MENTERI PERHUBUNGAN
REPUBLIK INDONESIA

PERATURAN MENTERI PERHUBUNGAN REPUBLIK INDONESIA

NOMOR : PM 76 TAHUN 2015

TENTANG

PERUBAHAN ATAS PERATURAN MENTERI PERHUBUNGAN NOMOR KM 27 TAHUN 2009 TENTANG PERATURAN KESELAMATAN PENERBANGAN SIPIL BAGIAN 33 AMANDEMEN 1 (*CIVIL AVIATION SAFETY REGULATIONS PART 33 AMENDMENT 1*) TENTANG STANDAR KELAIKUDARAAN UNTUK MESIN PESAWAT TERBANG (*AIRWORTHINESS STANDARDS : AIRCRAFT ENGINES*)

DENGAN RAHMAT TUHAN YANG MAHA ESA

MENTERI PERHUBUNGAN,

Menimbang :

a. bahwa dalam Pasal 13 dan 15 Undang Undang Nomor 1 Tahun 2009 tentang Penerbangan telah mengatur rancang bangun pesawat udara, mesin pesawat udara dan baling-baling pesawat terbang harus mendapat surat persetujuan setelah dilakukan pemeriksaan dan pengujian sesuai dengan standar kelaikudaraan;

b. bahwa untuk meningkatkan standar kelaikudaraan, memfasilitasi regulasi yang berhubungan dengan perkembangan teknologi, dan menjamin kesiapan pelaksanaan serta menyediakan regulasi yang memadai, perlu dilakukan perubahan mengenai standar kelaikudaraan untuk mesin pesawat terbang;

c. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a dan b, perlu menetapkan Perubahan Atas Peraturan Menteri Perhubungan Nomor KM 27 Tahun 2009 Tentang Peraturan Keselamatan Penerbangan Sipil Bagian 33 Amandemen 1 (*Civil Aviation Safety Regulations Part 33 Amendment 1*) Tentang Standar Kelaikudaraan Untuk Mesin Pesawat Terbang (*Airworthiness Standards : Aircraft Engines*), dengan Peraturan Menteri Perhubungan;

Mengingat :

1. Undang-Undang Nomor 1 Tahun 2009 tentang Penerbangan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 1, Tambahan Lembaran Negara Republik Indonesia Nomor 4956);

2. Peraturan Pemerintah Nomor 3 Tahun 2001 tentang Keamanan dan Keselamatan Penerbangan (Lembaran Negara Republik Indonesia Tahun 2001 Nomor 9, Tambahan Lembaran Negara Nomor 4075);

3. Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas dan Fungsi Kementerian Negara serta Susunan Organisasi, Tugas dan Fungsi Eselon I Kementerian Negara, sebagaimana telah diubah terakhir dengan Peraturan Presiden Nomor 135 Tahun 2014;

4. Peraturan Presiden Nomor 7 Tahun 2015 tentang Organisasi Kementerian Negara (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 8);

5. Peraturan Menteri Perhubungan Nomor KM 27 Tahun 2009 Tentang Peraturan Keselamatan Penerbangan Sipil Bagian 33 Amandemen 1 (*Civil Aviation Safety Regulations Part 33 Amendment 1*) Tentang Standar Kelaikudaraan Untuk Mesin Pesawat Terbang (*Airworthiness Standards : Aircraft Engines*);

6. Peraturan Menteri Perhubungan Nomor KM 60 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Perhubungan sebagaimana telah diubah terakhir dengan Peraturan Menteri Perhubungan Nomor PM 68 Tahun 2013;

M E M U T U S K A N:

Menetapkan : PERATURAN MENTERI PERHUBUNGAN TENTANG PERUBAHAN ATAS PERATURAN MENTERI PERHUBUNGAN NOMOR KM 27 TAHUN 2009 TENTANG PERATURAN KESELAMATAN PENERBANGAN SIPIL BAGIAN 33 AMANDEMEN 1 (*CIVIL AVIATION SAFETY REGULATIONS PART 33 AMENDMENT 1*) TENTANG STANDAR KELAIKUDARAAN UNTUK MESIN PESAWAT TERBANG (*AIRWORTHINESS STANDARDS : AIRCRAFT ENGINES*).

Pasal I

1. Beberapa ketentuan dalam Lampiran Peraturan Menteri Perhubungan Nomor KM 27 Tahun 2009 Tentang Peraturan Keselamatan Penerbangan Sipil Bagian 33 Amandemen 1 (*Civil Aviation Safety Regulations Part 33 Amendment 1*) Tentang Standar Kelaikudaraan Untuk Mesin Pesawat Terbang (*Airworthiness Standards : Aircraft Engines*), diubah sebagai berikut:

   a. Ketentuan Sub Bagian A butir 33.0 diubah sehingga berbunyi sebagai berikut :

      This Civil Aviation Safety Regulation (CASR) Part 33 sets the implementing rules for Airworthiness Standards Aircraft Engines as required by Aviation Act Number 1, 2009 Chapter VI Aircraft Design and Production.

b. Ketentuan Sub Bagian A butir 33.1 huruf (b) sehingga butir 33.1 berbunyi sebagai berikut :

33.1 Applicability

(a) This part prescribes airworthiness standards for the issue of type certificates and changes to those certificates, for aircraft engines.

(b) Each person who applies under CASR part 21 for such a certificate or change must show compliance with the applicable requirements of this part and the applicable requirements of CASR Part 34.

c. Ketentuan Sub Bagian A butir 33.5 huruf (a) ditambah angka (4), (5), (6), (7) dan (8), dan huruf (b) ditambah angka (4) dan (5) sehingga butir 33.5 secara keseluruhan berbunyi sebagai berikut:

33.5 Instruction Manual for Installing and Operating the Engine

Each applicant must prepare and make available to the Director General prior to the issuance of the type certificate, and to the owner at the time of delivery of the engine, approved instructions for installing and operating the engine. The instructions must include at least the following:

(a) Installation instructions.

(1) The location of engine mounting attachments, the method of attaching the engine to the aircraft, and the maximum allowable load for the mounting attachments and related structure.

(2) The location and description of engine connections to be attached to accessories, pipes, wires, cables, ducts, and cowling.

(3) An outline drawing of the engine including overall dimensions.

(4) A definition of the physical and functional interfaces with the aircraft and aircraft equipment, including the propeller when applicable.

(5) Where an engine system relies on components that are not part of the engine type design, the interface conditions and reliability requirements for those components

(6) *upon which engine type certification is based must be specified in the engine installation instructions directly or by reference to appropriate documentation.*

(7) *A list of the instruments necessary for control of the engine, including the overall limits of accuracy and transient response required of such instruments for control of the operation of*

(8) *the engine, must also be stated so that the suitability of the instruments as installed may be assessed.*

(b) *Operation instructions.*

(1) *The operating limitations established by the DGCA.*

(2) *The power or thrust ratings and procedures for correcting for nonstandard atmosphere.*

(3) *The recommended procedures, under normal and extreme ambient conditions for –*
(i) Starting;
(ii) Operating on the ground; and
(iii) Operating during flight.

