lines must be capable of retaining their contents under the inertial forces of sub-paragraph b) of this paragraph without rupture.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
FATIGUE EVALUATION				
ULH.571 – Fatigue evaluation of flight structure				
a) Each portion of the flight structure (including rotors, rotor drive systems between the engine and the rotor hubs, controls, fuselage, landing gear and their related primary attachments) the failure of which could be catastrophic, must be identified and evaluated for fatigue. The following apply to each fatigue evaluation: (1) The procedure for the evaluation must be acceptable to the BCAA. (2) The locations of probable failure must be determined. (3) Inflight measurement must be included in determining the following: (i) loads or stresses in all critical conditions throughout the range of limitations in ULH.309, except that manoeuvring load factors need not exceed the maximum values expected in operation; (ii) the effect of altitude upon these loads or stresses. (4) The loading spectra must be as severe as those expected in operation including ground-air-ground cycles. The loading spectra must be based on loads or stresses determined in sub-paragraph a) (3).				
b) The structure must be designed, as far as practicable, to avoid points of stress concentration and high stresses, and to take account of the effects of vibration. Materials with poor crack propagation properties must be avoided and all assemblies, especially on the primary structure, shall be readily inspectable. Flexible paints or coatings shall not be used.				
OTHER LOADS				
ULH.597 – Loads form single masses				
The attachment means for all single masses, which are part of the equipment of the helicopter (including ballast), must be designed to withstand loads corresponding to the maximum design load factors to be expected from the established flight and ground loads, including the emergency landing conditions of ULH.561.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Section D - DESIGN AND CONSTRUCTION				
GENERAL				
ULH.601 – General				
a) The helicopter may have no design features or details that experience has shown to be hazardous or unreliable.				
b) The suitability of each questionable design detail and part must be established by tests.				
ULH.602 – Critical parts				
a) A critical part is a part, the failure of which could have a catastrophic effect upon the helicopter, and for which critical characteristics have been identified which must be controlled to ensure the required level of integrity.				
b) If the helicopter design includes critical parts, a critical parts list must be established. Procedures must be established to define the critical design characteristics, identify processes that affect those characteristics, and identify the design change and process change controls necessary for showing compliance with quality assurance requirements.				
ULH.603 – Materials				
The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must: a) be established by experience or tests; and b) meet specifications that ensure that they have the strength and other properties assumed in the design data.				
ULH.605 – Fabrication methods				
The methods of fabrication used must produce consistently sound structures which must be reliable with respect to maintaining the original strength under reasonable service conditions. If a fabrication process (such as gluing, spot welding, heat-treating, or processing of non-metallic materials) requires close control to reach this objective, the process must be performed under a defined process specification. Unconventional methods of fabrication must be substantiated by adequate tests.				
ULH.607 – Locking of connections				
a) An acceptable means of locking must be provided on all connecting elements in the primary structure and in control and other mechanical systems which are essential to safe operation of the helicopter.				
b) In particular self-locking nuts may not be used on any bolt subject to rotation in operation, unless a non-friction locking device is used in addition to the self-locking device.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.609 – Protection of structure				
Each part of the structure must: a) be suitably protected against deterioration or loss of strength in service due to any cause, including: (1) weathering; (2) corrosion; and (3) abrasion; and				
b) have adequate provisions for ventilation and drainage.				
ULH.611 – Accessibility				
Means must be provided to allow inspection (including inspection of principal structural elements and control systems), close examination, repair, and replacement of each part requiring maintenance, adjustments for proper alignment and function, lubrication or servicing.				
ULH.612 – Provisions for rigging and de-rigging				
The design of the helicopter must be such that during rigging and de-rigging by persons having no more than average skills, the probability of damage or permanent deformation, especially when this is not readily visible, is extremely remote. Incorrect assembly must be avoided by proper design provisions. It must be possible to inspect the helicopter easily for correct rigging.				
ULH.613 – Material strength properties and design values				
a) Material strength properties must be based on enough tests of material meeting specifications to establish design values on a statistical basis.				
b) The design values must be chosen so that the probability of any structure being understrength because of material variations is extremely remote.				
c) Where the temperature attained in an essential component or structure in normal operating conditions has a significant effect on strength, that effect must be taken into account.				
ULH.619 – Special factors				
a) The factor of safety prescribed in ULH.303 must be multiplied by appropriate combinations of the special factors prescribed in ULH.619 b), ULH.621 to ULH.626, and ULH.693.				
b) For each part of the structure not covered by ULH.621 to ULH.625 but whose strength is: (1) uncertain; (2) likely to deteriorate in service before normal replacement; or (3) subject to appreciable variability because of uncertainties in manufacturing processes or inspection methods; the special factor must be chosen so that failure of the part due to inadequate strength is improbable.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.621 – Casting factors				
For castings the strength of which is substantiated by at least one static test and which are inspected by visual methods, a casting factor of 2.0 must be applied. This factor may be reduced to 1.25 providing the reduction is substantiated by tests on not less than three sample castings and if these and all production castings are subjected to an approved visual and radiographic inspection or an approved equivalent non-destructive inspection method.				
ULH.623 – Bearing factors				
The factor of safety for bearing loads at bolted or pinned joints must be multiplied by a special factor of 2.0 to provide for: a) relative motion in operation; and b) joints with clearance (free fit) subject to pounding and | or vibration.				
ULH.625 – Fitting factors				
For each fitting (a part or terminal used to join one structural member to another), the following apply: a) For each fitting whose strength is not proven by limit and ultimate load tests in which actual stress conditions are simulated in the fitting and surrounding structures, a fitting factor of at least 1.15 must be applied to each part of: (1) the fitting; (2) the means of attachment; and (3) the bearing on the joined members.				
b) No fitting factor need be used for joint designs based on comprehensive test data (such as continuous joints in metal plating, welded joints, and scarf joints in wood).				
c) For each integral fitting, the part must be treated as a fitting up to the point at which the section properties become typical of the member.				
d) Attachment points of each safety belt or harness to the main helicopter structure must be shown by analysis, tests, or both, to be able to withstand at least 1.33 times the inertia forces corresponding to the emergency landing conditions of ULH.561.				
ULH.626 – Cable factor				
An ultimate factor of safety of 2.0 on nominal cable strength must be applied to cables used for structural applications and for all primary control systems.				
ULH.629 – Flutter prevention and structural stiffness				
Each major part of the helicopter must be free from flutter and resonance under each appropriate speed and power condition, and this must be demonstrated by flight tests up to V_{DF}.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ROTORS				
ULH.653 – Pressure venting and drainage of rotor blades				
a) For each rotor blade: (1) there must be a means for venting the internal pressure of the blade; (2) drainage holes must be provided for the blade; and (3) the blade must be designed to prevent water from becoming trapped in it.				
b) Sub-paragraphs a) (1) and (2) do not apply to sealed rotor blades capable of withstanding the maximum pressure differentials expected in service.				
ULH.659 – Mass balance				
a) The rotors and blades must be mass balanced as necessary to: (1) prevent excessive vibration; and (2) prevent flutter at any speed up to the maximum forward speed.				
b) The structural integrity of the mass balance installation must be substantiated.				
ULH.661 – Rotor blade clearance				
There must be enough clearance between the rotor blades and other parts of the structure to prevent the blades from striking any part of the structure, or passing through any area likely to cause injury to occupants during any operating condition.				
ULH.663 – Ground resonance prevention means				
a) The reliability of the means for preventing ground resonance must be shown either by analysis and tests, or reliable service experience, or by showing through analysis or tests that malfunction or failure of a single means will not cause ground resonance.				
b) The probable range of variations, during service, of the damping action of the ground resonance prevention means, must be established and must be investigated during the test required by ULH.241.				
ULH.665 – Rotor-hub bearings				
All rotor-hub bearings must have their suitability established by experience or tests.				
CONTROL SYSTEMS				
ULH.671 – General				
Each control must operate easily, smoothly and positively enough to allow proper performance of its functions.				
ULH.673 – Primary flight control				
Primary flight controls are those used by the pilot for immediate control of pitch, roll, yaw, and vertical motion of the helicopter.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.674 – Interconnected controls				
Each primary flight control system must provide for safe flight and landing and operate independently after a malfunction, failure, or jam of any auxiliary interconnected control.				
ULH.675 – Stops				
a) Each control system must have stops that positively limit the range of motion of the pilot's controls.				
b) Each stop must be located so that wear, slackness, or take-up adjustments will not adversely affect the control characteristics of the helicopter because of a change in the range of travel of the control.				
c) Each stop must be able to withstand any loads corresponding to the design conditions for the control system.				
d) For each main rotor blade: (1) stops that are appropriate to the blade design must be provided to limit travel of the blade about its hinge points; and (2) there must be means to keep the blade from hitting the droop stops during any operation other than starting and stopping the rotor.				
ULH.679 – Control system locks				
If there is a device to lock the control system with the helicopter on the ground, there must be means to: a) give unmistakable warning to the pilot when the lock is engaged; and b) prevent the lock from engaging in flight.				
ULH.681 – Limit load static tests				
a) Compliance with the limit load requirements must be shown by tests in which: (1) the direction of the test loads produces the most severe loading in the control system; and (2) each fitting, pulley and bracket used in attaching the system to the main structure is included.				
b) Compliance must be shown (by analyses or individual load tests) with the special factor requirements for control system joints subject to angular motion.				
ULH.683 – Operation tests				
It must be shown by functional tests that the system designed to the loads specified in ULH.397 is free from: a) jamming; b) excessive friction; and c) excessive deformation; when operating the controls from the cockpit.				
ULH.685 – Control system details				
a) Each detail of each control system must be designed and installed to prevent jamming, chafing and interference from baggage, passengers, loose objects, or the freezing of moisture.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) There must be means in the cockpit to prevent the entry of foreign objects into places where they would jam the system.				
c) There must be means to prevent the slapping of cables, tubes, or rods against other parts.				
d) Each element of the flight control system must have design features, or must be distinctively and permanently marked, to minimise the possibility of incorrect assembly that could result in malfunctioning of the control system.				
