FEDERAL AVIATION AGENCY
FLIGHT STANDARDS SERVICE
Washington 25, D. C.

December 11, 1962

CIVIL AIR REGULATIONS DRAFT RELEASE NO. 62-52

SUBJECT: Rotorcraft Airworthiness; Normal Category - Miscellaneous Amendments; Turbine-Powered Rotorcraft

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The Flight Standards Service of the Federal Aviation Agency has under consideration amendments to Part 6 of the Civil Air Regulations relating to the use of turbine engines in rotorcraft certificated in accordance with that part. The reasons therefor are set forth in the explanatory statement of the attached proposal which was published today in the Federal Register as a notice of proposed rule making.

The Flight Standards Service desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comments will be given careful consideration.

It should be noted that comments should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, and in order to insure consideration should be received on or before February 11, 1963.

Acting Director,
Flight Standards Service

1158

NOTICE OF PROPOSED RULE MAKING

As published in the Federal Register on
December 11, 1962 (27 F.R. 12224)

FEDERAL AVIATION AGENCY

[14 CFR Part 6]

[Regulatory Docket No. 1512; Draft Release No. 62-52]

ROTORCRAFT AIRWORTHINESS; NORMAL CATEGORY

Turbine-Powered Rotorcraft

Pursuant to the authority delegated to me by the Administrator (§ 11.45, 27 F.R. 9585), notice is hereby given that there is under consideration a proposal to amend Part 6 of the Civil Air Regulations to include airworthiness requirements specifically related to turbine-powered rotorcraft.

Interested persons may participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, Room A-103, 1711 New York Avenue, NW., Washington 25, D.C. All communications received on or before February 11, 1963, will be considered by the Administrator before taking action upon the proposed rules. The proposals contained in this notice may be changed in the light of comments received. All comments submitted will be available in the Docket Section for examination by interested persons at any time.

This proposal is subject to the FAA Recodification Program. The final rule, if adopted, may be in a recodified form; however, the recodification itself will not alter the substantive contents proposed herein.

The Flight Standards Service has under consideration amendments of Part 6 of the Civil Air Regulations in recognition of the use of turbine engines in normal category rotorcraft. New requirements are necessary for turbine-powered rotorcraft to insure that the general level of safety presently intended by Part 6 is retained.

Section 6.116 requires that the range of heights and speeds be determined within which it is not possible to make a safe landing in autorotation. From this and other related requirements, a height-velocity envelope is established to inform the pilot of critical heights and speeds to be avoided during takeoff and in sustained powered flight.

In determining the heights and speeds for safe landings following power failure, it has been the general practice in the past to conduct tests only at one field elevation. The height-velocity envelope derived therefrom was established for sea level conditions and assumed to be applicable over the range of operating altitudes. Because the range of operating altitudes of the early helicopters was limited by performance, the effect of altitude on the height-velocity envelope was not considered to be significant.

Since 1956, tests have been conducted at relatively high field elevations to determine the effect of altitude on the height-velocity envelope and to permit comparison of performance at high and low field elevations. Several of these tests resulted in accidents. The characteristics of the height-velocity envelope were determined to be sufficiently different at altitude that considerable weight reduction was necessary to obtain an envelope similar to that for sea level conditions.

The current rules do not preclude altitude accountability in the determination of the limiting heights and speeds for safe landing. However, in view of the foregoing, it is proposed to clarify § 6.116 by including therein specific reference to altitudes and weights. It is also proposed that the limiting heights and speeds for safe landing following power failure be determined, and the height-velocity envelope established, at maximum certificated weight and at weights and corresponding altitudes selected by the applicant. The applicant may, therefore, establish the height-velocity envelope which represents optimum and realistic performance for the particular helicopter type. In addition, information on the height-velocity envelope, which is necessary for safe low speed operations, will be available to the pilot.

Conjoined with the aforementioned provisions, § 6.111 requires demonstration of a takeoff procedure such that, at the maximum certificated weight, a landing can be made safely at any point along the flight path in the event of an engine failure. It follows, therefore, that the takeoff flight path must be outside the height-velocity envelope established in accordance with the provisions of § 6.116. Section 6.111 requires a demonstration of the takeoff procedures only at the maximum certificated weight. It does not specifically require that the provisions for safe landing are necessary at maximum weight for all altitudes. It is proposed, therefore, to clarify § 6.111 by including a provision requiring a showing that a safe landing can be made following a power failure during takeoff, at maximum certificated weight at sea level, and for other weights and corresponding altitudes selected by the applicant, up to the maximum altitude anticipated for takeoffs and landings.