(4) *For rotorcraft engines having one or more OEI ratings, applicants must provide data on engine performance characteristics and variability to enable the aircraft manufacturer to establish aircraft power assurance procedures.*

(5) *A description of the primary and all alternate modes, and any back-up system, together with any associated limitations, of the engine control system and its interface with the aircraft systems, including the propeller when applicable.*

d. Ketentuan Sub Bagian A butir 33.7 huruf (c) diubah dan ditambah huruf (d) sehingga butir 33.7 secara keseluruhan berbunyi sebagai berikut:

33.7 *Engine Ratings and Operating Limitations*

(a) *Engine ratings and operating limitations are established by the Director General and included in the engine certificate data sheet specified in CASR part 21.41 of this chapter, including ratings and limitations based on the operating conditions and information specified in this section, as applicable, and any other information found necessary for safe operation of the engine.*

(b) *For reciprocating engines, ratings and operating limitations are established relating to the following:*

(1) Horsepower or torque, r.p.m, manifold pressure, and time at critical pressure altitude and sea level pressure altitude for -

(i) *Rated maximum continuous power (relating to unsupercharged operation or to operation in each supercharger mode as applicable); and*

(ii) *Rated takeoff power (relating to unsupercharged operation or to operation in each supercharger mode as applicable).*

(2) Fuel grade or specification.

(3) Oil grade or specification.

(4) Temperature of the -

(i) Cylinder;

(ii) Oil at the oil inlet; and

(iii) Turbosupercharger turbine wheel inlet gas.

(5) Pressure of -

(i) Fuel at the fuel inlet; and CASR 33, Amdt.13

(ii) Oil at the main oil gallery.

(6) Accessory drive torque and overhang moment.

(7) Component life.

(8) Turbosupercharger turbine wheel r.p.m.

(c) *For turbine engines, ratings and operating limitations are established relating to the following:*

(1) Horsepower, torque, or thrust, r.p.m., gas temperature, and time for—

(i) Rated maximum continuous power or thrust (augmented);

(ii) Rated maximum continuous power or thrust (unaugmented);

(iii) Rated takeoff power or thrust (augmented);

(iv) Rated takeoff power or thrust (unaugmented);

(v) Rated 30-minute OEI power;

(vi) Rated 2½ -minute OEI power;

(vii) Rated continuous OEI power; and

(viii) Rated 2-minute OEI Power;

(ix) Rated 30-second OEI power; and

(x) Auxiliary power unit (APU) mode of operation.

(2) *Fuel designation or specification.*
(3) *Oil grade or specification.*
(4) *Hydraulic fluid specification.*
(5) *Temperature of—*
  (i) Oil at a location specified by the applicant;
  (ii) Induction air at the inlet face of a supersonic engine, including steady state operation and transient over-temperature and time allowed;
  (iii) Hydraulic fluid of a supersonic engine;
  (iv) Fuel at a location specified by the applicant; and
  (v) External surfaces of the engine, if specified by the applicant.

(6) *Pressure of—*
  (i) Fuel at the fuel inlet;
  (ii) Oil at a location specified by the applicant;
  (iii) Induction air at the inlet face of a supersonic engine, including steady state operation and transient overpressure and time allowed; and
  (iv) Hydraulic fluid.

(7) *Accessory drive torque and overhang moment.*
(8) *Component life.*
(9) *Fuel filtration.*
(10) *Oil filtration.*
(11) *Bleed air.*
(12) *The number of start-stop stress cycles approved for each rotor disc and spacer.*
(13) *Inlet air distortion at the engine inlet.*
(14) *Transient rotor shaft overspeed r.p.m., and number of overspeed occurrences.*
(15) *Transient gas overtemperature, and number of overtemperature occurrences.*
(16) *Transient engine overtorque, and number of overtorque occurrences.*
(17) *Maximum engine overtorque for turbopropeller and turboshaft engines incorporating free power turbines.*

(d) In determining the engine performance and operating limitations, the overall limits of accuracy of the engine control system and of the necessary instrumentation as defined in Sec. 33.5(a)(6) must be taken into account.

e. Ketentuan Sub Bagian B butir 33.17 diubah sehingga berbunyi sebagai berikut:

33.17 Fire Prevention

(a) *The design and construction of the engine and the materials used must minimize the probability of the occurrence and spread of fire during normal operation and failure conditions, and must minimize the effect of such a fire. In addition, the design and construction of turbine engines must minimize the probability of the occurrence of an internal fire that could result in structural failure or other hazardous effects.*

(b) *Except as provided in paragraph (c) of this section, each external line, fitting, and other component, which contains or conveys flammable fluid during normal engine operation, must be fire resistant or fireproof, as determined by DGCA. Components must be shielded or located to safeguard against the ignition of leaking flammable fluid.*

(c) *A tank, which contains flammable fluids and any associated shut-off means and supports, which are part of and attached to the engine, must be fireproof either by construction or by protection unless damage by fire will not cause leakage or spillage of a hazardous quantity of flammable fluid. For a reciprocating engine having an integral oil sump of less than 23.7 liters capacity, the oil sump need not be fireproof or enclosed by a fireproof shield.*

(d) *An engine component designed, constructed, and installed to act as a firewall must be:*
   (1) Fireproof;
   (2) Constructed so that no hazardous quantity of air, fluid or flame can pass around or through the firewall; and,
   (3) Protected against corrosion

(e) *In addition to the requirements of paragraphs (a) and (b) of this section, engine control system components that are located in a designated fire zone must be fire resistant or fireproof, as determined by the DGCA.*

(f) *Unintentional accumulation of hazardous quantities of flammable fluid within the engine must be prevented by draining and venting.*

(g) *Any components, modules, or equipment, which are susceptible to or are potential sources of static discharges or electrical fault currents must be designed and constructed to be properly grounded to the engine reference, to minimize the risk of ignition in external areas where flammable fluids or vapors could be present.*

f. Ketentuan Sub Bagian B butir 33.19 huruf (b) diubah sehingga butir 33.19 berbunyi sebagai berikut:

33.19 Durability

(a) Engine design and construction must minimize the development of an unsafe condition of the engine between overhaul periods. The design of the compressor and turbine rotor cases must provide for the containment of damage from rotor blade failure. Energy levels and trajectories of fragments resulting from rotor blade failure that lie outside the compressor and turbine rotor cases must be defined.

(b) Each component of the propeller blade pitch control system which is a part of the engine type design must meet the requirements of Section 35.21, 35.23, 35.42 and 35.43 of CASR part 35.

g. Ketentuan Sub Bagian B butir 33.27 diubah sehingga berbunyi sebagai berikut:

33.27 Turbine, Compressor, Fan, and Turbosupercharger Rotors

(a) For each fan, compressor, turbine, and turbosupercharger rotor, the applicant must establish by test, analysis, or a combination of both, that each rotor will not burst when operated in the engine for 5 minutes at whichever of the conditions defined in paragraph (b) of this section is the most critical with respect to the integrity of such a rotor.