ULH.687 – Spring devices				
The reliability of any spring device used in the control system must be established by tests simulating service conditions unless failure of the spring will not cause flutter or unsafe flight characteristics.				
ULH.689 – Cable systems				
a) Each cable, cable fitting, turnbuckle, splice, and pulley used must meet stated specifications. In addition: (1) no cable smaller than 2 mm diameter may be used in primary control systems; (2) each cable system must be designed so that there will be no hazardous change in cable tension throughout the range of travel under operating conditions and temperature variations; and (3) there must be means for visual inspection at each fairlead, pulley, terminal and turnbuckle.				
b) Each kind and size of pulley must correspond to the cable with which it is used. Each pulley must have closely fitted guards to prevent the cables from being misplaced or fouled, even when slack. Each pulley must lie in the plane passing through the cable so that the cable does not rub against the pulley flange.				
c) Fairleads must be installed so that they do not cause a change in cable direction of more than 3 degrees, except where tests or experience indicate that a higher value would be satisfactory. The radius of curvature of fairleads must not be smaller than the radius of a pulley for the same cable.				
d) Turnbuckles must be attached to parts having angular motion in a manner that will positively prevent binding throughout the range of travel.				
ULH.691 – Autorotation control mechanism				
Each main rotor blade pitch control mechanism must allow rapid entry into autorotation after power failure.				
ULH.693 – Joints				
Control system joints (in push-pull systems) that are subject to angular motion, except those in ball or roller bearing systems, must have a special factor of safety of not less than 3.33 with respect to the ultimate bearing strength of the softest material used as a bearing. This factor may be reduced to 2.0 for joints in cable control systems. For ball or roller bearings, the approved ratings must not be exceeded.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
LANDING GEAR				
ULH.723 – Shock absorption tests				
The landing inertia load factor and the reserve energy absorption capacity of the landing gear must be substantiated by the tests prescribed in ULH.725 and ULH.727, respectively or by analysis. These tests must be conducted on the complete helicopter or on undercarriage units in their proper relation.				
ULH.725 – Limit drop test				
The limit drop test must be conducted as follows: a) The drop height must be: (1) 330 mm from the lowest point of the landing gear to the ground; or (2) any lesser height, not less than 200 mm, resulting in a drop contact velocity equal to the greatest probable sinking speed likely to occur at ground contact in normal power-off landings.				
b) If considered, the rotor lift specified in ULH.473 a) must be introduced into the drop test by appropriate energy absorbing devices or by the use of an effective mass.				
c) Each landing gear unit must be tested in the attitude simulating the landing condition that is most critical from the standpoint of the energy absorbed by it.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
d) When an effective mass is used in showing compliance with sub-paragraph b), the following formula may be used instead of more rational computations: $W_e = W \frac{h + (1 - L)\, d}{h + d}$ and $n = n_j \frac{W_e}{W} + L$ Where: W_e = the effective weight to be used in the drop test (kg); W = W_M for main gear units , equal to the static reaction on the particular unit with the helicopter in the most critical attitude. A rational method may be used in computing a main gear static reaction, taking into consideration the moment arm between the main wheel reaction and the helicopter centre of gravity (kg); W = W_N for nose gear units , equal to the vertical component of the static reaction that would exist at the nose wheel, assuming that the mass of the helicopter acts at the centre of gravity and exerts a force of 1.0 g downward and 0.25 g forward (kg); W = W_T for tailwheel units equal to whichever of the following is critical: (1) The static weight on the tailwheel with the helicopter resting on all wheels; or (2) The vertical component of the ground reaction that would occur at the tailwheel, assuming that the mass of the helicopter acts at the centre of gravity and exerts a force of 1.0 g downward with the helicopter in the maximum nose-up attitude considered in the nose-up landing conditions (kg); h = specified free drop height (mm); L = ratio of assumed rotor lift to the helicopter weight; d = the vertical component of the landing gear travel relative to the drop mass (mm); n = limit inertia load factor; n_j = the load factor developed, during impact, on the mass used in the drop test (i.e. the acceleration $\frac{dv}{dt}$ recorded in the drop test +1.0) (g).				
e) Structural yielding of elastic spring members should be acceptable under the limits specified in ULH.501 a) (2).				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.727 – Reserve energy absorption drop test				
The reserve energy absorption drop test must be conducted as follows: a) The drop height must be 1.5 times that specified in ULH.725 a).				
b) Rotor lift, where considered in a manner similar to that prescribed in ULH.725 b), may not exceed 1.5 times the lift allowed under that sub-paragraph.				
c) The landing gear must withstand this test without collapsing. Collapse of the landing gear occurs when a member of the nose, tail, or main gear will not support the helicopter in the proper attitude or allows the helicopter structure, other than the landing gear and external accessories, to impact the landing surface.				
ULH.731 – Wheels				
a) The maximum static load rating of each wheel may not be less than the corresponding static ground reaction with: (1) maximum weight; and (2) critical centre of gravity.				
b) The maximum limit load rating of each wheel must equal or exceed the maximum radial limit load determined under the applicable ground load requirements of this Airworthiness Code.				
ULH.733 – Tyres				
a) Each landing gear wheel must have a tyre: (1) that is a proper fit on the rim of the wheel; and (2) of the proper rating.				
b) The maximum static load rating of each tyre must equal or exceed the static ground reaction obtained at its wheel, assuming: (1) the design maximum weight; and (2) the most unfavourable centre of gravity.				
ULH.735 – Brakes				
For helicopters with a wheeled landing gear, a braking device must be installed that is: a) controllable by the pilot; b) usable during power-off landings; and c) adequate to: (1) counteract any normal unbalanced torque when starting or stopping the rotor; and (2) hold the helicopter parked on a 10 degree slope on a dry, smooth pavement.				
COCKPIT DESIGN				
ULH.771 – General				
The cockpit and its equipment must allow each pilot to perform his duties without unreasonable concentration or fatigue.				
ULH.773 – Cockpit view				
Each cockpit must be designed so that: a) the pilot's field of view is sufficiently extensive, clear and undistorted for safe operation; and				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) rain may not unduly impair his view along the flight path in normal flight and during landing.				
ULH.775 – Windshields and windows				
Windshields and windows, if fitted, must be constructed of a material that will not break into dangerous fragments or become opaque when damaged.				
ULH.777 – Cockpit controls				
a) Each cockpit control must be located to provide convenient operation, and to prevent confusion and inadvertent operation.				
b) The controls must be located and arranged so that each pilot, when properly secured by his safety harness, has full and unrestricted movement of each control without interference from either his clothing (including winter clothing) or from the cockpit structure.				
c) In helicopters with dual controls, it must be possible to operate all essential controls from each of the two pilot seats.				
d) Secondary controls must maintain any desired position without requiring constant attention by the pilot(s), and must not tend to creep under loads or vibration. Controls must have adequate strength to withstand operating loads without failure or excessive deflection.				
ULH.779 – Motion and effect of cockpit controls				
Cockpit controls must be designed so that they operate in accordance with the following movement and actuation: a) Flights controls, including the collective pitch control, must operate with a sense of motion which corresponds to the effect on the helicopter.				
b) Twist-grip engine power controls must be designed so that, for lefthand operation, the motion of the pilot's hand is clockwise to increase power when the hand is viewed from the edge containing the index finger. Other engine power controls, excluding the collective control, must operate with a forward motion to increase power.				
ULH.780 – Colour markings of cockpit controls				
Emergency controls must be coloured red.				
ULH.783 – Doors				
a) Each closed cabin must have at least one adequate and easily accessible external door.				
b) Each external door must be located where persons using it will not be endangered by the rotors, propellers, engine intakes and exhausts when appropriate operating procedures are used. If opening procedures are required, they must be marked inside, on or adjacent to, the door opening device.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.785 – Seats and safety harnesses				
a) Each seat and its supporting structure must be designed for an occupant weight in accordance with ULH.25 a) (2) and for the maximum load factors corresponding to the specified flight and ground conditions, including the emergency landing conditions prescribed in ULH.561 b).				
b) Seats including cushions may not deform under the flight loads of ULH.337 to such an extent that the pilot is unable to reach the controls safely, or that the wrong controls are operated.				
c) The strength of the safety harness must not be less than that following from the ultimate loads for the flight and ground load conditions and for the emergency landing conditions according to ULH.561 b) taking into account the geometry of the harness and seat arrangement.				
d) Each safety harness installation must be designed so that each occupant is safely retained in his initial sitting or reclining position under flight and emergency landing conditions.				
ULH.787 – Baggage compartment				
a) Each baggage compartment must be designed for its placarded maximum weight of contents and for the critical load distributions at the appropriate maximum load factors corresponding to the flight and ground load conditions of this Airworthiness Code.				
b) Means must be provided to protect occupants from injuries by movement of the contents of baggage compartments under the ultimate inertia forces specified in ULH.561 b).				
ULH.807 – Emergency exit				
a) The cockpit must be so designed that unimpeded and rapid escape is possible in an emergency.				
b) Where the cockpit is enclosed, the opening system must be designed for simple and easy operation. It must function rapidly and be designed so that it can be operated by each occupant strapped in his seat and also from outside the cockpit. Reasonable provisions must be provided to prevent jamming by fuselage deformation.				
ULH.831 – Ventilation				
a) When there is an enclosed cockpit it must be designed so as to afford suitable ventilation under normal flying conditions.				
b) Carbon monoxide concentration must not exceed one part per 20 000 parts air.				
FIRE PROTECTION				
ULH.857 – Electrical bonding				
a) Electrical continuity must be provided to prevent the existence of differences of potential between components of the powerplant including fuel and other tanks, and other significant parts of the helicopter which are electrically conductive.				
b) There must be provisions for electrically bonding the helicopter to the ground fuelling equipment.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.859 – Heating systems				
a) *General.* For each heating system that involves the passage of cabin air over, or close to, the exhaust manifold, there must be means to prevent carbon monoxide from entering the personnel compartment.				
b) *Heat exchangers.* Each heat exchanger must be: (1) of suitable materials; (2) adequately cooled under all conditions; and (3) easily disassembled for inspection.				
c) *Heater control.* There must be means to prevent the hazardous accumulation of water or ice on, or in, any heater control component, control system tubing, or safety control.				
d) *Air intakes.* Each ventilating air intake must be located so that no flammable fluids or vapours can enter the heater system: (1) during normal operation; or (2) as a result of the malfunction of any other component.				