Section 6.113(b) prescribes a minimum hovering ceiling, for helicopters, of not less than 4,000 feet under standard atmospheric conditions and at maximum weight. The turbine engine is considerably more sensitive to the effects of ambient temperature in developing power than is the reciprocating engine. As a result, ambient temperatures higher than the standard atmospheric conditions will impair the hovering performance of turbine-powered helicopters to a greater degree than in the case of helicopters equipped with reciprocating engines. Therefore, establishment of the minimum hovering ceiling in compliance with § 6.113(b) does not necessarily insure an overall level of hovering performance for turbine-powered helicopters equivalent to reciprocating-engine-powered helicopters under the same temperature conditions.

From an analysis of hovering performance data of helicopters equipped with sea level reciprocating engines, it appears that reasonable equivalence in overall hovering capabilities can be obtained if turbine-powered helicopters possess hovering capability at a pressure altitude of 2,500 feet and a temperature of standard plus 40° F. Therefore, it is proposed to require the application of this criterion to turbine-powered helicopters by amending § 6.113.

The presently effective rules do not include provisions for rapid power recovery when the power control is advanced from the idle position. For helicopters, rapid transition to powered flight is necessary for recovery following autorotation approaches, where the use of improper flare techniques close to the ground might result in an accident. Rapid power response would afford protection during autorotation training and practice, and in other landing operations.

Experience has shown that reciprocating engines can be made to respond rapidly to throttle opening. In the case of at least one turbine-powered helicopter, however, the engine manifested delayed power recovery characteristics following autorotation approaches and rejected landings. It is proposed, therefore, to amend § 6.121 by introducing a new paragraph which will require demonstration of rapid power recovery characteristics following an autorotational approach.

Section 6.251(c) presently specifies arbitrary factors to be applied to the mean torque to account for power surges on reciprocating engines. These factors vary with the number of cylinders. In § 6.251(c), it is proposed to require a factor of 1.25 on the mean engine torque to account for turbine-engine power surges under accelerated flight and landing conditions.

Presently effective § 6.120(a) requires compliance with certain provisions pertaining to rotorcraft flight characteristics. Compliance is required at all normally expected operating altitudes, under all critical loading conditions, and for all speeds, power, and rotor speed conditions for which certification is sought. Section 6.120(b) requires that it shall be possible to maintain a flight condition and to make a smooth transition from one flight condition to another without requiring an exceptional degree of skill, alertness, or strength on the part of the pilot. These requirements do not take into account explicitly any effect turbine-engine operation might have on

the execution of rotorcraft control and maneuver. It is proposed, therefore, to add to § 6.401 a provision that in establishing compliance with the provisions of § 6.120, for rotorcraft incorporating turbine engines, engine combustion flameout shall not occur nor shall compressor stall or surge affect any of the prescribed maneuvers.

Section 6.427 requires a strainer to be incorporated in the fuel system between the tank and the engine. Turbine engine fuel can contain significant quantities of dissolved and entrained water which might, under low temperature conditions, precipitate from the fuel onto the strainer. It is proposed to add to § 6.427(a) provision, for turbine engines, to require automatic maintenance of fuel flow when ice-clogging of the strainer occurs, unless means are incorporated in the fuel system to prevent the accumulation of ice particles on the strainer. This requirement is the same as the requirement which has been applied to turbine transport airplanes type certificated in accordance with Part 4b of the Civil Air Regulations, and is proposed because rotorcraft type certificated in accordance with Part 6 can be exposed to a similar environment as exists for turbine transport airplanes. Rotorcraft operated in northern latitudes can be exposed to low temperature atmosphere and the fuel temperature reduced below the freezing temperature of water. This is a situation conducive to formation of ice particles in the fuel system.

Presently effective §§ 6.450 and 6.451 deal with powerplant cooling capability and require tests to show that powerplant temperature limits can be maintained. It is proposed to arrange these requirements in the same form adopted for other parts to clarify their general applicability to turbine engine installations as well as reciprocating engine installations. It is also proposed to specify test conditions which are based on the applicable rotorcraft performance requirements. Presently effective rules require cooling capability to be shown under an anticipated hot-day temperature of 100° F. but do not establish a limitation on rotorcraft operation to ambient atmospheric temperatures not exceeding 100° F. The proposed rules would permit the applicant to select the temperature up to which cooling capability is shown and would also require the selected temperature to be established as an operating limitation for safe operation.