(1) Test rotors used to demonstrate compliance with this section that do not have the most adverse combination of material properties and dimensional tolerances must be tested at conditions which have been adjusted to ensure the minimum specification rotor possesses the required overspeed capability. This can be accomplished by increasing test speed, temperature, and/or loads.

(2) When an engine test is being used to demonstrate compliance with the overspeed conditions listed in paragraph (b)(3) or (b)(4) of this section and the failure of a component or system is sudden and transient, it may not be possible to operate the engine for 5 minutes after the failure. Under these circumstances, the actual overspeed duration is acceptable if the required maximum overspeed is achieved.

(b) When determining the maximum overspeed condition applicable to each rotor in order to comply with paragraphs (a) and (c) of this section, the applicant must evaluate the following rotor speeds taking into consideration the part's operating temperatures and temperature gradients throughout the engine's operating envelope:

(1) 120 percent of the maximum permissible rotor speed associated with any of the engine ratings except one-engine-inoperative (OEI) ratings of less than 2½ minutes.

(2) 115 percent of the maximum permissible rotor speed associated with any OEI ratings of less than 2½ minutes.

(3) 105 percent of the highest rotor speed that would result from either:

(i) The failure of the component or system which, in a representative installation of the engine, is the most critical with respect to overspeed when operating at any rating condition except OEI ratings of less than 2½ minutes, or

(ii) The failure of any component or system in a representative installation of the engine, in combination with any other failure of a component or system that would not normally be detected during a routine pre-flight check or during normal flight operation, that is the most critical with respect to overspeed, except as provided by paragraph (c) of this section, when operating at any rating condition except OEI ratings of less than 2½ minutes.

(4) 100 percent of the highest rotor speed that would result from the failure of the component or system which, in a representative installation of the engine, is the most critical with respect to overspeed when operating at any OEI rating of less than 2 1/2 minutes.

(c) The highest overspeed that results from a complete loss of load on a turbine rotor, except as provided by paragraph (f) of this section, must be included in the overspeed conditions considered by paragraphs (b)(3)(i), (b)(3)(ii), and (b)(4) of this section, regardless of whether that overspeed results from a failure within the engine or external to the engine. The overspeed resulting from any other single failure must be considered when selecting the most limiting

overspeed conditions applicable to each rotor. Overspeeds resulting from combinations of failures must also be considered unless the applicant can show that the probability of occurrence is not greater than extremely remote (probability range of 10−7 to 10−9 per engine flight hour).

(d) In addition, the applicant must demonstrate that each fan, compressor, turbine, and turbosupercharger rotor complies with paragraphs (d)(1) and (d)(2) of this section for the maximum overspeed achieved when subjected to the conditions specified in paragraphs (b)(3) and (b)(4) of this section. The applicant must use the approach in paragraph (a) of this section which specifies the required test conditions.

(1) Rotor Growth must not cause the engine to:

(i) Catch fire;

(ii) Release high-energy debris through the engine casing or result in a hazardous failure of the engine casing;

(iii) Generate loads greater than those ultimate loads specified in Sec. 33.23(a); or

(iv) Lose the capability of being shut down.

(2) Following an overspeed event and after continued operation, the rotor may not exhibit conditions such as cracking or distortion which preclude continued safe operation.

(e) The design and functioning of engine control systems, instruments, and other methods not covered under Sec. 33.28 must ensure that the engine operating limitations that affect turbine, compressor, fan, and turbosupercharger rotor structural integrity will not be exceeded in service.

(f) Failure of a shaft section may be excluded from consideration in determining the highest overspeed that would result from a complete loss of load on a turbine rotor if the applicant:

(1) Identifies the shaft as an engine life-limited-part and complies with Sec. 33.70.

(2) Uses material and design features that are well understood and that can be analyzed by well-established and validated stress analysis techniques.

(3) Determines, based on an assessment of the environment surrounding the shaft section, that environmental influences are unlikely to cause a shaft failure. This assessment must

include complexity of design, corrosion, wear, vibration, fire, contact with adjacent components or structure, overheating, and secondary effects from other failures or combination of failures.

(4) Identifies and declares, in accordance with Sec. 33.5, any assumptions regarding the engine installation in making the assessment described above in paragraph (f)(3) of this section.

(5) Assesses, and considers as appropriate, experience with shaft sections of similar design.

(6) Does not exclude the entire shaft.

(g) If analysis is used to meet the overspeed requirements, then the analytical tool must be validated to prior overspeed test results of a similar rotor. The tool must be validated for each material. The rotor being certified must not exceed the boundaries of the rotors being used to validate the analytical tool in terms of geometric shape, operating stress, and temperature. Validation includes the ability to accurately predict rotor dimensional growth and the burst speed. The predictions must also show that the rotor being certified does not have lower burst and growth margins than rotors used to validate the tool.

h. Ketentuan Sub Bagian B butir 33.28 diubah sehingga berbunyi sebagai berikut:

33.28 Electrical and Electronic Engine Control Systems

Each control system which relies on electrical and electronic means for normal operation must:

(a) Applicability. These requirements are applicable to any system or device that is part of engine type design, that controls, limits, or monitors engine operation, and is necessary for the continued airworthiness of the engine.

(b) Validation —

(1) Functional aspects. The applicant must substantiate by tests, analysis, or a combination thereof, that the engine control system performs the intended functions in a manner which:

(i) *Enables selected values of relevant control parameters to be maintained and the engine kept within the approved operating limits over changing atmospheric conditions in the declared flight envelope;*

(ii) *Complies with the operability requirements of Sec. 33.51, 33.65 and 33.73, as appropriate, under all likely system inputs and allowable engine power or thrust demands, unless it can be demonstrated that failure of the control function results in a non-dispatchable condition in the intended application;*

(iii) *Allows modulation of engine power or thrust with adequate sensitivity over the declared range of engine operating conditions; and*

(iv) *Does not create unacceptable power or thrust oscillations.*

(2) Environmental limits. The applicant must demonstrate, when complying with Sec. 33.53 or 33.91, that the engine control system functionality will not be adversely affected by declared environmental conditions, including electromagnetic interference (EMI), High Intensity Radiated Fields (HIRF), and lightning. The limits to which the system has been qualified must be documented in the engine installation instructions.

(c) Control transitions.