ULH.861 – Fire protection of structure, controls and other parts				
Each part of the structure, controls, rotor mechanism, and other parts essential to a controlled landing that would be affected by powerplant fires must be fireproof or protected so they can perform their essential functions for at least 5 minutes under any foreseeable powerplant fire conditions.				
ULH.863 – Flammable fluid fire protection				
In each area where flammable fluids or vapours might escape by leakage of a fluid system, there must be means in the form of adequate segregation, ventilation and drainage, to minimise the probability of ignition of the fluids and vapours, and the resultant hazards if ignition does occur.				
MISCELLANEOUS				
ULH.871 – Levelling marks				
There must be reference marks for levelling the helicopter on the ground.				
ULH.873 – Ballast provisions				
If provided, ballast provisions must be designed and constructed to prevent inadvertent shifting of ballast in flight.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Subpart E - POWERPLANT				
GENERAL				
ULH.901 – Installation				
a) The powerplant installation includes each component of the helicopter, other than the main and auxiliary rotor structures, that: (1) is necessary for propulsion; (2) affects the control of the propulsive unit; and (3) affects the safety of the propulsive unit between normal inspections and overhauls.				
b) For the powerplant installation: (1) all components of the powerplant installation must be constructed, arranged and installed to ensure their continuing safe operation between normal inspections or overhaul periods; (2) accessibility must be provided for any inspection and maintenance necessary for continued airworthiness; and (3) electrical interconnections must be provided to prevent differences of potential between major components of the powerplant installation and the rest of the helicopter.				
ULH.902 – Compatibility				
The applicant must show that each selected engine in the helicopter, for which an authorisation is requested, is compatible with the helicopter, functions in a satisfactory manner and can be operated safely within any limitations established under ULH.1505 and ULH.1521.				
ULH.903 – Engine				
a) The engine must meet the specifications of Section H				
b) If an engine cooling fan is installed, there must be a means to protect the helicopter and allow a safe landing if a fan blade fails.				
ULH.907 – Engine vibration				
a) The engine must be installed to prevent the harmful vibration of any part of the engine or helicopter.				
b) The addition of the rotor and the rotor drive system to the engine must not subject the principal rotating parts of the engine to excessive vibrations or vibration stresses.				
c) No part of the rotor drive system may be subjected to excessive vibratory stresses.				
ULH.917 – Design				
a) Each rotor drive system must incorporate a unit to automatically disengage the engine from the main and auxiliary rotors if that engine fails.				
b) Each rotor drive system must be arranged so that each rotor necessary for control in autorotation will continue to be driven by the main rotors after disengagement of the engine from the main and auxiliary rotors.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
c) The rotor drive system includes any part necessary to transmit power from the engine to the rotor hubs. This includes gear boxes, shafting, universal joints, couplings, clutches, supporting bearings for shafting, any attendant accessory pads or drives and any cooling fans that are a part of, attached to, or mounted on the rotor drive system.				
ULH.921 – Rotor brake				
If there is a means to control the rotation of the rotor drive system independently of the engine, any limitations on the use of that means must be specified, and the control for that means must be guarded to prevent inadvertent operation.				
ULH.923 – Rotor drive system and control mechanism tests				
a) Each rotor drive system and control mechanism must be shown to be satisfactory for its intended use. This must be shown by service experience, testing or a combination of both.				
b) Where compliance is to be shown using service experience, verified evidence of satisfactory operation must be supplied, together with overhaul records for the power train (rotor and transmission) components. Records of all components which have failed to reach their overhaul lives must also be submitted for consideration.				
c) If a test programme is to be followed: (1) the test must be conducted on the helicopter, and the power must be absorbed by the rotors to be installed, except that other ground test facilities with other appropriate methods of power absorption may be used if the conditions of support and vibration closely simulate the conditions that would exist during a test on the helicopter; (2) the test must be conducted for not less than 50 hours for new designs. In the case of designs for which service experience exists, but it is in some respects inadequate to fulfil the requirements of sub-paragraph b) of this paragraph, a limited test programme must be implemented to make up for the shortfall in service experience; and (3) each part tested must be in a serviceable condition at the end of the tests. No intervening disassembly which might affect test results may be conducted.				
ULH.927 – Additional tests				
a) Any additional dynamic, endurance, and operational tests, and vibratory investigations necessary to determine that the rotor drive mechanism is safe, must be performed.				
b) It must be shown by tests that the rotor drive system is capable of operation under autorotative conditions for 5 minutes after the loss of pressure in the rotor drive primary oil system.				
ULH.931 – Shafting critical speed				
a) The critical speeds of any shafting must be determined by demonstration, except that analytical methods may be used if reliable methods of analysis are available for the particular design.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) If any critical speed lies within, or close to, the operating ranges for idling, power-on, and autorotative conditions, the stresses occurring at that speed must be within safe limits. This must be shown by tests.				
c) If analytical methods are used and show that no critical speed lies within the permissible operating ranges, the margins between the calculated critical speeds and the limits of the allowable operating ranges must be adequate to allow for possible variations between the computed and actual values.				
ULH.935 – Shafting joints				
Each universal joint, slip joint, and other shafting joints whose lubrication is necessary for operation must have provision for lubrication.				
FUEL SYSTEM				
ULH.951 – General				
a) Each fuel system must be constructed and arranged to ensure a flow of fuel at a rate and pressure established for proper engine functioning under any normal operating condition.				
b) Each fuel system must be arranged so that no fuel pump can draw fuel from more than one tank at a time. Gravity feed systems may not supply fuel to the engine from more than one tank at a time, unless the airspaces are interconnected in a manner to ensure that all interconnected tanks feed equally.				
c) The fuel system must be arranged to minimise the occurrence of vapour locks and to prevent the introduction of air into the system.				
ULH.955 – Fuel flow				
a) *Gravity systems.* The fuel flow rate for gravity systems (main and reserve supply) must be 150 % of the take-off fuel consumption of the engine.				
b) *Pump systems.* The fuel flow rate for each pump system (main and reserve supply) must be at least 125 % of the take-off fuel consumption of the engine at the maximum power established for take-off.				
ULH.959 – Unusable fuel				
The unusable fuel quantity for each tank must be established as not less than that quantity at which the first evidence of malfunction occurs under the most adverse fuel feed condition occurring under each intended operation and flight manoeuvre involving that tank. It shall not be greater than 5 % of the tank's capacity.				
ULH.961 – Fuel system hot weather operation				
Each suction lift fuel system and other fuel systems with features conducive to vapour formation must be shown by tests to operate satisfactorily (within the limits for which an authorisation is requested) when using fuel at a temperature of 43 °C.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.963 – Fuel tanks: general				
a) Each fuel tank must be able to withstand without failure, the vibration, inertia, fluid and structural loads that it may be subjected to in operation.				
b) Where surging of fuel within the tank could cause significant changes in the centre of gravity of the helicopter, means must be provided to reduce the surging to within acceptable limits.				
ULH.965 – Fuel tank tests				
Each fuel tank must be able to withstand a pressure of 24 kPa without failure or leakage.				
ULH.967 – Fuel tank installation				
a) Each fuel tank must be supported so that the loads resulting from the weight of the fuel are not concentrated. In addition: (1) there must be pads, if necessary, to prevent chafing between each tank and its support; and (2) materials employed for supporting the tank or padding the supporting members must be non-absorbent or treated to prevent the absorption of fuel.				
b) Each tank compartment must be ventilated and drained to prevent the accumulation of flammable fluids and vapours. Each compartment adjacent to a tank must be treated in a similar manner.				
c) No fuel tank may be located where an engine fire could impinge on it.				
d) It must be demonstrated that the presence of the tank will in no way interfere with the operation of any part of the helicopter, or the normal movement of the occupants, and that no leaking fuel will fall directly onto any occupant.				
e) Structural damage which may result from a heavy landing in excess of the ultimate capability of the landing gear but within the emergency landing conditions of ULH.561, must not result in rupture of the fuel tank or fuel lines.				
ULH.969 – Fuel tank expansion space				
Each fuel tank must have an expansion space of not less than 2 % of the tank capacity, unless the tank vent discharges clear of the helicopter (in which case no expansion space is required). It must be impossible to fill the expansion space inadvertently with the helicopter in the normal ground attitude.				
ULH.971 – Fuel tank sump				
a) Each fuel tank must have a drainable sump with an effective capacity, in the normal ground and flight attitudes, of 0.10 % of the tank capacity, or 120 cm^3, whichever is the greater, unless: (1) the fuel system has a sediment bowl or chamber that is accessible for drainage and has a capacity of 25 cm^3; and (2) each fuel tank outlet is located so that, in the normal ground attitude, water will drain from all parts of the tank to the sediment bowl or chamber.				
b) The drainage system must be readily accessible and easy to drain.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
c) Each fuel system drain must have manual or automatic means for positive locking in the closed position.				
ULH.973 – Fuel tank filler connection				
a) Fuel tank filler connections must be located outside the personnel compartment. Spilled fuel must be prevented from entering the fuel tank compartment or any part of the helicopter other than the tank itself.				
b) Each filler cap must provide a fuel-tight seal for the main filler opening.				
ULH.975 – Fuel tank vents				
a) Each fuel tank must be vented from the top part of the expansion space. In addition: (1) each vent outlet must be located and constructed in a manner that minimises the possibility of it being obstructed by ice or other foreign matter; (2) each vent must be constructed to prevent siphoning of fuel during normal operation; (3) each vent must discharge clear of the helicopter.				
b) The venting system must be designed to minimise spillage of fuel through vents to an ignition source in the event of a rollover during landing, ground operation, or a survivable impact.				
