



[4910-13]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 29**

[Docket No.FAA-2017-0466; Special Conditions No. 29-041-SC]

**Special Conditions: Bell Helicopter Textron Inc. (Bell) Model 412EP Helicopter in the 412 EPI Configuration; Search and Rescue (SAR) with Automatic Flight Control System (AFCS) Installation**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Bell Model 412EP (412EPI configuration) helicopter. This helicopter as modified by Bell will have a novel or unusual design feature associated with a SAR AFCS. The applicable airworthiness standards do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** These special conditions are effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

**ADDRESSES:** Send comments identified by docket number [FAA-2017-0466] using any of the following methods:

- Federal eRegulations Portal: Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.
- Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.
- Hand Delivery of Courier: Deliver comments to the “Mail” address between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://regulations.gov>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT’s complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov>.

Docket: You can read the background documents or comments received at <http://www.regulations.gov>. Follow the online instructions for accessing the docket or go to the Docket Operations in Room @12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m., and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** George Harrum, Flight Analyst, FAA, Rotorcraft Directorate, Regulations and Policy Group, (ASW-111), 10101 Hillwood Parkway, Fort Worth, Texas 76177; telephone (817) 222-4087; e-mail George.Harrum@faa.gov.

**SUPPLEMENTARY INFORMATION:**

**Reason for No Prior Notice and Comment Before Adoption**

The substance of these special conditions has been subjected to the notice and comment period previously and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. Therefore, the FAA has determined that prior public notice and comment are unnecessary, impracticable, and contrary to the public interest, and finds good cause exists for adopting these special conditions upon issuance. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment.

**Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We will consider comments filed late if it is possible to do so without incurring additional expense or delay. We may change these special conditions based on the comments we receive.

## **Background and Discussion**

On March 20, 2015, Bell applied for a supplemental type certificate (STC) for installation of an optional SAR AFCS in certain Model 412EP helicopters. The Model 412EP helicopter, approved under Type Certificate No. H4SW, is a 14 CFR part 29 transport category helicopter certificated in both Category A and Category B and for operation under instrument flight rules under the requirements of Appendix B to Part 29. Bell designated certain serial-numbered Model 412EP helicopters for a specific configuration commercially identified as “412EPI.” The 412 EPI configuration includes the following changes from the 412EP: Installation of the Pratt & Whitney Canada Model PT6T-9 Twin Power Section Turboshaft Engine with Electronic Engine Control, and cockpit instruments and avionics replacement with the Bell BasiX-Pro® Integrated Avionics System. This rotorcraft has a maximum take-off weight of 12,200 pounds. It carries up to 13 passengers with maximum external load of almost 6,614 lbs. and a range up to 609 miles.

The use of dedicated AFCS upper modes, in which a fully coupled autopilot provides operational SAR profiles, is needed for SAR operations conducted over water in offshore areas clear of obstructions. The SAR modes enable the helicopter pilot to fly fully coupled maneuvers, to include predefined search patterns during cruise flight, and to transition from cruise flight to a stabilized hover and departure (transition from hover to cruise flight). The SAR AFCS also includes an auxiliary crew control that allows another crewmember (such as a hoist operator) to have limited authority to control the helicopter’s longitudinal and lateral position during hover operations.

Flight operations conducted over water at night may have an extremely limited visual horizon with little visual reference to the surface even when conducted under Visual

Meteorological Conditions. Consequently, the certification requirements for SAR modes must meet the criteria in Appendix B to Part 29. While Appendix B to Part 29 prescribes airworthiness criteria for instrument flight, it does not consider operations below instrument flight minimum speed ( $V_{MINI}$ ), whereas the SAR modes allow for coupled operations at low speed, all-azimuth flight to zero airspeed (hover).

The regulations as currently promulgated did not envision instrument flight below the Appendix B envelope, including hover using AFCS modes. This necessitates the development of a special condition to address the gap in 14 CFR Part 29 regulations and the lack of adequate airworthiness standards for AFCS SAR mode certification to include flight characteristics, performance, and installed equipment and systems. Also, the requirements of the Bell 412EP Special Conditions No. 29-ASW-5 are not adequate to address the safety objectives for this SAR AFCS design feature. Special Conditions No. 29-ASW-5 only requires provisions for mitigating hazards to required equipment from high intensity radio frequency transmission sources.