(1) The applicant must demonstrate that, when fault or failure results in a change from one control mode to another, from one channel to another, or from the primary system to the back-up system, the change occurs so that:

(i) The engine does not exceed any of its operating limitations;

(ii) The engine does not surge, stall, or experience unacceptable thrust or power changes or oscillations or other unacceptable characteristics; and

(iii) There is a means to alert the flight crew if the crew is required to initiate, respond to, or be aware of the control mode change. The means to alert the crew must be described in the engine installation instructions, and the crew action must be described in the engine operating instructions;

(2) *The magnitude of any change in thrust or power and the associated transition time must be identified and described in the engine installation instructions and the engine operating instructions.*

(d) *Engine control system failures. The applicant must design and construct the engine control system so that:*

(1) *The rate for Loss of Thrust (or Power) Control (LOTC/LOPC) events, consistent with the safety objective associated with the intended application can be achieved;*

(2) *In the full-up configuration, the system is single fault tolerant, as determined by the DGCA, for electrical or electronic failures with respect to LOTC/LOPC events;*

(3) *Single failures of engine control system components do not result in a hazardous engine effect; and*

(4) *Foreseeable failures or malfunctions leading to local events in the intended aircraft installation, such as fire, overheat, or failures leading to damage to engine control system components, do not result in a hazardous engine effect due to engine control system failures or malfunctions.*

(e) *System safety assessment. When complying with this section and Sec. 33.75, the applicant must complete a System Safety Assessment for the engine control system. This assessment must identify faults or failures that result in a change in thrust or power, transmission of erroneous data, or an effect on engine operability producing a surge or stall together with the predicted frequency of occurrence of these faults or failures.*

(f) *Protection systems.*

(1) *The design and functioning of engine control devices and systems, together with engine instruments and operating and maintenance instructions, must provide reasonable assurance that those engine operating limitations that affect turbine, compressor, fan, and turbosupercharger rotor structural integrity will not be exceeded in service.*

(2) *When electronic overspeed protection systems are provided, the design must include a means for testing, at least once per engine start/stop cycle, to establish the availability of*

the protection function. The means must be such that a complete test of the system can be achieved in the minimum number of cycles. If the test is not fully automatic, the requirement for a manual test must be contained in the engine instructions for operation.

(3) When overspeed protection is provided through hydromechanical or mechanical means, the applicant must demonstrate by test or other acceptable means that the overspeed function remains available between inspection and maintenance periods.

(g) Software. The applicant must design, implement, and verify all associated software to minimize the existence of errors by using a method, accepted approved by the DGCA, consistent with the criticality of the performed functions.

(h) Aircraft-supplied data. Single failures leading to loss, interruption or corruption of aircraft-supplied data (other than thrust or power command signals from the aircraft), or data shared between engines must:

(1) Not result in a hazardous engine effect for any engine; and

(2) Be detected and accommodated. The accommodation strategy must not result in an unacceptable change in thrust or power or an unacceptable change in engine operating and starting characteristics. The applicant must evaluate and document in the engine installation instructions the effects of these failures on engine power or thrust, engine operability, and starting characteristics throughout the flight envelope.

(i) Aircraft-supplied electrical power.

(1) The applicant must design the engine control system so that the loss, malfunction, or interruption of electrical power supplied from the aircraft to the engine control system will not result in any of the following:

(i) A hazardous engine effect, or

(ii) The unacceptable transmission of erroneous data.

(2) When an engine dedicated power source is required for compliance with paragraph (i)(1) of this section, its capacity should provide sufficient margin to account for engine operation below idle where the engine control

system is designed and expected to recover engine operation automatically.

(3) The applicant must identify and declare the need for, and the characteristics of, any electrical power supplied from the aircraft to the engine control system for starting and operating the engine, including transient and steady state voltage limits, in the engine instructions for installation.

(4) Low voltage transients outside the power supply voltage limitations declared in paragraph (i)(3) of this section must meet the requirements of paragraph (i)(1) of this section. The engine control system must be capable of resuming normal operation when aircraft-supplied power returns to within the declared limits.

(j) Air pressure signal. The applicant must consider the effects of blockage or leakage of the signal lines on the engine control system as part of the System Safety Assessment of paragraph (e) of this section and must adopt the appropriate design precautions.

(k) Automatic availability and control of engine power for 30-second OEI rating. Rotorcraft engines having a 30-second OEI rating must incorporate a means, or a provision for a means, for automatic availability and automatic control of the 30-second OEI power within its operating limitations.

(l) Engine shut down means. Means must be provided for shutting down the engine rapidly.

(m) Programmable logic devices. The development of programmable logic devices using digital logic or other complex design technologies must provide a level of assurance for the encoded logic commensurate with the hazard associated with the failure or malfunction of the systems in which the devices are located. The applicant must provide evidence that the development of these devices has been done by using a method, accepted by the DGCA, that is consistent with the criticality of the performed function.

i. Ketentuan Sub Bagian B butir 33.29 diubah sehingga berbunyi sebagai berikut:

33.29 Instrument Connection

(a) Unless it is constructed to prevent its connection to an incorrect instrument, each connection provided for powerplant instruments required by aircraft

airworthiness regulations or necessary to insure operation of the engine in compliance with any engine limitation must be marked to identify it with its corresponding instrument.

(b) A connection must be provided on each turbojet engine for an indicator system to indicate rotor system unbalance.

(c) Each rotorcraft turbine engine having a 30-second OEI rating and a 2-minute OEI rating must have a provision for a means to:

(1) Alert the pilot when the engine is at the 30-second OEI and the 2-minute OEI power levels, when the event begins, and when the time interval expires;

(2) Automatically record each usage and duration of power at the 30-second OEI and 2-minute OEI levels;

(3) Alert maintenance personnel in a positive manner that the engine has been operated at either or both of the 30-second and 2-minute OEI power levels, and permit retrieval of the recorded data; and

(4) Enable routine verification of the proper operation of the above means.

(d) The means, or the provision for a means, of paragraphs (c)(2) and (c)(3) of this section must not be capable of being reset in flight.

(e) The applicant must make provision for the installation of instrumentation necessary to ensure operation in compliance with engine operating limitations. Where, in presenting the safety analysis, or complying with any other requirement, dependence is placed on instrumentation that is not otherwise mandatory in the assumed aircraft installation, then the applicant must specify this instrumentation in the engine installation instructions and declare it mandatory in the engine approval documentation.

(f) As part of the System Safety Assessment of § 33.28(e), the applicant must assess the possibility and subsequent effect of incorrect fit of instruments, sensors, or connectors. Where necessary, the applicant must take design precautions to prevent incorrect configuration of the system.

(g) The sensors, together with associated wiring and signal conditioning, must be segregated, electrically and physically, to the extent necessary to ensure that the probability of a fault propagating from instrumentation and monitoring functions to control functions, or vice versa, is consistent with the failure effect of the fault.

(h) The applicant must provide instrumentation enabling the flight crew to monitor the functioning of the turbine cooling system unless appropriate inspections are published in the relevant manuals and evidence shows that:

(1) Other existing instrumentation provides adequate warning of failure or impending failure;

(2) Failure of the cooling system would not lead to hazardous engine effects before detection; or

(3) The probability of failure of the cooling system is extremely remote.

j. Ketentuan Sub Bagian B butir 33.53 diubah sehingga berbunyi sebagai berikut:

33.53 Engine system and component tests.

(a) For those systems and components that cannot be adequately substantiated in accordance with endurance testing of Sec. 33.49, the applicant must conduct additional tests to demonstrate that systems or components are able to perform the intended functions in all declared environmental and operating conditions.