ULH.977 – Fuel strainer or filter				
a) There must be a fuel filter between the tank outlet and the carburettor inlet (or an engine driven fuel pump, if any).				
b) There must be a strainer at the outlet of each fuel tank.				
c) Each filter and strainer must be easily accessible for drainage and cleaning.				
FUEL SYSTEM COMPONENTS				
ULH.991 – Fuel pumps				
a) *Main pump.* For an engine installation having fuel pumps to supply fuel to the engine, at least one pump must be directly driven by the engine and must meet ULH.955. This pump is a main pump.				
b) *Emergency pump.* There must be an emergency pump immediately available to supply fuel to the engine if the main pump (other than a fuel injection pump approved as part of an engine) fails. The power supply for the emergency pump must be independent of the power supply for the main pump.				
c) *Warning means.* If both the main pump and emergency pump operate continuously, there must be a means to indicate to the pilot a malfunction of either pump.				
d) Operation of any fuel pump may not affect engine operation so as to create a hazard, regardless of the engine power or the functional status of any other fuel pump.				
ULH.993 – Fuel system lines and fittings				
a) Each fuel line must be installed and supported to prevent excessive vibration and to withstand loads due to fuel pressure and accelerated flight conditions.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) Each fuel line connected to components between which relative motion could exist must have provisions for flexibility.				
c) Each flexible hose must be shown to be suitable for the particular application.				
d) Each fuel line and fitting in any area subject to engine fire conditions must be at least fire-resistant.				
e) Leakage from any fuel line or connection must not impinge on hot surfaces or equipment which could cause a fire, nor fall directly onto any occupant.				
ULH.995 – Fuel valves and controls				
a) There must be a means to allow the pilot to rapidly shut off, in flight, the fuel to the engine.				
b) The portion of the line between the fuel cock and the carburettor must be as short as possible.				
c) Each fuel cock must have either positive stops or effective detents in the 'ON' and 'OFF' positions.				
d) Fuel tank selector valves must: (1) require a separate and distinct action to place the selector in the 'OFF' position; and (2) have the tank selector positions located in such a manner that it is impossible for the selector to pass through the 'OFF' position when changing from one tank to another.				
ULH.999 – Fuel system drains				
a) There must be at least one accessible drain at the lowest point in each fuel system to completely drain the system with the helicopter in any ground attitude to be expected in service.				
b) Each drain must: (1) discharge clear of all parts of the helicopter; (2) have manual or automatic means for positive locking in the closed position; and (3) have a drain valve that is readily accessible and which can be easily opened and closed.				
OIL SYSTEM				
ULH.1011 – General				
a) If an engine is provided with an oil system, it must be capable of supplying the engine with an appropriate quantity of oil at a temperature not exceeding the maximum established as safe for continuous operation.				
b) Each oil system must have a usable capacity adequate for the endurance of the helicopter.				
ULH.1013 – Oil tanks				
a) Each oil tank must be installed to: (1) meet the requirements of ULH.967 a), b), d) and e); and (2) withstand any vibration, inertia and fluid loads expected in operation.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) The oil level must be easy to check without having to remove any cowling parts (with the exception of oil tank access covers) or to use any tools.				
c) If the oil tank is installed in the engine compartment it must be made of fireproof material.				
ULH.1015 – Oil tank tests				
Each oil tank must be able to withstand a pressure of 35 kPa without failure or leakage.				
ULH.1017 – Oil lines and fittings				
a) Oil lines must comply with ULH.993 and must accommodate a flow of oil at a rate and pressure adequate for proper engine functioning under any normal operating conditions.				
b) Each oil line and fitting must be made of fire-resistant material.				
c) *Breather lines.* Breather lines must be arranged so that: (1) condensed water vapour or oil that might freeze and obstruct the line cannot accumulate at any point; (2) the breather discharge will not constitute a fire hazard if foaming occurs or cause emitted oil to strike the occupant(s) or the pilot's wind shields; and (3) the breather does not discharge into the engine air induction system.				
ULH.1019 – Oil strainer or filter				
Each oil strainer or filter in the powerplant installation must be constructed and installed so that oil will flow at the normal rate through the rest of the system with the strainer or filter element completely blocked.				
ULH.1021 – Oil system drains				
A drain (or drains) must be provided to allow safe drainage of the oil system. Each drain must: a) be accessible; and b) have manual or automatic means for positive locking in the closed position.				
ULH.1023 – Oil radiators				
Each oil radiator and its supporting structures must be able to withstand the vibration, inertia, and oil pressure loads to which it would be subjected in operation.				
ULH.1027 – Transmissions and gearboxes: general				
a) Pressure lubrication systems for transmissions and gearboxes must comply with the engine oil system requirements of ULH.1013, ULH.1015, ULH.1017, ULH.1021 and ULH.1337 d).				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) Each pressure lubrication system must have an oil strainer or filter through which all of the lubricant flows and must: (1) be designed to remove from the lubricant any contaminant which may damage transmission and drive system components or impede the flow of lubricant to a hazardous degree; (2) be equipped with a means to indicate collection of contaminations of the filter or strainer at or before opening of the bypass required by sub-paragraph b) (3); and (3) be equipped with a bypass constructed and installed so that: (i) the lubricant will flow at the normal rate through the rest of the system with the strainer or filter completely blocked; and (ii) the release of collected contaminants is minimised by appropriate location of the bypass to ensure that collected contaminants are not in the bypass flow path.				
c) For each lubricant tank or sump outlet supplying lubrication to rotor drive systems and rotor drive system components, a screen must be provided to prevent entrance into the lubrication system of any object that might obstruct the flow of lubricant from the outlet to the filter required by sub-paragraph b). The requirements of sub-paragraph b) do not apply to screens installed at lubricant tank or sump outlets.				
d) Splash-type lubrication systems for rotor drive system gearboxes must comply with ULH.1021 and ULH.1337 d).				
COOLING				
ULH.1041 – General				
The powerplant cooling provisions must be able to maintain the temperatures of powerplant components and engine fluids within the temperature limits established by the engine manufacturer, or as have been determined to be necessary by the helicopter constructor, during all likely operating conditions.				
ULH.1043 – Cooling tests				
a) Cooling tests must be carried out to show compliance with ULH.1041.				
b) The test conditions selected must be the most adverse of operational and flight conditions anticipated.				
c) The maximum anticipated air temperature is 38 °C at sea level. If tests are conducted in conditions less than this the test results must be converted accordingly.				
ULH.1045 – Cooling test procedures				
a) *General.* For each stage of flight, the cooling tests must be conducted with the helicopter: (1) in the configuration most critical for cooling; and (2) under the conditions most critical for cooling.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) *Temperature stabilisation.* For the purpose of the cooling tests, a temperature is 'stabilised' when its rate of change is less than 1 °C per minute. The following component and engine fluid temperature stabilisation rules apply: (1) for each helicopter, and for each stage of flight: (i) the temperatures must be stabilised under the conditions from which entry is made into the stage of flight being investigated; or (ii) if the entry normally does not allow temperatures to stabilise, operation through the full entry condition must be conducted before entry into the stage of flight being investigated in order to allow the temperatures to attain their natural levels at the time of entry. (2) for each helicopter during the take-off stage of flight, the climb at take-off power must be preceded by a period of hover during which the temperatures are stabilised.				
c) *Duration of test.* For each stage of flight the tests must be continued until: (1) the temperatures stabilise or 5 minutes after the occurrence of the highest temperature recorded, as appropriate to the test condition; (2) that stage of flight is completed; or (3) an operating limitation is reached.				
LIQUID COOLING				
ULH.1061 – Installation				
a) *General.* Each liquid-cooled engine must have an independent cooling system (including coolant tank) installed, so that: (1) each coolant tank is supported so that the loads resulting from the weight of the coolant are not concentrated; (2) there are pads, if necessary, to prevent chafing between each tank and its support; (3) materials employed for supporting the tank or padding the supporting members are non-absorbent or treated to prevent the absorption of flammable fluids; (4) no air or vapour can be trapped in any part of the system, except the expansion tank, during filling or during operation.				
b) *Coolant tank.* (1) Each coolant tank must be able to withstand the vibration, inertia and fluids loads to which it may be subjected in operation. (2) Each coolant tank must have an expansion space of at least 10 % of the total cooling system in the normal ground attitude. (3) It must be impossible to fill the expansion space inadvertently with the helicopter in the normal ground attitude.				
c) *Lines and fittings.* Each coolant system line and fitting must comply with the fuel system line requirements of ULH.993 a), b) and c), except that the inside diameter of the engine coolant inlet and outlet lines may not be less than the diameter of the corresponding engine inlet and outlet connections.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
d) *Radiators.* Each coolant radiator must be able to withstand any vibration, inertia, and coolant pressure load to which it may normally be subjected. In addition: (1) each radiator must be supported to allow expansion due to operating temperatures and prevent the transmittal of harmful vibration to the radiator; and (2) if flammable coolant is used, the air intake duct to the coolant radiator must be located so that (in case of fire) flames from the nacelle cannot strike the radiator.				
e) *Drains.* There must be an accessible drain that: (1) drains the entire cooling system (including the coolant tank, radiator and engine) when the helicopter is in the normal ground attitude; (2) discharges clear of the entire helicopter; and (3) has means to positively lock it closed.				
ULH.1063 – Coolant tank test				
Each coolant tank must be able to withstand a pressure which is the sum of a pressure of 24 kPa plus the maximum working pressure of the system, without failure of leakage.				
INDUCTION SYSTEM				
ULH.1091 – Air induction system				
a) The air induction system for the engine must supply the air required by the engine under all likely operating conditions.				
b) If fuel can accumulate in any air induction system, that system must have drains that discharge fuel: (1) clear of the helicopter; and (2) out of the path of exhaust flames.				
ULH.1093 – Induction system icing protection				
The engine air induction system shall incorporate means for the prevention and elimination of ice accumulations unless it is demonstrated that this can be accomplished by other means.				