In conjunction with proposed changes to the cooling system requirements, it is proposed to define (in § 6.1(c)(2)) as the maximum ambient atmospheric temperature, the temperature selected by the applicant as the maximum operational limit, and to add this temperature to the powerplant limitation set forth in § 6.714. In connection with this proposal, it is necessary to add a requirement for a free air temperature indicator, to permit a determination that the maximum ambient atmospheric temperature limitation is not being exceeded. Accordingly, it is proposed to add this requirement by amending § 6.603, consistent with the same requirement in other airworthiness and operation regulations.

Presently effective §§ 6.460 through 6.463 deal with the induction and exhaust systems. Although these sections have general applicability, regardless of the type of engine used, the provisions in detail cover reciprocating engines only. In consideration of the differences in configuration, operation, and characteristics between turbine and reciprocating engines, it is necessary to add similar details covering turbine engines. Accordingly, it is proposed to amend § 6.460 to incorporate the general requirement for induction systems which is presently contained in § 6.461(a). It is proposed to amend § 6.461 to make the provision of paragraph (c), covering drains, generally applicable. Foreign object ingestion can damage turbine compressors. Service experience with military type aircraft operating from undeveloped or unclean ramp and runway areas shows that compressor damage due to foreign objects is one of the major causes of premature engine change and compressor failures. Helicopters, while operating on the ground or hovering in ground effect, produce a strong recirculation pattern of airflow through the rotor disk which is capable of lifting objects from the ground and whirling them about the helicopter. Turbine engines used in helicopters type certificated in accordance with Part 6, are lightly constructed and, therefore, are especially vulnerable to compressor damage. It is proposed, therefore, to add a provision to § 6.461, for turbine engines, to require that operation of turbine engines from idle to the start of takeoff shall not result in pebble ingestion into the induction air inlet during rotorcraft operation on a defined bed of pebbles. The objective of this proposed amendment is to protect the engine against foreign object damage and thereby avoid engine failure from this cause.

It is also proposed to amend § 6.462 by adding a clarifying provision for the protection of turbine engines in icing conditions by requiring that the engine installation shall not adversely affect the capability of the engine to operate in accordance with the provisions of § 13.210(c) of Part 13 of the Civil Air Regulations. This addition more specifically covers the effect of installation on the ice protection features of the engine than the general terms of § 6.400(b).

It is proposed to amend § 6.463 by adding a provision requiring drains for turbine engine exhaust systems to prevent the accumulation of fuel after the failure of an attempted engine start.

In consideration of the difficulty of insuring that turbine engine exhaust gases are discharged clear of rotorcraft structure, and the possible ambiguity of this requirement with respect to the provisions of § 6.304, it is proposed to delete this provision of § 6.463(b)(1) and to clarify § 6.304 by adding the provision that all parts of the rotorcraft shall be protected against deterioration or loss of strength in service due to engine exhaust gases. In this connection, the similar provision of § 6.463(b)(1), requiring that exhaust gases shall be discharged clear of cowling, is contradictory to § 6.484(d) which permits impingement of exhaust gases on cowling under certain conditions. It is proposed, therefore, to delete the word "cowling" from § 6.463(b)(1).

The currently effective provisions of § 6.485 set forth requirements for flammable fluid lines and fittings in areas subject to engine fire conditions. These requirements do not take into account that turbine engines present a greater area of hot surface than reciprocating engines and that leaking flammable fluid can easily ignite upon contact with the hot surface. Experience with turbine-powered transports shows that fluid leaks do occur occasionally and can reasonably be expected to occur as well in rotorcraft type certificated in accordance with Part 6. The requirements of § 6.463(b)(2) for separation of exhaust system and fuel system components establishes a concept of fire prevention which must be retained in the case of turbine engine installations if a comparable level of safety is to be achieved. It is proposed, therefore, to amend § 6.485 by adding a provision that lines and fittings carrying flammable fluid shall be located or shielded to prevent fluid leakage on surfaces hot enough to ignite the fluid. It is also proposed to require that flammable fluid from drains and vents be discharged clear of the induction system air inlet.