(b) Temperature limits must be established for each component that requires temperature controlling provisions in the aircraft installation to assure satisfactory functioning, reliability, and durability.

k. Menambah ketentuan Sub Bagian E butir 33.64 di antara butir 33.63 dan butir 33.65 yang berbunyi sebagai berikut:

33.64 Pressurized engine static parts.

(a) Strength. The applicant must establish by test, validated analysis, or a combination of both, that all static parts subject to significant gas or liquid pressure loads for a stabilized period of one minute will not:

(1) *Exhibit permanent distortion beyond serviceable limits or exhibit leakage that could create a hazardous condition when subjected to the greater of the following pressures:*
   (i) *1.1 times the maximum working pressure;*
   (ii) *1.33 times the normal working pressure; or*
   (iii) *35 kPa (5 p.s.i.) above the normal working pressure.*

(2) *Exhibit fracture or burst when subjected to the greater of the following pressures:*
   (i) *1.15 times the maximum possible pressure;*
   (ii) *1.5 times the maximum working pressure; or*
   (iii) *35 kPa (5 p.s.i.) above the maximum possible pressure.*

(b) *Compliance with this section must take into account:*
   (1) *The operating temperature of the part;*
   (2) *Any other significant static loads in addition to pressure loads;*
   (3) *Minimum properties representative of both the material and the processes used in the construction of the part; and*
   (4) *Any adverse geometry conditions allowed by the type design.*

l. Ketentuan Sub Bagian E butir 33.67 huruf (d) dihapus sehingga butir 33.67 berbunyi sebagai berikut:

33.67 Fuel System

(a) *With fuel supplied to the engine at the flow and pressure specified by the applicant, the engine must function properly under each operating condition required by this part. Each fuel control adjusting means that may not be manipulated while the fuel control device is mounted on the engine must be secured by a locking device and sealed, or otherwise be inaccessible. All other fuel control adjusting means must be accessible and marked to indicate the function of the adjustment unless the function is obvious.*

(b) *There must be a fuel strainer or filter between the engine fuel inlet opening and the inlet of either the fuel metering device or the engine driven positive displacement pump whichever is nearer the engine fuel inlet. In addition, the following provisions apply to each strainer or filter required by this paragraph (b):*

(1) *It must be accessible for draining and cleaning and must incorporate a screen or element that is easily removable.*

(2) *It must have a sediment trap and drain except that it need not have a drain if the strainer or filter is easily removable for drain purposes.*

(3) *It must be mounted so that its weight is not supported by the connecting lines or by the inlet or outlet connections of the strainer or filter, unless adequate strength margins under all loading conditions are provided in the lines and connections.*

(4) *It must have the type and degree of fuel filtering specified as necessary for protection of the engine fuel system against foreign particles in the fuel. The applicant must show:*
   (i) *That foreign particles passing through the specified filtering means do not impair the engine fuel system functioning; and*
   (ii) *That the fuel system is capable of sustained operation throughout its flow and pressure range with the fuel initially saturated with water at 80°F (27° C) and having 0.025 fluid ounces per gallon (0.20 milliliters per liter) of free water added and cooled to the most critical condition for icing likely to be encountered in operation. However, this requirement may be met by demonstrating the effectiveness of specified approved fuel anti-icing additives, or that the fuel system incorporates a fuel heater which maintains the fuel temperature at the fuel strainer or fuel inlet above 32° F (0° C) under the most critical conditions.*

(5) *The applicant must demonstrate that the filtering means has the capacity (with respect to engine operating limitations) to ensure that the engine will continue to operate within approved limits, with fuel contaminated to the maximum degree of particle size and density likely to be encountered in service. Operation under these conditions must be demonstrated for a period acceptable to the Director General, beginning when indication of impending filter blockage is first given by either:*
   (i) *Existing engine instrumentation; or*
   (ii) *Additional means incorporated into the engine fuel system.*

(6) *Any strainer or filter bypass must be designed and constructed so that the release of collected contaminants is minimized by appropriate location of the bypass to ensure that collected contaminants are not in the bypass flow path.*

(c) *If provided as part of the engine, the applicant must show for each fluid injection (other than fuel) system and its controls that the flow of the injected fluid is adequately controlled.*

m. Ketentuan Sub Bagian E butir 33.71 huruf (c) angka (9) diubah sehingga butir 33.71 berbunyi sebagai berikut:

33.71 Lubrication System

(a) *General. Each lubrication system must function properly in the flight attitudes and atmospheric conditions in which an aircraft is expected to operate.*

(b) *Oil strainer or filter. There must be an oil strainer or filter through which all of the engine oil flows. In addition:*

(1) *Each strainer or filter required by this paragraph that has a bypass 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.*

(2) *The type and degree of filtering necessary for protection of the engine oil system against foreign particles in the oil must be specified. The applicant must demonstrate that foreign particles passing through the specified filtering means do not impair engine oil system functioning.*

(3) *Each strainer or filter required by this paragraph must have the capacity (with respect to operating limitations established for the engine) to ensure that engine oil system functioning is not impaired with the oil contaminated to a degree (with respect to particle size and density) that is greater than that established for the engine in paragraph (b)(2) of this section.*

(4) *For each strainer or filter required by this paragraph, except the strainer or filter at the oil tank outlet, there must be means to indicate contamination before it reaches the capacity established in accordance with paragraph (b)(3) of this section.*

(5) *Any filter bypass must be designed and constructed so that the release of collected contaminants is minimized by appropriate location of the bypass to ensure that the collected contaminants are not in the bypass flow path.*

(6) *Each strainer or filter required by this paragraph that has no bypass, except the strainer or filter at an oil tank outlet or for a scavenge pump, must have provisions for connection with a warning means to warn the pilot of the occurrence of contamination of the screen before it reaches the capacity established in accordance with paragraph (b)(3) of this section.*

(7) *Each strainer or filter required by this paragraph must be accessible for draining and cleaning.*

(c) *Oil tanks.*

(1) *Each oil tank must have an expansion space of not less than 10 percent of the tank capacity.*

(2) *It must be impossible to inadvertently fill the oil tank expansion space.*

(3) *Each recessed oil tank filler connection that can retain any appreciable quantity of oil must have provision for fitting a drain.*

(4) *Each oil tank cap must provide an oiltight seal. For an applicant seeking eligibility for an engine to be installed on an airplane approved for ETOPS, the oil tank must be designed to prevent a hazardous loss of oil due to an incorrectly installed oil tank cap.*

(5) *Each oil tank filler must be marked with the word "oil."*

(6) *Each oil tank must be vented from the top part of the expansion space, with the vent so arranged that condensed water vapor that might freeze and obstruct the line cannot accumulate at any point.*

(7) There must be means to prevent entrance into the oil tank or into any oil tank outlet, of any object that might obstruct the flow of oil through the system.

(8) There must be a shutoff valve at the outlet of each oil tank, unless the external portion of the oil system (including oil tank supports) is fireproof.

(9) Each unpressurized oil tank may not leak when subjected to a maximum operating temperature and an internal pressure of 5 p.s.i., and each pressurized oil tank must meet the requirements of Sec. 33.64.

(10) Leaked or spilled oil may not accumulate between the tank and the remainder of the engine.

(11) Each oil tank must have an oil quantity indicator or provisions for one.