EXHAUST SYSTEM				
ULH.1121 – General				
a) The exhaust system must ensure safe disposal of exhaust gases without fire hazard or carbon monoxide contamination in any personnel compartment.				
b) Each exhaust system part with a surface hot enough to ignite flammable fluids or vapours must be located or shielded so that leakage from any system carrying flammable fluids or vapours will not result in a fire caused by impingement of the fluids or vapours on any part of the exhaust system, including shields for the exhaust system.				
c) Each exhaust system component must be separated by fireproof shields from adjacent flammable parts of the helicopter that are outside the engine compartment.				
d) No exhaust gases may discharge dangerously near any fuel or oil system drain.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
e) Each exhaust system component must be ventilated to prevent points of excessively high temperature.				
ULH.1123 – Exhaust manifold				
a) Each exhaust system must be fireproof and corrosion resistant, and must have means to prevent failure due to expansion by operating temperatures.				
b) Each exhaust system must be supported to withstand the vibration and inertia loads to which it may be subjected in normal operation.				
c) Parts of the exhaust system connected to components between which relative motion could exist must have means for flexibility.				
POWERPLANT CONTROLS AND ACCESSORIES				
ULH.1141 – General				
a) Each control must be able to maintain any set position without: (1) constant attention by the pilot(s); or (2) tendency to creep due to control loads or vibration.				
b) The portion of each powerplant control located in the engine compartment that is required to be operated in the event of fire must be at least fire-resistant.				
ULH.1143 – Engine controls				
If a power control incorporates a fuel shut-off feature, the control must have a means to prevent the inadvertent movement of the control into the shut-off position. The means must: a) have a positive lock or stop at the idle position; and b) require a separate and distinct operation to place the control in the shut-off position.				
ULH.1145 – Ignition switches				
a) A switch must be provided to enable each ignition circuit to be rendered inoperative.				
b) Each ignition circuit must be independently switched, and must not require the operation of any other switch for it to be made operative.				
c) Ignition switches must be arranged and designed to prevent inadvertent operation.				
d) The ignition switch must not be used as the master switch for other circuits.				
ULH.1151 – Rotor brake controls				
a) It must be impossible to apply the rotor brake inadvertently in flight.				
b) There must be a means to warn the pilot(s) if the rotor brake has not been completely released before take-off.				
ULH.1163 – Powerplant accessories				
a) Each engine-driven accessory must: (1) be satisfactory for mounting on the engine concerned; (2) use the provisions on the engine for mounting; and (3) be sealed to prevent contamination of the engine oil system and the accessory system.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) Electrical equipment subject to arcing or sparking must be installed to minimise the probability of contact with any flammable fluids or vapours that might be present in a free state.				
c) Unless other means are provided, torque limiting means must be provided for accessory drives located on any component of the transmission and rotor drive system to prevent damage to these components from excessive accessory load.				
ULH.1165 – Engine ignition systems				
a) Each battery ignition system must be supplemented by a generator that is automatically available as an alternate source of electrical energy to allow continued engine operation if any battery becomes depleted.				
b) The capacity of batteries and generators must be large enough to meet the simultaneous demands of the engine ignition system and the greatest demands of any electrical system components that draw from the same source.				
c) The design of the engine ignition system must account for: (1) the condition of an inoperative generator; (2) the condition of a completely depleted battery with the generator running at its normal operating speed; and (3) the condition of a completely depleted battery with the generator operating at idling speed if there is only one battery.				
d) There must be means to warn the pilot(s) if malfunctioning of any part of the electrical system is causing the continuous discharge of any battery used for engine ignition.				
POWERPLANT FIRE PROTECTION				
ULH.1183 – Lines, fittings and components				
a) With the exception of drain and vent lines, and their fittings whose failure will not result in, or add to, a fire hazard, each component, line and fitting carrying flammable fluid in any area subject to engine fire conditions must be at least fire-resistant. Flammable fluid tanks and supports which are part of and attached to the engine must be fireproof or be enclosed by a fireproof shield unless damage by fire to any non-fireproof part will not cause leakage of spillage of flammable fluid.				
b) Each flammable fluid drain and vent must discharge clear of the induction system air inlet.				
ULH.1191 – Firewalls				
a) The engine must be isolated from the rest of the helicopter by a firewall, shroud or equivalent means.				
b) The firewall or shroud must be constructed so that no hazardous quantity of liquid, gas or flame can pass from the engine compartment to other parts of the helicopter.				
c) Each opening in the firewall or shroud must be sealed with close fitting, fireproof grommets, bushings or firewall fittings.				
d) The firewall and shroud must be fireproof and protected against corrosion.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1193 – Cowling and nacelle				
When an engine installation is cowled: a) Each cowling must be constructed and supported so that it can resist any vibration, inertia and air loads to which it may be subjected in operation.				
b) There must be a means for rapid and complete drainage of each part of the cowling in the normal ground and flight attitudes. No drain may discharge where it will cause a fire hazard.				
c) The cowling must be at least fire-resistant.				
d) Each part behind an opening in the engine compartment cowling must be at least fire-resistant for a distance of at least 600 mm aft of the opening.				
e) Each part of the cowling subjected to high temperatures due to its nearness to exhaust system ports or exhaust gas impingement, must be fireproof.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Subpart F - EQUIPMENT				
GENERAL				
ULH.1301 – Function and installation				
ULH.1301 – Function and installation a) Each item of required equipment must: (1) be of a kind and design appropriate to its intended function; (2) be labelled as to its identification, function, or operating limitations, or any applicable combination of these factors; (3) be installed according to limitations specified for that equipment; and (4) function properly when installed.				
b) Instruments and other equipment may not in themselves, or by their effect upon the helicopter, constitute a hazard to safe operation.				
ULH.1303 – Flight and navigation instruments				
The following are the required flight and navigation instruments: a) an airspeed indicator; b) an altimeter; and c) a magnetic direction indicator.				
ULH.1305 – Powerplant instruments				
The following are the required powerplant instruments: a) such pressure and temperature indications and | or warnings as the engine manufacturer may require or as necessary to operate the engine within its limitations; b) a fuel quantity indicator for each fuel tank, visible to each pilot when strapped in; c) an oil quantity indicator for each oil tank, e.g. dipstick; d) a fuel pressure indicator and | or fuel low pressure warning devices for non-gravity fed engines; e) an oil temperature warning device to indicate when the temperature exceeds a safe value in the main rotor drive gearbox having an oil system independent of the engine oil system; f) an oil pressure warning device to indicate when the pressure falls below a safe value in the pressure-lubricated main rotor drive gearbox having an oil system independent of the engine oil system; g) a tachometer to indicate the rpm of: (1) the engine; and (2) the main rotor; and h) a means of measuring elapsed running time.				
ULH.1307 – Miscellaneous equipment				
The following is the required, miscellaneous equipment: a) A seat for each occupant;				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) A four- or five-point safety harness must be provided for each occupant, capable of restraining the wearer against the forces resulting from the accelerations prescribed for emergency landing conditions in ULH.561;				
c) An adequate source of electrical energy, where electrical energy is necessary for operation of the helicopter; and				
d) Electrical protective devices.				
ULH.1309 – Equipment, systems, and installations				
a) The equipment, systems, and installations whose functioning is required by this Section F must be designed and installed to ensure that they perform their intended functions under any foreseeable operating condition.				
b) The equipment, systems and installations must be designed to minimise hazards to the helicopter in the event of a probable malfunction or failure.				
INSTRUMENTS: INSTALLATION				
ULH.1321 – Arrangement and visibility				
a) Each flight, navigation, and powerplant instrument must be clearly arranged and plainly visible to each pilot.				
b) Instrument panel vibration may not damage or impair the readability or accuracy of any instrument.				
ULH.1322 – Warning, caution, and advisory lights				
If warning, caution, or advisory lights are installed in the cockpit, they must be: a) red for warning lights (lights indicating a hazard which may require immediate corrective action); b) amber for caution lights (lights indicating the possible need for future corrective action); c) green for safe operation lights; and d) any other colour, including white, for lights not described in sub-paragraphs a) to c) of this paragraph, provided the colour differs sufficiently from the colours prescribed in sub-paragraphs a) to c) of this paragraph to avoid possible confusion.				
ULH.1323 – Airspeed indicating system				
a) The airspeed indicating system must be calibrated to indicate true airspeed at sea level in standard atmosphere with a maximum pitot-static error not exceeding ±9.3 km / h or ±5 %, whichever is greater.				
b) Calibration must be made in flight.				
c) The airspeed indicating system must be suitable for speeds between 50 km / h and at least 1.05 times V_{NE}.				
ULH.1325 – Static pressure system				
a) Each instrument provided with static pressure case connections must be so vented that the influence of helicopter speed, the opening and closing of windows, moisture or other foreign matter will not significantly affect the accuracy of the instruments.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) The design and installation of pitot and static pressure systems must be such that: (1) positive drainage of moisture is provided; (2) chafing of the tubing, and excessive distortion or restriction at bends in the tubing, is avoided; and (3) the materials used are durable, suitable for the purpose intended, and protected against corrosion.				
ULH.1327 – Magnetic direction indicator				
a) The magnetic direction indicator required must be installed so that its accuracy is not excessively affected by the helicopter's vibration or magnetic fields.				
b) The compensated installation must not have a deviation in level flight, greater than 10 degrees on any heading.				
ULH.1337 – Powerplant instruments				
a) *Instruments and instrument lines* (1) Each powerplant instrument line must meet the requirements of ULH.993. (2) Each line carrying flammable fluids under pressure must have restricting orifices or other safety devices at the source of pressure to prevent the escape of excessive fluid if the line fails.				
b) *Fuel quantity indicator.* There must be a means to indicate to the pilot the quantity of fuel in each tank during flight. In addition each exposed sight gauge used as a fuel quantity indicator must be protected against damage.				
c) *Fuel flow meter system.* If a fuel flow meter system is installed, each metering component must have a means for bypassing the fuel supply if malfunction of that component severely restricts fuel flow.				
d) Rotor drive system transmissions and gearboxes utilising ferromagnetic materials must be equipped with chip detectors designed to reveal the presence of ferromagnetic particles resulting from damage or excessive wear. Chip detectors must be readily removable for inspection of the magnetic element for metallic chips.				