The 412EPI configuration SAR operations necessitate safety critical navigation and control functions. These functions allow the rotorcraft to operate under instrument flight rules (IFR) then transition to stabilized visual flight rules hover below required minimum obstacle distances. To safely accomplish this specialized operation, the equipment must possess minimum functional reliability and availability under potentially adverse environmental conditions. The 412EPI configuration SAR equipment operates as an integrated system to accomplish the functions mentioned above.

## **Type Certification Basis**

Under the provisions of 14 CFR 21.101, Bell must show that the 412EP model helicopter in the 412EPI configuration, as changed, continues to meet either the applicable provisions of the regulations incorporated by reference in type certificate (TC) No. H4SW or the applicable regulations in effect on the date of application for the change, depending on the significance of the change as defined by 14 CFR 21.101. The regulations incorporated by reference in the TC are commonly referred to as the "original type certification basis." The regulations incorporated by reference in H4SW are as follows:

- (a) 14 CFR Part 29, dated February 1, 1965, including Amendments 29-1 through 29-51.
- (b) 14 CFR 29.141, 29.143, 29.251, 29.301, 29.303, 29.305, 29.307(a), 29.561(c), 29.601(a), 29.603, 29.605, 29.609(a), 29.625, 29.777, 29.831(b)(c)(d), 29.907, 29.993, 29.1023(a), 29.1049, 29.1093, 29.1203(a)(b)(d), 29.1301, 29.1327, 29.1381, 29.1385, 29.1389, 29.1391, 29.1393, 29.1395, 29.1431, 29.1435, 29.1523(a)(b), 29.1541, 29.1543(b), 29.1547, 29.1551, 29.1553, at Amdt. 29-0.
- (c) 14 CFR 29.955(a)(1) at Amdt. 29-2.
- (d) 14 CFR 29.773(a), 29.901, 29.1191(a)(c)(d)(e)(f), at Amdt. 29-3.
- (e) 14 CFR 29.1397 at Amdt. 29-7.
- (f) 14 CFR 29.1387 at Amdt 29-9.
- (g) 14 CFR Part 29.1401 at Amdt. 29-11.
- (h) 14 CFR 29.63, 29.939, 29.1165, 29.1322 at Amdt. 29-12.
- (i) 14 CFR 29.1145 at Amdt. 29-13.
- (j) 14 CFR 29.1335 at Amdt. 29-14.

- (k) 14 CFR 29.29, 29.33(a)(1), 29.1353(a)(b), 29.1501, 29.1527, 29.1581(a)(b)(d) at Amdt. 29-15.
- (l) 14 CFR 29.1413(a), at Amdt. 29-16.
- (m) 14 CFR 29.1091(a)(b), 29.1545 at Amdt. 29-17.
- (n) 14 CFR 29.571, 29.1529, 14 CFR Part 29 Appendix A at Amdt. 29-20.
- (o) 14 CFR 29.1321, 14 CFR Part 29 Appendix B I and IX (a)(b) at Amdt. 29-21.
- (p) 14 CFR 29.853(a)(2)(c) at Amdt. 29-23.
- (q) 14 CFR 29.21, 29.45(a)(b)(c)(e)(f), 29.151, 29.672(a), 29.771(a)(b)(c), 29.1303, 29.1325, 29.1331, 29.1333, 29.1355, 29.1357(a)(c)(d)(e)(g), 29.1517, 29.1555(a)(b)(c)(d), 29.1559, 29.1583, 29.1585 at Amdt. 29-24.
- (r) 14 CFR 29.1011(d), 29.1041, 29.1043, 29.1045, 29.1047, 29.1141(a)(b)(c)(d)(f)(2), 29.1337(a)(b)(1)(2)(c)(d)(e), 29.1557(c)(2) at Amdt. 29-26.
- (s) 14 CFR 29.337(a), 29.613(d), at Amdt. 29-30.
- (t) 14 CFR 29.783(e), 29.903(a)(b)(c)(3)(d)(e) at Amdt. 29-31
- (u) 14CFR 29.1143(a)(b)(c)(e)(f), 29.1549 at Amdt. 29-34.
- (v) 14 CFR 29.49(a)(b)(c), 29.51, 29.53, 29.55, 29.60, 29.61, 29.64, 29.65(a), 29.75, 29.79, 29.83(a)(b), 29.87(a), at Amdt. 29-39.
- (w) 14 CFR 29.1305(a)(3)(4)(6-19)(21-23)(25)(26)(b)(c), 29.1309(a)(b)(2)(c)(d)(e)(f)(g)(h), 14 CFR Part 29 Appendix B VIII (a)(b)(3)(4)(5)(6)(c), at Amdt. 29-40.
- (x) 14 CFR 29.1521(a)(b)(1)(3)(4)(5)(6)(7)(ii)(c)(4)(d)(e)(f)(g)(h)(i)(j) at Amdt. 29-41.
- (y) 14 CFR 29.1329(f), 29.1351(a)(b)(3)(4)(6)(d), 29.1359 at Amdt. 29-42.
- (z) 14 CFR 29.865(c)(6) at Amdt. 29-43.