(12) If the propeller feathering system depends on engine oil -

(i) There must be means to trap an amount of oil in the tank if the supply
(ii) becomes depleted due to failure of any part of the lubricating system
(iii) other than the tank itself;
(iv) The amount of trapped oil must be enough to accomplish the feathering
(v) operation and must be available only to the feathering pump; and
(vi) Provision must be made to prevent sludge or other foreign matter from
(vii) affecting the safe operation of the propeller feathering system.

(d) Oil drains. A drain (or drains) must be provided to allow safe drainage of the oil system. Each drain must -

(1) Be accessible; and
(2) Have manual or automatic means for positive locking in the closed position.

(e) Oil radiators. Each oil radiator must withstand, without failure, any vibration, inertia, and oil pressure load to which it is subjected during the block tests.

n. Menambah ketentuan Sub Bagian F butir 33.84 di antara butir 33.83 dan butir 33.85 yang berbunyi sebagai berikut:

33.84 Engine overtorque test

(a) If approval of a maximum engine overtorque is sought for an engine incorporating a free power turbine, compliance with this section must be demonstrated by testing.

(1) The test may be run as part of the endurance test requirement of Sec. 33.87. Alternatively, tests may be performed on a complete engine or equivalent testing on individual groups of components.

(2) Upon conclusion of tests conducted to show compliance with this section, each engine part or individual groups of components must meet the requirements of Sec. 33.93(a)(1) and (a)(2).

(b) The test conditions must be as follows:

(1) A total of 15 minutes run at the maximum engine overtorque to be approved. This may be done in separate runs, each being of at least 2 1/2 minutes duration.

(2) A power turbine rotational speed equal to the highest speed at which the maximum overtorque can occur in service. The test speed may not be more than the limit speed of take-off or OEI ratings longer than 2 minutes.

(3) For engines incorporating a reduction gearbox, a gearbox oil temperature equal to the maximum temperature when the maximum engine overtorque could occur in service; and for all other engines, an oil temperature within the normal operating range.

(4) A turbine entry gas temperature equal to the maximum steady state temperature approved for use during periods longer than 20 seconds when operating at conditions not associated with 30-second or 2 minutes OEI ratings. The requirement to run the test at the maximum approved steady state temperature may be waived by the DGCA if the applicant can demonstrate that other testing provides substantiation of the temperature effects when considered in combination with the other parameters identified in paragraphs (b)(1), (b)(2) and (b)(3) of this section.

o. Ketentuan Sub Bagian F butir 33.87 diubah sehingga berbunyi sebagai berikut:

33.87 Endurance Test

(a) General. Each engine must be subjected to an endurance test that includes a total of at least 150 hours of operation and, depending upon the type and contemplated use of the engine, consists of one of the series of runs specified in paragraphs (b) through (g) of this section, as applicable. For engines tested under paragraphs (b), (c), (d), (e) or (g) of this section, the prescribed 6-hour test sequence must be conducted 25 times to complete the required 150 hours of operation. Engines for which the 30-second OEI and 2-minute OEI ratings are desired must be further tested under paragraph (f) of this section. The following test requirements apply:

(1) The runs must be made in the order found appropriate by the Director General for the particular engine being tested.

(2) Any automatic engine control that is part of the engine must control the engine during the endurance test except for operations where automatic control is normally overridden by manual control or where manual control is otherwise specified for a particular test run.

(3) Except as provided in paragraph (a)(5) of this section, power or thrust, gas temperature, rotor shaft rotational speed, and, if limited, temperature of external surfaces of the engine must be at least 100 percent of the value associated with the particular engine operation being tested. More than one test may be run if all parameters cannot be held at the 100 percent level simultaneously.

(4) The runs must be made using fuel, lubricants and hydraulic fluid which conform to the specifications specified in complying with Sec.33.7(c).

(5) Maximum air bleed for engine and aircraft services must be used during at least one-fifth of the runs, except for the test required under paragraph (f) of this section, provided the validity of the test is not compromised. However, for these runs, the power or thrust or the rotor shaft rotational speed may be less than 100 percent of the value associated with the particular operation being tested if the DGCA finds that the validity of the endurance test is not compromised.

(6) *Each accessory drive and mounting attachment must be loaded in accordance with paragraphs (a)(6)(i) and (ii) of this section, except as permitted by paragraph (a)(6)(iii) of this section for the test required under paragraph (f) of this section.*

(i) The load imposed by each accessory used only for aircraft service must be the limit load specified by the applicant for the engine drive and attachment point during rated maximum continuous power or thrust and higher output.

(ii) The endurance test of any accessory drive and mounting attachment under load may be accomplished on a separate rig if the validity of the test is confirmed by an approved analysis.

(iii) The applicant is not required to load the accessory drives and mounting attachments when running the tests under paragraphs (f)(1) through (f)(8) of this section if the applicant can substantiate that there is no significant effect on the durability of any accessory drive or engine component. However, the applicant must add the equivalent engine output power extraction from the power turbine rotor assembly to the engine shaft output.

(7) *During the runs at any rated power or thrust the gas temperature and the oil inlet temperature must be maintained at the limiting temperature except where the test periods are not longer than 5 minutes and do not allow stabilization. At least one run must be made with fuel, oil, and hydraulic fluid at the minimum pressure limit and at least one run must be made with fuel, oil, and hydraulic fluid at the maximum pressure limit with fluid temperature reduced as necessary to allow maximum pressure to be attained.*

(8) *If the number of occurrences of either transient rotor shaft overspeed, transient gas overtemperature or transient engine overtorque is limited, that number of the accelerations required by paragraphs (b) through (g) of this section must be made at the limiting overspeed, overtemperature or overtorque. If the number of occurrences is not limited, half the required accelerations must be made at the limiting overspeed, overtemperature or overtorque.*

(9) *For each engine type certificated for use on supersonic aircraft the following additional test requirements apply:*

(i) To change the thrust setting, the power control lever must be moved from the initial position to the final position in not more than one second except for movements into the fuel burning thrust augmentor augmentation position if additional time to confirm ignition is necessary. During the runs at any rated augmented thrust the hydraulic fluid temperature must be maintained at the limiting temperature except where the test periods are not long enough to allow stabilization.

(ii) During the simulated supersonic runs the fuel temperature and induction air temperature may not be less than the limiting temperature.

(iii) The endurance test must be conducted with the fuel burning thrust augmentor installed, with the primary and secondary exhaust nozzles installed, and with the variable area exhaust nozzles operated during each run according to the methods specified in complying with Sec.33.5(b).

(iv) During the runs at thrust settings for maximum continuous thrust and percentages thereof, the engine must be operated with the inlet air distortion at the limit for those thrust settings.