ELECTRICAL SYSTEMS AND EQUIPMENT				
ULH.1351 – General				
a) *Electrical system capacity.* Each electrical system must be adequate for its intended use. In addition: (1) electric power sources, their transmission cables, and their associated control and protective devices must be able to furnish the required power at the proper voltage to each load circuit essential for safe operation; and (2) compliance with sub-paragraph a) (1) must be shown by an electrical load analysis, or by electrical measurements that take into account the electrical loads applied to the electrical system in probable combinations and for probable durations.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) *Functions.* For each electrical system, the following apply: (1) Each system when installed, must be: (i) free from hazards in itself, in its method of operation, and in its effects on other parts of the helicopter; (ii) protected form fuel, oil, water, other detrimental substances, and mechanical damage; and (iii) so designed that the risk of electrical shock to occupants is reduced to a minimum. (2) Electric power sources must function properly when connected in combination or independently, except that alternators may depend on a battery for initial excitation or for stabilisation. (3) No failure or malfunction of any electric power source may impair the ability of any remaining source to supply load circuits essential for safe operation, except that the operation of an alternator that depends on a battery for initial excitation or for stabilisation may be stopped by failure of that battery. (4) Each electric power source control must allow the independent operation of each source, except that controls associated with alternators that depend on a battery for initial excitation or for stabilisation need not break the connection between the alternator and its battery.				
c) *Generating system.* There must be at least one generator if the system supplies power to load circuits essential for safe operation. In addition: (1) each generator must be able to deliver its continuous rated power; (2) generator voltage control equipment must be able to dependably regulate each generator output within rated limits; (3) each generator must have a reverse current cutout designed to disconnect the generator from the battery and from the other generators when enough reverse current exists to damage that generator; (4) there must be a means to give immediate warning to the pilot of a failure or any generator; and (5) each generator must have an overvoltage control designed and installed to prevent damage to the electrical system, or to equipment supplied by the electrical system, that could result if that generator were to develop an overvoltage condition.				
d) *Instruments.* There must be a means to indicate to the pilot that the electrical power supplies are adequate for safe operation. For direct current systems, an ammeter in the battery feeder may be used.				
ULH.1353 – Storage battery design and installation				
a) Each storage battery must be designed and installed as prescribed in this paragraph.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) Safe cell temperatures and pressures must be maintained during any probable charging and discharging condition. No uncontrolled increase in cell temperature may result when the battery is recharged (after previous complete discharge): (1) at maximum regulated voltage and power; (2) during a flight of maximum duration; and (3) under the most adverse cooling condition likely to occur in service.				
c) Compliance with sub-paragraph b) of this paragraph must be shown by test unless experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures presents no problem.				
d) No explosive or toxic gases emitted by any battery in normal operation, or as the result of any probable malfunction in the charging system or battery installation, may accumulate in hazardous quantities within the helicopter.				
e) No corrosive fluids or gases that may escape from the battery may damage surrounding structures or adjacent essential equipment.				
f) Each nickel cadmium battery installation capable of being used to start the engine must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of its individual cells.				
g) Nickel cadmium battery installations capable of being used to start the engine must have: (1) a system to control the charging rate of the battery automatically so as to prevent battery overheating; (2) a battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or (3) a battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.				
ULH.1357 – Circuit protective devices				
a) Protective devices, such as fuses or circuit breakers, must be installed in each electrical circuit other than: (1) the main circuit of starter motors; and (2) circuits in which no hazard is presented by their omission.				
b) A protective device for a circuit essential to flight safety may not be used to protect any other circuit.				
c) Each resettable circuit protective device (‘trip free’ device in which the tripping mechanism cannot be overridden by the operating control) must be designed so that: (1) a manual operation is required to restore service after tripping; and (2) if an overload or circuit fault exists, the device will open the circuit regardless of the position of the operating control.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
d) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be located and identified so that it can be readily reset or replaced in flight.				
e) If fuses are used, there must be one spare of each rating, or 50 % spare fuse of each rating, whichever is greater.				
ULH.1361 – Master switch arrangement				
a) There must be a master switch or switches arranged to allow ready disconnection of all electric power sources. The point of disconnection must be adjacent to the sources controlled by the switch.				
b) The master switch arrangement must be so installed that it is easily discernible and accessible to the pilot in flight.				
ULH.1365 – Electric cables and equipment				
a) Each electric connecting cable must be of adequate capacity and correctly routed, attached and connected so as to minimise the probability of short circuits and fire hazards.				
b) Overload protection must be provided for each item of electrical equipment. No protective device may protect more than one circuit essential to flight safety.				
ULH.1367 – Switches				
Each switch must be: a) able to carry its rated current; b) accessible to the pilot; and c) labelled as to operation and the circuit controlled.				
LIGHTS				
ULH.1385 – External lights				
If external lights are to be installed they must be approved.				
SAFETY EQUIPMENT				
ULH.1411 – General				
a) When safety equipment is installed it must be readily accessible; and				
b) Stowage provisions for that equipment must be furnished and must: (1) be arranged so that the equipment is directly accessible and its location is obvious; and (2) protect the safety equipment from damage caused by being subjected to the inertia loads specified in ULH.561.				
MISCELLANEOUS EQUIPMENT				
ULH.1431 – Airborne radio and radio navigation equipment				
Each item of airborne radio equipment provided must comply with the following: a) The equipment and its aerials may neither in themselves, nor by their mode of operation or by their effect upon the operating characteristics of the helicopter and its equipment, constitute a hazard to safe operation.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) The equipment and its control and monitoring devices must be arranged so as to be easily controllable. Their installation must be such that they are sufficiently ventilated to prevent overheating.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Section G - OPERATING LIMITATIONS AND INFORMATION				
GENERAL				
ULH.1501 – General				
a) Each operating limitation specified in ULH.1503 to ULH.1521 and other limitations and information necessary for safe operation must be established.				
b) The operating limitations and other information necessary for safe operation must be made available to the pilot as prescribed in ULH.1541 to ULH.1589.				
OPERATING LIMITATIONS				
ULH.1503 – Airspeed limitations: general				
a) An operating speed range must be established.				
b) When airspeed limitations are a function of weight, weight distribution, altitude, rotor speed, power, or other factors, airspeed limitations corresponding with the critical combinations of these factors must be established.				
c) All flight speeds must be stated in terms of airspeed indicator readings (IAS).				
ULH.1505 – Never-exceed speed				
a) The never-exceed speed, V_{NE}, must be established power-on and power-off.				
b) The never-exceed speed, V_{NE}, must not exceed 0.90 times the maximum speed demonstrated in flight tests, V_{DF}.				
c) Power-off V_{NE} may be established at a speed less that than in sub-paragraph b) of this paragraph.				
d) V_{NE} may vary with altitude, rpm, temperature and weight.				
ULH.1509 – Rotor speed				
a) *Maximum power-off (autorotation).* The maximum power-off rotor speed must be established so that it does not exceed 95 % of the lesser of: (1) the maximum design rpm determined under ULH.309 b); and (2) the maximum rpm shown during the type tests.				
b) *Minimum power-off.* The minimum power-off rotor speed must be established so that it is not less than 105 % of the greater of: (1) the minimum shown during the type tests; and (2) the minimum determined by design substantiation.				
c) *Minimum power-on.* The minimum power-on speed must be established so that it is: (1) not less than the greater of: (i) the minimum shown during the type tests; and (ii) the minimum determined by design substantiation; and (2) not more than a value determined under ULH.33 a) (1).				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1519 – Weight and centre of gravity				
a) The weight and centre of gravity limitations determined under ULH.25 and ULH.27 respectively, must be established as operating limitations.				
b) The empty weight and the corresponding centre of gravity positions must be determined in accordance with ULH.29.				
ULH.1521 – Powerplant limitations				
a) *General.* The powerplant limitations prescribed in this paragraph must be established so that they do not exceed the corresponding limits established for the engine.				
b) *Take-off operation.* The powerplant take-off operation must be limited by: (1) the maximum rotational speed, which may not be greater than: (i) the maximum value determined by the rotor design; or (ii) the maximum value shown during the type tests; (2) the maximum allowable manifold pressure if appropriate to the engine installation; and (3) the time limit for the use of the power corresponding to the limitations established in sub-paragraphs b) 1) and 2) of this paragraph.				
c) *Continuous operation.* The continuous operation must be limited by: (1) the maximum rotational speed which may not be greater than: (i) the maximum value determined by the rotor design; or (ii) the maximum value shown during the type tests; and (2) the minimum rotational speed shown under the rotor speed requirements in ULH.1509 c).				
d) *Fuel grade or designation.* The minimum fuel grade must be established so that it is not less than that required for the operation of the engine within the limitations in sub-paragraphs b) and c) of this paragraph.				
ULH.1527 – Maximum operating altitude				
The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1529 – Maintenance manual				
A maintenance manual containing the information that the applicant considers essential for proper maintenance must be provided. The applicant must consider at least the following in developing the essential information: a) description of systems; b) lubrication instructions setting forth the frequency and the lubricants and fluids which are to be used in the various systems; c) pressures and electrical loads applicable to the various systems; d) tolerances and adjustments necessary for proper functioning, including gearbox backlash values, rotor feathering hinge rotational drag load values and limits of rotor pitch angles relative to the hubs; e) method of determining centre of gravity position; f) methods of rotor tracking and maximum permissible values of play at hinges and control circuit backlash; g) identification of primary and secondary structures; h) frequency and extent of inspections necessary for proper maintenance; i) special repair methods applicable to the helicopter; j) special inspection techniques and maintenance 'cautions'; k) list of special tools; l) rigging data necessary for proper operation; m) statement of service life limitations (replacement or overhaul) of parts, components and accessories subject to such limitations; n) identification of critical parts; o) the materials necessary for small repairs; p) care and cleaning recommendations; q) instructions for inspection and cleaning of the main and tail rotor blades such that they maintain their optimum aerodynamic performance; r) instructions for rigging and de-rigging; s) information on supporting points and measures to be taken to prevent damage during ground transportation; and t) list of placards and markings and their locations. Note that the inspection techniques should include procedures to check that the primary structure, controls, rotors and rotor blades are free from cracks, corrosion or visible damage.				