Section 6.1(g)(2)(ii) defines takeoff power for turbine engines in terms of the maximum conditions of engine rotor shaft rotational speed and gas temperature approved for normal takeoff. Section 6.1(g)(4) defines gas temperature as the temperature of the gas stream obtained as indicated in the approved engine specification. Gas temperature is a limiting condition on the development of power and is limited itself by engine operating limitations. Sections 6.604 and 6.714 are deficient in not requiring a gas temperature indicator and the establishment of gas temperature limits. It is proposed, therefore, to add such requirements to these sections.

Turboshaft engines used in rotorcraft are capable of producing brake horsepower substantially in excess of the maximum rating or that which the rotor drive system is designed to absorb. Adherence to gas temperature and r.p.m. limitations will not in all cases prevent excess brake horsepower. To prevent adverse effects upon rotorcraft and engine structure, and flight characteristics, it is necessary to establish a maximum limit upon brake horsepower. This limit requires means to be provided for the pilot to permit a determination that the brake horsepower limit is not being exceeded. It is proposed, therefore, to amend § 6.714 to require that brake horsepower limitations be established for takeoff and maximum continuous operation and to amend § 6.604 by adding a requirement for means to enable the pilot to determine the brake horsepower.

In consideration of the foregoing, it is proposed to amend Part 6 of the Civil Air Regulations (14 CFR Part 6, as amended) as follows:

1. By amending § 6.1(c)(2) to read as follows:

§ 6.1 **Definitions.**

* * * * *

(c) *General design.* * * *

(2) *Maximum ambient atmospheric temperature.* The maximum ambient atmospheric temperature is the temperature selected by the applicant as the maximum operational limit.

2. By amending § 6.111 to read as follows:

§ 6.111 **Takeoff.**

(See also §§ 6.116, 6.740, 6.742, and 6.743.)

(a) The takeoff shall be demonstrated at maximum certificated weight, forward center of gravity, and using takeoff power and takeoff r.p.m.

(b) The takeoff shall be made in a manner such that a landing can be made safely at any point along the flight path in case of an engine failure and shall not require an exceptional degree of skill on the part of the pilot or exceptionally favorable conditions.

(c) Compliance with the provisions of paragraph (b) of this section shall be shown at the maximum certificated weight under sea level conditions, and at weights selected by the applicant for altitudes up to the maximum altitude anticipated for takeoffs and landings.

(d) Pertinent information concerning the takeoff weights and altitudes shall be specified in the performance information section of the Rotorcraft Flight Manual. Information concerning the takeoff procedure, including the type of takeoff surface and appropriate climb-out airspeeds, shall be specified in the operating procedures section of the Rotorcraft Flight Manual.

3. By amending § 6.113 by redesignating paragraph (c) as paragraph (d), and by amending paragraph (b) and adding a new paragraph (c) to read as follows:

§ 6.113 **Minimum operating speed performance.**

* * * * *

(b) For reciprocating-engine-powered helicopters, the hovering ceiling at maximum weight shall be not less than 4,000 feet under standard atmospheric conditions and under operating conditions prescribed in paragraph (a) of this section.

(c) For turbine-powered helicopters, the hovering ceiling at maximum weight shall be not less than 2,500 feet pressure altitude at a temperature of standard +40° F. and under operating conditions prescribed in paragraph (a) of this section.

§ 6.116 **[Amendment]**

4. By amending § 6.116 by adding in the first sentence between the words "established" and "together" the words "at the maximum certificated weight and at other weights and corresponding altitudes selected by the applicant".

§ 6.121 **[Amendment]**

5. By amending § 6.121(a) by adding a new sentence at the end thereof to read "It shall be possible to recover promptly from a balked autorotative approach to power-on flight."

§ 6.251 **[Amendment]**

6. By amending § 6.251(c) by adding a new sentence at the end thereof to read "For turbine engines, the limit torque shall be obtained by multiplying the mean torque by 1.25."

7. By amending § 6.304 to read as follows:

§ 6.304 **Protection.**

All parts of the rotorcraft shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion, engine exhaust gases, or other causes, and shall be ventilated and drained to prevent the accumulation of corrosive, flammable, and noxious fluids.

8. By amending § 6.401 by adding a new paragraph (c) to read as follows:

§ 6.401 **Engines.**

* * * * *

(c) In establishing compliance with the provisions of § 6.120, for rotorcraft incorporating turbine engines, engine combustion flameout shall not occur nor shall compressor stall or surge affect any of the prescribed maneuvers.