(aa) 14 CFR 29.59, 29.62, 29.67, 29.77, 29.81, 29.85, 29.1323(a)(b)(c)(d)(e) at Amdt. 29-44.

(bb) 14 CFR 29.1317(a)(b)(c), 14 CFR Part 29 Appendix E at Amdt. 29-49.

(cc) 14 CFR 29.1587 at Amdt. 29-51.

(dd) Equivalent Level of Safety Findings:

(1) 14 CFR 29.1305(a)(11-16) and 29.1549(a)(b)(c)(e) for the Power Situation Indicator

(documented in ELOS Memo No. ST0025RC-RD/P-1) dated January 16, 2013.

(2) 14 CFR 29.1545(b)(2) for Airspeed Indicator (documented in ELOS Memo No. ST0025RC-RD/F-2) dated September 27, 2012.

(3) 14 CFR 29.1333(a) and 14 CFR Part 29 Appendix B VIII(b)(5)(i) and (ii) for Electronically Integrated Flight Instrument Systems (documented in ELOS Memo No. ST0025RC-RD/S-2) dated January 25, 2013.

(4) 14 CFR 29.1555(c)(1) for the Useable Fuel Capacity Marking (documented in ELOS Memo No. ST0025RC-RD/P-2) dated December 18, 2012.

(ee) If BHT Kit 412-706-140, Increased Gross Weight, is installed then compliance has also been shown to 14 CFR 29.25(a)(1)(3)(4) Amend 29-51, 14 CFR Part 29 Appendix B III,

IV(a)(b)(1)(3)(c)(1)(d)(1)(e)(f), V, VI, VII at Amend 29-21 and 14 CFR 36.1(c) at Amend 36-14.

### **Regulatory Basis for Special Conditions**

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 29) do not contain adequate or appropriate safety standards for the Bell Model 412EP helicopter in the 412EPI configuration because of a novel or unusual design feature, special conditions are prescribed under § 21.16.

The FAA issues special conditions, as defined in § 11.19, under § 11.38, and they become part of the type certification basis under § 21.101.

Special conditions are initially applicable to the model for which they are issued. Should the TC for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same TC be modified to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model.

### **Novel or Unusual Design Features**

The Bell Model 412EP helicopter in the 412EPI configuration will incorporate the following novel or unusual design features.

The SAR system is composed of a navigation computer with SAR modes, an AFCS that provides coupled SAR functions, hoist operator control, a hover speed reference system, and two radio altimeters. The AFCS coupled SAR functions include:

- (a) Hover hold at selected height above the surface.
- (b) Ground speed hold.
- (c) Transition down and hover to a waypoint under guidance from the navigation computer.
- (d) SAR pattern, transition down, and hover near a target over which the helicopter has flown.
- (e) Transition up, climb, and capture a cruise height.
- (f) Capture and track SAR search patterns generated by the navigation computer.

(g) Monitor the preselected hover height with automatic increase in collective if the aircraft height drops below the safe minimum height.

These SAR modes are intended to be used over large bodies of water in areas clear of obstructions. Further, use of the modes that transition down from cruise to hover will include operation at airspeeds below  $V_{MINI}$ .