MARKINGS AND PLACARDS				
ULH.1541 – General				
a) The helicopter must be marked with: (1) the markings and placards specified in ULH.1542 to ULH.1557; and (2) any additional information, instrument markings, and placards required for the safe operation of the helicopter.				
b) Each marking and placard prescribed in sub-paragraph a) of this paragraph: (1) must be displayed in a conspicuous place; and (2) may not be easily erased, disfigured or obscured.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
c) The units of measurement used to indicate airspeed on placards must be the same as those used on the indicator.				
ULH.1542 – Operating limitations placards and instrument markings				
Limitations essential to safe operation of the helicopter must be plainly visible to the pilot. Where this cannot be achieved by instrument markings, a placard must be provided. Where these limitations are shown by instrument markings, each maximum and minimum safe operating limit must be marked by a red line.				
ULH.1543 – Instrument markings: general				
For each instrument: a) when markings are on the cover glass of the instrument, there must be means to maintain the correct alignment of the glass cover with the face of the dial; and				
b) each arc and line must be wide enough and located to be clearly visible to the pilot.				
ULH.1545 – Airspeed indicator				
Each airspeed indicator must show the following markings: a) a red radial line at $V_{NE\ (power\text{-}on)}$; b) a red cross-hatched radial line at $V_{NE\ (power\text{-}off)}$, if $V_{NE\ (power\text{-}off)}$ is less than $V_{NE\ (power\text{-}on)}$; c) for the caution range, a yellow arc; d) for the safe operating range, a green arc.				
ULH.1547 – Compass				
Unless the deviation is less than 5 degrees on all headings, the deviation values for magnetic headings in not more than 30 degree increments must be placarded near the compass.				
ULH.1549 – Powerplant instruments				
For each required powerplant instrument, as appropriate to the type of instrument: a) each maximum and, if applicable, minimum safe operating limit must be marked with a red radial or a red line; b) each normal operating range must be marked with a green arc or green line, not extending beyond the maximum and minimum safe limits; c) each take-off and precautionary range must be marked with a yellow arc or a yellow line; d) each engine range that is restricted because of excessive vibration stresses must be marked with red arcs or red lines.				
ULH.1551 – Oil quantity indicator				
Each oil quantity indicator must be marked to clearly indicate the maximum and minimum quantity of oil that is acceptable.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1553 – Fuel quantity indicator				
Each fuel quantity indicator must be calibrated to read 'zero' during level flight, when the quantity of fuel remaining in the tank is equal to the unusable quantity determined in accordance with ULH.959.				
ULH.1555 – Control markings				
a) Each cockpit control, other than primary flight controls, must be clearly marked as to its function and method of operation.				
b) The colour markings of cockpit controls must be in accordance with those specified in ULH.780.				
c) For powerplant fuel controls: (1) each fuel tank selector control must be marked to indicate the position corresponding to each tank; and (2) if safe operation requires the use of any tanks in a specific sequence, that sequence must be marked on or near the selector for those tanks.				
ULH.1557 – Miscellaneous markings and placards				
a) *Baggage compartment.* Each baggage compartment must have a placard stating the loading limitations.				
b) *Fuel and oil filler openings.* The following apply: (1) Fuel filler openings must be marked at or near the filler cover with the minimum fuel grade and if applicable the fuel | oil ratio. (2) Oil filler openings must be marked at or near the filler cover: (i) with the grade; and (ii) if the oil is detergent or nondetergent.				
c) *Fuel tanks.* The usable fuel capacity of each tank must be marked either at the selector or on the gauge (when provided), or on the tank if this is translucent and visible to the pilot in flight.				
d) *Loading.* (1) *Placards.* The following data must be placarded in each helicopter so that they are plainly visible to the pilot: (i) empty weight; (ii) maximum weight; (iii) maximum and minimum cockpit load; and (iv) cockpit load conditions for two seater flown solo. (2) *Removable ballast.* If removable ballast is used, the place for carrying ballast must have a placard stating instructions for the proper placement and securing of the removable ballast under each loading condition for which each removable ballast is necessary.				
e) *Aerobatic manoeuvres.* A placard prohibiting aerobatic manoeuvres must be plainly visible to the pilot.				
ULH.1561 – Safety equipment				
When installed, safety equipment must be plainly marked as to the methods of operation.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1565 – Tail rotor				
The tail rotor must be marked so that its disc is conspicuous under normal daylight ground conditions.				
PILOT'S HANDBOOK				
ULH.1581 – General				
a) Each helicopter must be furnished with a Pilot's Handbook. Each Pilot's Handbook must contain at least: (1) the information specified in ULH.1583 to ULH.1589; (2) *additional information.* Any information not specified in ULH.1583 to ULH.1589 that is required for safe operation because of unusual design, operating, or handling characteristics.				
b) *Units.* The units of measurement used in the Pilot's Handbook must be the same as those used on the indicators.				
ULH.1583 – Operating limitations				
a) *Airspeed limitations.* The following limitations must be furnished: (1) the airspeed limit V_{NE} as required by ULH.1505 together with information on the significance of this limit; (2) maximum wind limitations; (3) airspeed indicator system calibration.				
b) *Powerplant and rotor system limitations.* The following information must be furnished: (1) limitations required by ULH.1509 and ULH.1521; (2) information necessary for marking the instruments required by ULH.1542 to ULH.1553; (3) fuel and oil designation.				
c) *Weights.* The following limitations must be furnished: (1) the maximum weight; (2) the empty weight and the position of the empty weight centre of gravity; (3) the composition of the useful load.				
d) *Loading.* The following limitations must be furnished: (1) the weight and centre of gravity limits required by ULH.23 and ULH.25 together with the items included in the empty weight in ULH.29; (2) information enabling the pilot of the helicopter to determine whether the centre of gravity and the distribution of the useful load in the different loading combinations are still within the allowable range; (3) information for the proper placement of removable ballast under each loading condition for which removable ballast is necessary.				
e) *Manoeuvres.* Authorised manoeuvres established in accordance with ULH.3.				
f) *Kinds of operation.* The kind of operation, e.g. day VFR, in which the helicopter may be used, must be stated. The minimum equipment required for operation must be listed.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
g) *Placards.* Placards required by ULH.1555 and ULH.1557 must be furnished.				
h) *Altitude.* The altitude established under ULH.1527 and an explanation of the limiting factors must be furnished.				
ULH.1585 – Operating procedures				
a) Information concerning normal and emergency procedures and other information necessary for safe operation, including take-off and landing procedures and associated airspeeds, must be furnished. The Pilot's Handbook must contain any pertinent information including: (1) the kind of take-off surface used in the tests and each appropriate climb out speed; and (2) the kind of landing surface used in the tests and appropriate approach and glide airspeeds.				
b) For helicopters for which a $V_{NE\ (power\text{-}off)}$ is established under ULH.1505 c), information must be furnished to explain the $V_{NE\ (power\text{-}off)}$ and the procedures for reducing airspeed to not more than the $V_{NE\ (power\text{-}off)}$ following failure of the engine.				
c) For each helicopter showing compliance with ULH.1353 g) (2) or g) (3), the operating procedures for disconnecting the battery from its charging source must be furnished.				
d) Information on the total quantity of usable fuel for each fuel tank must be furnished.				
e) The airspeeds and rotor speeds for minimum rate of descent and best glide angle as prescribed in ULH.71 must be provided.				
ULH.1587 – Performance information				
a) The helicopter must be furnished with the information determined in accordance with ULH.51 to ULH.79 and ULH.143 c) as well as the following: (1) enough information to determine the limiting height-speed envelope; (2) information relative to: (i) the hovering ceilings and the steady rates of climb and descent, as affected by any pertinent factors such as airspeed, weight, altitude and temperature; (ii) the maximum safe wind for operation near the ground. If there are combinations of weight, altitude, and temperature for which performance information is provided and at which the helicopter cannot land and take-off safely with the maximum wind value, those portions of the operating envelope and the appropriate safe wind conditions shall be identified in the Pilot's Handbook; (iii) the maximum atmospheric temperature at which compliance with the cooling provisions of ULH.1041 to ULH.1043 is shown; and (iv) glide distance as a function of altitude when autorotating at the speeds and conditions for minimum rate of descent and best glide as determined in ULH.71.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
b) The Pilot's Handbook must contain in its performance information section, any pertinent information concerning the take-off weights and altitudes used in compliance with ULH.51.				
ULH.1589 – Loading information				
There must be loading instructions for each possible loading condition between the maximum and minimum weights determined under ULH.25 that can result in a centre of gravity beyond any extreme prescribed in ULH.27, assuming any probable occupant weights.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
Section H - ENGINES				
GENERAL				
ULH.1801 – Applicability				
This Section H is applicable to spark- and compression-ignition engines for ultralight motorised helicopters.	dd			
ULH.1803 – Instruction manual				
An instruction manual containing the information that the applicant considers essential for installing, operating, servicing and maintaining the engine must be provided.				
ULH.1805 – Engine ratings and operating limitations				
Engine ratings and operating limitations must be established based on the operating conditions demonstrated during the bench tests prescribed in this Section H. These include power ratings and operational limitations relating to speeds, temperatures, pressures, fuels and oils which the applicant finds necessary for the safe operation of the engine.				
DESIGN AND CONSTRUCTION				
ULH.1809 – Engine critical parts				
a) A critical part is a part, the failure of which could have a catastrophic effect upon the helicopter, and for which critical characteristics have been identified which must be controlled to ensure the required level of integrity.				
b) If the engine design includes critical parts, a critical parts list must be established. Procedures must be established to define the critical design characteristics, identify processes that affect those characteristics, and identify the design change and process change controls necessary for showing compliance with quality assurance requirements.				
ULH.1811 – Materials				
The suitability and durability of materials used in the engine must: a) be established on the basis of experience or tests; and b) conform to specifications that ensure they have the strength and other properties assumed in the design data.				