(b) Engines other than certain rotorcraft engines. For each engine except a rotorcraft engine for which a rating is desired under paragraph (c), (d), or (e) of this section, the applicant must conduct the following runs:

(1) Takeoff and idling. One hour of alternate five-minute periods at rated takeoff power or thrust and at idling power or thrust. The developed powers or thrusts at takeoff and idling conditions and their corresponding rotor speed and gas temperature conditions must be as established by the power control in accordance with the schedule established by the applicant. The applicant may, during any one period, manually control the rotor speed, power, or thrust while taking data to check performance. For engines with augmented takeoff power ratings that involve increases in turbine inlet temperature, rotor speed, or shaft power, this period of running at takeoff must be at the

augmented rating. For engines with augmented takeoff power ratings that do not materially increase operating severity, the amount of running conducted at the augmented rating is determined by the Director General. In changing the power setting after each period, the power-control lever must be moved in the manner prescribed in paragraph (b)(5) of this section.

(2) Rated maximum continuous and takeoff power and thrust. Thirty minutes at -

(i) Rated maximum continuous power and thrust during fifteen of the twenty-five 6 hour endurance test cycles; and

(ii) Rated takeoff power and thrust during ten of the twenty-five 6 hour endurance test cycles.

(3) Rated maximum continuous power and thrust. One hour and 30 minutes at rated maximum continuous power and thrust.

(4) Incremental cruise power and thrust. Two hours and 30 minutes at the successive power lever positions corresponding to at least 15 approximately equal speed and time increments between maximum continuous engine rotational speed and ground or minimum idle rotational speed. For engines operating at constant speed, the thrust and power may be varied in place of speed. If there is significant peak vibration anywhere between ground idle and maximum continuous conditions, the number of increments chosen may be changed to increase the amount of running made while subject to the peak vibrations up to not more than 50 percent of the total time spent in incremental running.

(5) Acceleration and deceleration runs. 30 minutes of accelerations and decelerations, consisting of six cycles from idling power and thrust to rated takeoff power and thrust and maintained at the takeoff power lever position for 30 seconds and at the idling power lever position for approximately four and one-half minutes. In complying with this paragraph, the power control lever must be moved from one extreme position to the other in not more than one second, except that, if different regimes of control operations are incorporated necessitating scheduling of the power control lever motion in going from one extreme position to the other, a longer period of time is acceptable, but not more than two seconds.

two hour engine shutdown. There must be at least 10 false engine starts, pausing for the applicant's specified minimum fuel drainage time, before attempting a normal start. There must be at least 10 normal restarts with not longer than 15 minutes since engine shutdown. The remaining starts may be made after completing the 150 hours of endurance testing.

(c) *Rotorcraft engines for which a 30 minute OEI power rating is desired. For each rotorcraft engine for which a 30 minute OEI power rating is desired, the applicant must conduct the following series of tests:*

(1) *Takeoff and idling. One hour of alternate 5 minute periods at rated takeoff power and at idling power. The developed powers at takeoff and idling conditions and their corresponding rotor speed and gas temperature conditions must be as established by the power control in accordance with the schedule established by the manufacturer. During any one period, the rotor speed and power may be controlled manually while taking data to check performance. For engines with augmented takeoff power ratings that involve increases in turbine inlet temperature, rotor speed, or shaft power, this period of running at rated takeoff power must be at the augmented power rating. In changing the power setting after each period, the power control lever must be moved in the manner prescribed in paragraph (c)(6) of this section.*

(2) *Rated maximum continuous and takeoff power . Thirty minutes at—*

(i) *Rated maximum continuous power during fifteen of the twenty-five 6-hour endurance test cycles; and*

(ii) *Rated takeoff power during ten of the twenty-five 6-hour endurance test cycles.*

(3) *Rated maximum continuous power . One hour at rated maximum continuous power.*

(4) *Rated 30-minute OEI power . Thirty minutes at rated 30-minute OEI power.*

(5) *Incremental cruise power . Two hours and 30 minutes at the successive power lever positions corresponding with not less than 15 approximately equal speed and time increments between maximum continuous engine rotational speed and ground or minimum idle rotational speed. For engines operating at constant speed,*

power may be varied in place of speed. If there are significant peak vibrations anywhere between ground idle and maximum continuous conditions, the number of increments chosen must be changed to increase the amount of running conducted while subject to peak vibrations up to not more than 50 percent of the total time spent in incremental running.

(6) Acceleration and deceleration runs. Thirty minutes of accelerations and decelerations, consisting of six cycles from idling power to rated take off power and maintained at the take off power lever position for 30 seconds and at the idling power lever position for approximately 4 1/2 minutes. In complying with this paragraph, the power control lever must be moved from one extreme position to the other in not more than one second. If, however, different regimes of control operations are incorporated that necessitate scheduling of the power control lever motion from one extreme position to the other, then a longer period of time is acceptable, but not more than two seconds.

(7) Starts. One hundred starts, of which 25 starts must be preceded by at least a two hour engine shutdown. There must be at least 10 false engine starts, pausing for the applicant's specified minimum fuel drainage time, before attempting a normal start. There must be at least 10 normal restarts with not longer than 15 minutes since engine shutdown. The remaining starts may be made after completing the 150 hours of endurance testing.

(d) Rotorcraft engines for which a continuous OEI rating is desired. For each rotorcraft engine for which a continuous OEI power rating is desired, the applicant must conduct the following series of tests:

(1) Takeoff and idling. One hour of alternate 5-minute periods at rated takeoff power and at idling power. The developed powers at takeoff and idling conditions and their corresponding rotor speed and gas temperature conditions must be as established by the power control in accordance with the schedule established by the applicant. During any one period the rotor speed and power may be controlled manually while taking data to check performance. For engines with augmented takeoff power ratings that involve increases in turbine inlet temperature, rotor speed, or shaft power, this period of running at rated takeoff power must be at the augmented power rating. In changing the power setting after each period, the power

control lever must be moved in the manner prescribed in paragraph (d)(6) of this section.

(2) Rated maximum continuous and takeoff power. Thirty minutes at -

(i) Rated maximum continuous power during fifteen of the twenty-five 6 hour endurance test cycles; and

(ii) Rated takeoff power during ten of the twenty-five 6 hour endurance test cycles.

(3) Rated continuous OEI power. One hour at rated continuous OEI power.

(4) Rated maximum continuous power. One hour at rated maximum continuous power.

(5) Incremental cruise power. Two hours at the successive power lever positions corresponding with not less than 12 approximately equal speed and time increments between maximum continuous engine rotational speed and ground or minimum idle rotational speed. For engines operating at constant speed, power may be varied in place of speed. If there are significant peak vibrations anywhere between ground idle and maximum continuous conditions, the number of increments chosen must be changed to increase the amount of running conducted while being subjected to the peak vibrations up to not more than 50 percent of the total time spent in incremental running.

(6) Acceleration and deceleration runs. Thirty minutes of accelerations and decelerations, consisting of six cycles from idling power to rated takeoff power and maintained at the takeoff power lever position for 30 seconds and at the idling power lever position for approximately 4 1/2 minutes. In complying with this paragraph, the power control lever must be moved from one extreme position to the other in not more than 1 second, except that if different regimes of control operations are incorporated necessitating scheduling of the power control lever motion in going from one extreme position to the other, a longer period of time is acceptable, but not more than 2 seconds.