9. By amending § 6.427 to read as follows:

§ 6.427 **Fuel strainer or filter.**

A fuel strainer or filter shall be installed between the fuel tank outlet and the fuel metering device of the engine and shall comply with the following provisions:

(a) The strainer or filter shall incorporate a sediment trap and drain;

(b) The strainer or filter shall be installed in an accessible position;

(c) The screen or filter element shall be easily removed for cleaning;

(d) If an engine driven fuel pump is incorporated, the strainer or filter shall be located between the fuel tank and the pump; and

(e) Provision shall be made to maintain automatically the fuel flow to turbine engines when ice-clogging of the strainer or filter occurs, unless means are incorporated in the fuel system to prevent the accumulation of ice particles on the strainer or filter.

10. By amending § 6.450 to read as follows:

§ 6.450 **General.**

The powerplant cooling system shall be capable of maintaining the temperatures of powerplant components and engine fluids within the temperature limits established for such components and fluids, under all surface (ground or water) and flight operating conditions. (For cooling system instruments, see §§ 6.604 and 6.734.)

11. By amending § 6.451 to read as follows:

§ 6.451 **Cooling tests.**

(a) *General.* Compliance with the provisions of § 6.450 shall be demonstrated by test under critical surface (ground or water) and flight operating conditions. If the tests are conducted under conditions which deviate from the maximum ambient atmospheric temperature (see paragraph (b) of this section), the recorded powerplant temperatures shall be corrected in accordance with the provisions of paragraphs (c) and (d) of this section. The corrected temperatures determined in this manner shall not exceed the established limits. In the case of reciprocating engines, the fuel used during the cooling tests shall be of the minimum grade approved for the engines involved, and the mixture settings shall be those normally used in the flight stages for which the cooling tests are conducted. The test procedures shall be as outlined in § 6.452.

(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding with sea level conditions shall be established by the applicant as a limitation on the operation of the rotorcraft (see § 6.714). The temperature lapse rate shall be 3.6° F. per thousand feet of altitude above sea level until a temperature of −69.7° F. is reached above which altitude the temperature shall be constant at −69.7° F.

(c) *Correction factor.* Temperatures of all powerplant components and engine fluids, except cylinder barrels, for which temperature limits have been established shall be corrected by adding the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum component or fluid temperature recorded during the cooling test, unless a more rational correction is shown to be applicable.

(d) *Correction factor for cylinder barrel temperatures.* Cylinder barrel temperatures shall be corrected by adding 0.7 of the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test, unless a more rational correction is shown to be applicable.

12. By adding a new § 6.452 to read as follows:

§ 6.452 **Cooling test procedures.**

(a) *General.* Compliance with the provisions of § 6.450 shall be established for the takeoff, climb, minimum operating speed, and landing stages of flight which correspond with the applicable performance regulations. The cooling tests shall be conducted with the rotorcraft in the configuration and operating under the conditions which are critical relative to cooling during each stage of flight.

(b) *Temperature stabilization.* For all stages of flight, temperatures shall be stabilized under conditions from which entry is made into the stage of flight for which a test is conducted, except when the entry condition normally is not one during which component and engine fluid temperatures would stabilize. In such case, operation through the full entry condition shall be conducted prior to entry into the stage of flight for which the test is conducted in order to allow temperatures to attain their natural level at the time of entry.

During the takeoff cooling test of helicopters, the climb at takeoff power shall be preceded by a period of operation at hover during which the powerplant component and engine fluid temperatures are stabilized. A temperature shall be considered stabilized when its rate of change is less than 2° F. per minute.

(c) *Duration of test.* Cooling tests for each stage of flight shall be continued until one of the following conditions is fulfilled:

(1) Component and engine fluid temperatures stabilize;

(2) The stage of flight is completed; or

(3) An operating limitation is reached.

13. By amending § 6.460 to read as follows:

§ 6.460 General.

The engine air induction system shall supply air as required by the engine when the rotorcraft is operated under all intended operating conditions and maneuvers.

14. By amending § 6.461 to read as follows:

§ 6.461 Air induction.

The following provisions shall apply to air induction systems:

(a) Air induction systems shall open completely outside the cowling unless the emergence of backfire flames is prevented;

(b) Air induction systems shall be provided with drains which discharge fuel clear of the rotorcraft and out of the path of exhaust flames; and

(c) Operation of turbine engines from idle to the start of takeoff shall not result in pebble ingestion into the induction air inlet when the rotorcraft is operated on a pebble bed at least $1\frac{1}{2}$ inches deep, consisting of pebbles which will pass through $\frac{1}{2}$-inch mesh screening but not through $\frac{1}{8}$-inch mesh screening, and spread over an area which extends horizontally 5 feet beyond tips of the main rotor.