ULH.1813 – Fabrication methods				
a) The methods of fabrication used must produce consistently sound structures. If a fabrication process (such as gluing, spot welding, or heat-treating) requires close control to reach this objective, the process must be performed according to a defined process specification.				
b) Each new fabrication method must be substantiated by adequate tests.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1815 – Fasteners				
a) Each removable bolt, screw, nut, pin or other fastener whose loss could jeopardise the safe operation of the engine must incorporate two separate locking devices. The fastener and its locking devices may not be adversely affected by the environmental conditions associated with the particular helicopter installation.				
b) No self-locking nut may be used on any bolt subject to rotation in operation, unless a non-friction locking device is used in addition to the self-locking device.				
ULH.1817 – Protection of structure				
Each part of the engine structure must be suitably protected against deterioration or loss of strength in service due to any cause, including weathering, corrosion and abrasion.				
ULH.1819 – Inspection provisions				
There must be means to allow the close examination of each part that requires recurring inspection, adjustment for proper alignment and functioning, lubrication or rigging and de-rigging.				
ULH.1821 – Engine control system				
The engine control system must operate with the ease, smoothness, and positiveness appropriate to its functions.				
ULH.1823 – Engine mounting system				
Each engine component which forms part of the engine mounting and any other parts of the engine liable to be critically affected must, when the engine is properly supported by a suitable engine-mounting structure: a) Be able to support limit loads without detrimental permanent deformation. At any load up to limit loads, the deformation may not interfere with safe operation.				
b) Be able to support ultimate loads without failure. This must be shown by: (1) applying ultimate loads to the structure in a static test for at least 3 seconds; or (2) dynamic tests simulating actual load application.				
ULH.1825 – Fire prevention				
a) The design and construction of the engine and the materials used must minimise the probability of the occurrence and spread of fire because of structural failure, overheating or other causes.				
b) With the exception of drain and vent lines, and their fittings whose failure will not result in, or add to, a fire hazard, each external line, fitting and other component carrying flammable fluid during engine operation must be at least fire-resistant. Flammable fluid tanks and supports which are part of and attached to the engine must be fireproof or be enclosed by a fireproof shield unless damage by fire to any non-fireproof part will not cause leakage or spillage of flammable fluid. Components must be shielded or located so as to safeguard against the ignition of leaking flammable fluid.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
c) An engine component designed, constructed and installed as a firewall must be: (1) fireproof; and (2) constructed so that no hazardous quantity of air, fluid or flame can pass around or through the firewall; and (3) protected against corrosion.				
d) Engine control system components which are located in the engine compartment that are required to be operated in the event of fire must be at least fire-resistant.				
e) Any components, modules, equipment and accessories which are susceptible to or are potential sources of static discharges or electrical fault currents must be designed and constructed so as to be grounded to the engine reference in order to minimise the risk of ignition in external areas where flammable fluids or vapours could be present.				
f) Those features of the engine which form part of the mounting structure or engine attachment points must be fireproof, either by construction or by protection, or protected so they can perform their essential functions for at least 5 minutes under any foreseeable powerplant fire conditions.				
ULH.1827 – Durability				
Engine design and construction must minimise the probability of occurrence of an unsafe condition of the engine between overhauls.				
ULH.1829 – Engine cooling				
Engine design and construction must provide the necessary cooling under conditions in which the helicopter is expected to operate.				
ULH.1831 – Accessory attachment				
Each accessory drive and mounting attachment must be designed and constructed so that the engine will operate properly with the accessories attached. The design of the engine must allow the examination, adjustment or removal of each essential engine accessory.				
ULH.1833 – Vibration				
a) The engine must be designed and constructed to function from idling to 103 % crankshaft rotational speed at maximum take-off conditions without vibration levels which may affect the integrity of parts and assemblies.				
b) The engine must withstand a vibration survey throughout the expected operating range of rotational speed and power of the engine and up to an engine speed equivalent to take-off power on helicopter rotor speed plus 3 %. Each accessory drive and mounting attachment must be loaded with the critical loads expected in service.				

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1835 – Ignition				
Except for compression ignition engines, the engine must be equipped with a dual ignition system having all the magnetic and electrical circuits entirely independent, or with a single ignition system of at least equal reliability to a dual system. The ignition system must function throughout the complete operating range of the engine under all starting and flight conditions.				
ULH.1837 – Fuel and induction system				
a) The fuel system of the engine must be designed and constructed to supply the appropriate mixture of fuel to the combustion chambers throughout the complete operating range of the engine under all starting, flight and atmospheric conditions.				
b) The intake passages of the engine through which air, or fuel in combination with air, passes must be designed and constructed to minimise ice accretion and vapour condensation in those passages. The engine must be designed and constructed to permit the use of a means for ice prevention.				
c) The type and degree of fuel filtering necessary for protection of the engine fuel system against foreign particles in the fuel must be specified. The applicant must show (e.g. within the 50 hour run prescribed in ULH.1847 a)) that foreign particles passing through the prescribed filtering means will not critically impair engine fuel system functioning.				
d) Each passage in the induction system that conducts a mixture of fuel and air, and in which fuel may accumulate, must be self-draining to prevent a liquid lock in the combustion chambers. This applies to all attitudes selected by the applicant.				
ULH.1839 – Lubrication system				
a) The lubrication system of the engine must be designed and constructed so that it will function properly in all attitudes and atmospheric conditions in which the helicopter is expected to operate. In wet-sump engines this requirement must be met when the engine contains only the minimum oil quantity, the minimum quantity being not more than half the maximum quantity.				
b) The lubrication system of the engine must be designed and constructed to allow installing a means of cooling the lubricant.				
c) The crankcase must be vented to preclude leakage of oil form excessive pressure in the crankcase.				
ULH.1841 – High energy rotors				
Equipment with high-energy rotors must be such as to meet one of the following: a) Failures will not result in significant non containment of high energy debris; or b) An acceptable level of integrity of the design, including the high energy parts, has been established; or c) An appropriate combination of subparagraphs a) and b).				

<table>
<tr><th>Requirement</th><th>Means of Compliance</th><th>Compliance Document</th><th>Remarks</th><th>Compliance Check</th></tr>
<tr><td>BENCH TESTS</td><td></td><td></td><td></td><td></td></tr>
<tr><td>ULH.1843 – Calibration test</td><td></td><td></td><td></td><td></td></tr>
<tr><td>The engine must be subjected to the calibration tests necessary to establish its power characteristics and the conditions for the endurance test specified in ULH.1847 a) to c). The results of the power characteristics calibration tests form the basis for establishing the characteristics of the engine over its entire operating range of crankshaft rotational speeds, manifold pressures, and fuel | air mixture settings. Power ratings are based on standard atmospheric conditions at sea level.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>ULH.1845 – Detonation test (spark ignition engine only)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>The engine must be tested using the dual ignition system and each separate ignition system alone so as to establish that it can function without detonation throughout the range of intended conditions of operation.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>ULH.1847 – Endurance test</td><td></td><td></td><td></td><td></td></tr>
<tr><td>a) The engine must be subjected to an endurance test that includes a total of 50 hours of operation and consists of the cycles specified in sub-paragraph c) of this paragraph.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>b) Additional endurance testing at particular rotational speed(s) may be required depending on the results of the tests prescribed in ULH.1833, to establish the ability of the engine to operate without fatigue failure.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>c) Each cycle must be conducted as follows:</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">
<table>
<tr><th>Sequence</th><th>Duration (minutes)</th><th>Operating conditions</th></tr>
<tr><td>1</td><td>5</td><td>Starting -idle</td></tr>
<tr><td>2</td><td>5</td><td>Take-off power</td></tr>
<tr><td>3</td><td>5</td><td>Cooling run (idle)</td></tr>
<tr><td>4</td><td>5</td><td>Take-off power</td></tr>
<tr><td>5</td><td>5</td><td>Cooling run (idle)</td></tr>
<tr><td>6</td><td>5</td><td>Take-off power</td></tr>
<tr><td>7</td><td>5</td><td>Cooling run (idle)</td></tr>
<tr><td>8</td><td>15</td><td>75 % of maximum continuous power</td></tr>
<tr><td>9</td><td>5</td><td>Cooling run (idle)</td></tr>
<tr><td>10</td><td>60</td><td>Maximum continuous power</td></tr>
<tr><td>11</td><td>5</td><td>Cooling run and stop</td></tr>
<tr><td>Total:</td><td>120</td><td></td></tr>
</table>
</td></tr>
<tr><td>d) During or following the endurance test the fuel and oil consumption must be determined.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>ULH.1849 – Operation test</td><td></td><td></td><td></td><td></td></tr>
<tr><td>The operation test must include the demonstration of backfire characteristics, starting, idling, acceleration, running with a single ignition system, overspeeding and any other operational characteristics of the engine.</td><td></td><td></td><td></td><td></td></tr>
</table>

Requirement	Means of Compliance	Compliance Document	Remarks	Compliance Check
ULH.1851 – Engine component test				
a) For those systems or components that cannot be adequately substantiated by endurance testing in accordance with ULH.1847 a) to c), the applicant must conduct additional tests or analysis to establish that the systems or components are able to function reliably in all normally anticipated flight and atmospheric conditions.				
b) Temperature limits must be established for each component that requires temperature controlling provisions to ensure satisfactory functioning, reliability and durability.				
ULH.1853 – Teardown inspection				
After completing the endurance test and engine component tests as required: a) Each engine must be completely disassembled;				
b) Each component having an adjustment setting and a functioning characteristic that can be established independent of installation on the engine must retain each setting and functioning characteristic within the limits that were established and recorded at the beginning of the test.				
ULH.1855 – Engine adjustment and parts replacement.				
The applicant may service and make minor repairs to the engine during the bench tests in accordance with the service and maintenance instructions. If the frequency of the service is excessive, or the number of stops due to engine malfunction is excessive, or a major repair or replacement of parts is found necessary during the bench tests or as the result of findings from the teardown inspection, the engine or its parts may be subjected to any additional tests the BCAA finds necessary.				