The SAR system only entails navigation, flight control, and coupled AFCS operation of the helicopter. The system does not include additional equipment that may be required for over water flight or external loads to meet other operational requirements.

### **Applicability**

These special conditions apply to the Bell Model 412EP helicopter in the 412EPI configuration. Should Bell apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of § 21.101(d).

### **Conclusion**

This action affects only certain novel or unusual design features on one model of helicopter. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features on the helicopter.

### **List of Subjects in 14 CFR Part 29**

Aircraft, Aviation safety.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701-44702, 44704.

### **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Bell Helicopter Textron Inc. (Bell) Model 412EP helicopters in the 412EPI configuration when modified by Bell by installing an optional Search and Rescue (SAR) Automatic Flight Control System (AFCS).

In addition to the 14 CFR Part 29 certification requirements for Category A and helicopter instrument flight (Appendix B), the following additional requirements must be met for certification of the SAR AFCS:

(a) **SAR Flight Modes**. The coupled SAR flight modes must provide:

(1) Safe and controlled flight in the three axes at all airspeeds (lateral position and speed, longitudinal position and speed, and height and vertical speed) from the previous  $V_{MINI}$  to a hover (within the maximum demonstrated wind envelope).

(2) Automatic transition to the helicopter instrument flight (Appendix B) envelope as part of the normal SAR mode sequencing.

(3) A pilot-selectable Go-Around mode that safely interrupts any other coupled mode and automatically transitions the helicopter to the instrument flight (Appendix B) envelope.

(4) A means to prevent unintended flight below a safe minimum height.

Pilot-commanded descent below the safe minimum height is acceptable provided the alerting requirements in paragraph (b)(8)(i) of these Special Conditions alert the pilot of this descent below safe minimum height.

(b) **SAR Mode System Architecture**. To support the integrity of the SAR modes, the following system architecture is required:

(1) Ground mapping radar function that presents real-time information to the pilots.

(2) A system for limiting the engine power demanded by the AFCS when any of the automatic piloting modes are engaged, so full authority digital engine control power limitations, such as torque and temperature, are not exceeded.

(3) A system providing the aircraft height above the surface and final pilot-selected height at a location on the instrument panel in a position acceptable to the FAA that will make it plainly visible to and usable by any pilot at their station.

(4) A system providing the aircraft heading and the ability to automatically hold a pilot-selected heading set by either setting the reference to the current heading or adjusting the reference left or right. If the reference setting can change faster than the aircraft ability to follow, a display of reference heading is required at a location on the instrument panel in a position acceptable to the FAA that will make it plainly visible to and usable by any pilot at their station.

(5) A system providing the aircraft longitudinal and lateral hover velocities and the pilot-selected longitudinal and lateral velocities when used by the AFCS in the flight envelope where airspeed indications become unreliable. This information must be presented at a location on the instrument panel in a position acceptable to the FAA that is plainly visible to and usable by any pilot at their station.

(6) A system providing wind speed and wind direction when automatic piloting modes are engaged or transitioning from one mode to another.

(7) A means to monitor for flight guidance deviations and failures with alerting that enables the flight crew take appropriate corrective action.

(8) An alerting system that provides visual or aural alerts, or both, to the flight crew under any of the following conditions:

(i) When the stored or pilot-selected safe minimum height is reached.

(ii) When a SAR mode system malfunction occurs.

(iii) When the AFCS changes modes automatically from one SAR mode to another. For normal transitions from one SAR mode to another, a single visual or aural alert may suffice. For a SAR mode malfunction or a mode having a time-critical component, the flight crew alerting system must activate early enough to allow the flight crew to take timely and appropriate action. The alerting system means must be designed to alert the flight crew in order to minimize crew errors that could create an additional hazard.

(9) The SAR system hoist operator control is considered a flight control with limited authority and must comply with the following:

(i) The hoist operator control must be designed and located to provide for convenient operation and to prevent confusion and inadvertent operation.

(ii) The helicopter must be safely controllable by the hoist operator control throughout the range of that control.

(iii) The hoist operator control may not interfere with the safe operation of the helicopter.

(iv) Pilot and copilot flight controls must be able to smoothly override the control authority of the hoist operator control, without exceptional piloting skill, alertness, or strength, and without the danger of exceeding any other limitation because of the override.