15. By amending § 6.462 to read as follows:

§ 6.462 Induction system protection from ice.

(a) *Reciprocating engines.*

(1) 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, compliance with the following heat rise provisions shall be demonstrated in air free of visible moisture at a temperature of 30° F. when the engine is operating at 75 percent of its maximum continuous power.

(2) Rotorcraft equipped with sea level engines employing conventional venturi carburetors shall have a preheater capable of providing a heat rise of 90° F.

(3) Rotorcraft equipped with sea level engines employing carburetors which embody features tending to reduce the possibility of ice formation shall be provided with a sheltered alternate source of air. The preheat supplied to this alternate air intake shall be not less than that provided by the engine cooling air downstream of the cylinders.

(4) Rotorcraft equipped with altitude engines employing conventional venturi carburetors shall have a preheater capable of providing a heat rise of 120° F.

(5) Rotorcraft equipped with altitude engines employing carburetors which embody features tending to reduce the possibility of ice formation shall have a preheater capable of providing a heat rise of 100° F., except that if a fluid deicing system is used the heat rise need not be greater than 40° F.

(b) *Turbine engines.* The installation of turbine engines shall not adversely affect the capability of the engines to operate in accordance with the provisions of § 13.210(c) of Part 13 of this chapter.

16. By amending § 6.463 to read as follows:

§ 6.463 Exhaust system.

The following provisions shall apply to exhaust systems:

(a) Provision shall be made for thermal expansion of manifolds and pipes;

(b) Provision shall be made to prevent local hot spots;

(c) Exhaust gases shall be discharged clear of the engine air intake, fuel system components, and drains;

(d) Exhaust pipes shall not be located adjacent to or under the carburetor or fuel system parts unless such parts are protected against leakage;

(e) Exhaust gases shall not impair pilot vision at night due to glare; and

(f) Turbine engine exhaust systems shall be provided with drains discharging clear of the rotorcraft in normal ground and flight attitudes to prevent the accumulation of fuel after the failure of an attempted engine start.

§ 6.485 [Amendment]

17. By amending § 6.485 by adding at the end of paragraph (a) a new sentence to read "Lines and fittings carrying flammable fluid shall be located, or shielded to prevent fluid leakage on surfaces hot enough to ignite the fluid," and by adding at the end of paragraph (b) a new sentence to read "Flammable fluid from drains and vents shall be discharged clear of the induction system air inlet."

18. By amending § 6.603 by adding a new paragraph (d) to read as follows:

§ 6.603 Flight and navigational instruments.

* * * * *

(d) Free air temperature indicator.

19. By amending § 6.604 by adding new paragraphs (n) and (o) to read as follows:

§ 6.604 Powerplant instruments.

* * * * *

(n) Gas temperature indicator for each turbine engine.

(o) For each turboshaft engine, means to enable the pilot to determine the brake horsepower.

20. By amending § 6.714 by deleting from the first sentence the parenthetical letter "(c)" and inserting in lieu thereof "(d)", by adding to paragraph (a) new subparagraphs (5) and (6), by adding to paragraph (b) new subparagraphs (3) and (4), and by adding a new paragraph (d) to read as follows:

§ 6.714 Powerplant limitations.

* * * * *

(a) *Takeoff operation.* * * *

(5) The permissible gas temperature for turbine engines over the range of operating and atmospheric conditions for which certification is sought,

(6) For turboshaft engines, the maximum horsepower approved for takeoff and the time limit upon the use of takeoff power.

(b) *Continuous operation.* * * *

(3) The permissible gas temperature for turbine engines over the range of operating and atmospheric conditions for which certification is sought.

(4) For turboshaft engines, the approved maximum continuous horsepower.

* * * * *

(d) *Maximum ambient atmospheric temperature.* The maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 6.450 through 6.452 is established.

These amendments are proposed under the authority of sections 313(a), 601, and 603 of the Federal Aviation Act of 1958 (72 Stat. 752, 775, 776, 49 U.S.C. 1354, 1421, 1423).

Issued in Washington, D.C., on December 5, 1962.

G. S. MOORE,
Acting Director,
Flight Standards Service.

[F.R. Doc. 62-12177; Filed, Dec. 10, 1962; 8:45 a.m.]