(7) Starts. One hundred starts, of which 25 starts must be preceded by at least a 2 hour engine shutdown. There must be at least 10 false engine starts, pausing for the applicant's specified minimum fuel drainage time, before attempting a normal start. There must be at least 10 normal restarts with not longer than 15

minutes since engine shutdown. The remaining starts may be made after completing the 150 hours of endurance testing.

(e) Rotorcraft engines for which a 2 1/2 minute OEI power rating is desired. For each rotorcraft engine for which a 2 1/2 minute OEI power rating is desired, the applicant must conduct the following series of tests:

(1) Take off, 2½ -minute OEI, and idling. One hour of alternate 5-minute periods at rated takeoff power and at idling power except that, during the third and sixth takeoff power periods, only 2½ minutes need be conducted at rated takeoff power, and the remaining 2½ minutes must be conducted at rated 2½ -minute OEI power. The developed powers at takeoff, 2½ -minute OEI, and idling conditions and their corresponding rotor speed and gas temperature conditions must be as established by the power control in accordance with the schedule established by the applicant. The applicant may, during any one period, control manually the rotor speed and power while taking data to check performance. For engines with augmented takeoff power ratings that involve increases in turbine inlet temperature, rotor speed, or shaft power, this period of running at rated takeoff power must be at the augmented rating. In changing the power setting after or during each period, the power control lever must be moved in the manner prescribed in paragraph (b)(5), (c)(6), or (d)(6) of this section, as applicable.

(2) The tests required in paragraphs (b)(2) through (b)(6), or (c)(2) through (c)(7), or (d)(2) through (d)(7) of this section, as applicable, except that in one of the 6-hour test sequences, the last 5 minutes of the 30 minutes at takeoff power test period of paragraph (b)(2) of this section, or of the 30 minutes at 30-minute OEI power test period of paragraph (c)(4) of this section, or of the 1 hour at continuous OEI power test period of paragraph (d)(3) of this section, must be run at 2½ -minute OEI power.

(f) OEI and 2-minute OEI ratings are desired. For each rotorcraft engine for which 30-second OEI and 2-minute OEI power ratings are desired, and following completion of the tests under paragraphs (b), (c), (d), or (e) of this section, the applicant may disassemble the tested engine to the extent necessary to show compliance with the requirements of Sec. 33.93(a). The tested engine must then be reassembled using the same parts used during the test runs of

paragraphs (b), (c), (d), or (e) of this section, except those parts described as consumables in the Instructions for Continued Airworthiness. Additionally, the tests required in paragraphs (f)(1) through (f)(8) of this section must be run continuously. If a stop occurs during these tests, the interrupted sequence must be repeated unless the applicant shows that the severity of the test would not be reduced if it were continued.

The applicant must conduct the following test sequence four times, for a total time of not less than 120 minutes:

(1) Takeoff power. Three minutes at rated takeoff power.

(2) 30-second OEI power. Thirty seconds at rated 30-second OEI power.

(3) 2-minute OEI power. Two minutes at rated 2-minute OEI power.

(4) 30-minute OEI power, continuous OEI power, or maximum continuous power. Five minutes at whichever is the greatest of rated 30-minute OEI power, rated continuous OEI power, or rated maximum continuous power, except that, during the first test sequence, this period shall be 65 minutes. However, where the greatest rated power is 30-minute OEI power, that sixty-five minute period shall consist of 30 minutes at 30-minute OEI power followed by 35 minutes at whichever is the greater of continuous OEI power or maximum continuous power.

(5) 50 percent takeoff power. One minute at 50 percent takeoff power.

(6) 30-second OEI power. Thirty seconds at rated 30-second OEI power.

(7) 2-minute OEI power. Two minutes at rated 2-minute OEI power.

(8) Idle. One minute at flight idle.

p. Ketentuan Sub Bagian F butir 33.91 diubah sehingga berbunyi sebagai berikut:

33.91 Engine system and component tests.

For those systems or components that cannot be adequately substantiated in accordance with endurance testing of Sec. 33.87, the applicant must conduct additional tests to demonstrate that the systems or components are able to perform the intended functions in all declared environmental and operating conditions.

(a) For those systems that cannot be adequately substantiated by endurance testing in accordance with the provisions of Sec.33.87, additional tests must be made to establish that components are

able to function reliably in all normally anticipated flight and atmospheric conditions.

(b) Temperature limits must be established for those components that require temperature controlling provisions in the aircraft installation to assure satisfactory functioning, reliability, and durability.

(c) Each unpressurized hydraulic fluid tank may not fail or leak when subjected to a maximum operating temperature and an internal pressure of 5 p.s.i., and each pressurized hydraulic fluid tank must meet the requirements of Sec 33.64.

(d) For an engine type certificated for use in supersonic aircraft, the systems, safety devices, and external components that may fail because of operation at maximum and minimum operating temperatures must be identified and tested at maximum and minimum operating temperatures and while temperature and other operating conditions are cycled between maximum and minimum operating values.

q. Ketentuan Sub Bagian F butir 33.93 huruf (b) angka (2) diubah sehingga butir 33.93 berbunyi sebagai berikut:

33.93 Teardown Inspection

(a) After completing the endurance testing of Sec.33.87 (b), (c), (d), (e), or (g) of this part, each engine must be completely disassembled, and

(1) 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; and

(2) Each engine part must conform to the type design and be eligible for incorporation into an engine for continued operation, in accordance with information submitted in compliance with Sec.33.4.

(b) After completing the endurance testing of Sec.33.87(f), each engine must be completely disassembled, and

(1) 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; and

(2) *Each engine may exhibit deterioration in excess of that permitted in paragraph (a)(2) of this section including some engine parts or components that may be unsuitable for further use. The applicant must show by analysis and/or test, as found necessary by the Director General, that structural integrity of the engine including mounts, cases, bearing supports, shafts, and rotors, is maintained; or*

(c) *In lieu of compliance with paragraph (b) of this section, each engine for which the 30-second OEI and 2-minute OEI ratings are desired, may be subjected to the endurance testing of Sec.33.87 (b), (c), (d), or (e) of this part, and followed by the testing of Sec.33.87(f) without intervening disassembly and inspection. However, the engine must comply with paragraph (a) of this section after completing the endurance testing of Sec.33.87(f).*

Pasal II

Peraturan Menteri ini mulai berlaku sejak tanggal diundangkan.

Agar setiap orang mengetahuinya, memerintahkan pengundangan Peraturan Menteri Perhubungan ini dengan Penempatannya dalam Berita Negara Republik Indonesia.

Ditetapkan di Jakarta
Pada tanggal 15 April 2015

MENTERI PERHUBUNGAN
REPUBLIK INDONESIA,

ttd.

IGNASIUS JONAN

Diundangkan di Jakarta
pada tanggal 23 April 2015

MENTERI HUKUM DAN HAK ASASI MANUSIA
REPUBLIK INDONESIA,

ttd.

YASONNA H. LAOLY

BERITA NEGARA REPUBLIK INDONESIA TAHUN 2015 NOMOR 601

Salinan sesuai dengan aslinya

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