(10) The reliability of the AFCS must be related to the effects of its failure. The occurrence of any failure condition that would prevent continued safe flight and landing must be extremely improbable. For any failure condition of the AFCS which is shown to not be extremely improbable:

(i) The helicopter must be safely controllable and capable of continued safe flight without exceptional piloting skill, alertness, or strength. Additional unrelated probable failures affecting the control system must be evaluated.

(ii) The AFCS must be designed so that it cannot create a hazardous deviation in the flight path or produce hazardous loads on the helicopter during normal operation or in the event of a malfunction or failure, assuming corrective action begins within an appropriate period of time. Where multiple systems are installed, subsequent malfunction conditions must be evaluated in sequence unless their occurrence is shown to be improbable.

(11) A functional hazard assessment and a system safety assessment must address the failure conditions associated with SAR operations:

(i) For SAR catastrophic failure conditions, changes may be required to the following:

(A) System architecture.

(B) Software and complex electronic hardware design assurance levels.

(C) High Intensity Radiated Field (HIRF) test levels.

(D) Instructions for continued airworthiness.

(ii) The assessments must consider all the systems required for SAR operations, including the AFCS, all associated AFCS sensors (for example, radio altimeter), and primary flight displays. Electrical and electronic systems with SAR catastrophic failure conditions for both visual flight rules and IFR must comply with the 14 CFR 29.1317(a)(4) HIRF requirements.

**(c) SAR Mode Performance Requirements.**

(1) The SAR modes must be demonstrated for the requested flight envelope, including the following minimum sea-state and wind conditions:

(i) Sea State: Wave height of 2.5 meters (8.2 feet), considering both short and long swells.

(ii) Wind: 25 knots headwind; 17 knots for all other azimuths.

(2) The selected hover height and hover velocity must be captured (including the transition from one captured mode to another captured mode) accurately and smoothly and not exhibit any significant overshoot or oscillation.

(3) The minimum use height (MUH) for the SAR modes must be no less than the maximum loss of height following any single failure or any combination of failures not shown to be extremely improbable, plus an additional margin of 15 feet above the surface. MUH is the minimum height at which any SAR AFCS mode may be engaged.

(4) The SAR mode system must be usable up to the maximum certified gross weight of the aircraft or to the lower of the following weights:

(i) Maximum emergency flotation weight.

(ii) Maximum hover Out-of-Ground Effect (OGE) weight.

(iii) Maximum demonstrated weight.

**(d) Flight Characteristics.**

(1) For SAR mode coupled flight below  $V_{MINI}$ , at the maximum demonstrated winds, the helicopter must be able to maintain any required flight condition and make a smooth transition from any flight condition to any other flight condition without requiring exceptional piloting

skill, alertness, or strength, and without exceeding the limit load factor. This requirement also includes aircraft control through the hoist operator's control.

(2) For coupled flight below the previously established  $V_{MINI}$ , the following stability requirements replace the stability requirements of paragraph IV, V, and VI of Appendix B to Part 29:

(i) Static Longitudinal Stability: The requirements of Appendix B to part 29, paragraph IV are not applicable.

(ii) Static Lateral-Directional Stability: The requirements of Appendix B to part 29, paragraph V are not applicable.

(iii) Dynamic Stability, paragraph VI:

(A) Any oscillation must be damped and any aperiodic response must not double in amplitude in less than 10 seconds. This requirement must also be met with degraded upper mode(s) of the AFCS.

(B) After any upset, such as a wind gust, the AFCS must return the aircraft to the last commanded flight condition within 10 seconds or less.

(3) With any of the upper modes of the AFCS engaged, the pilot must be able to manually recover the aircraft and transition to the normal (Appendix B) IFR flight profile envelope without exceptional skill, alertness, or strength.

**(e) One-Engine Inoperative (OEI) Performance Information.**

(1) The following performance information must be provided in the Rotorcraft Flight Manual Supplement (RFMS):

(i) OEI performance information and emergency procedures, providing the maximum weight that will provide a minimum clearance of 15 feet above the surface, following failure of the critical engine in a hover. The maximum weight must be presented as a function of the hover height for the temperature and pressure altitude range requested for certification. The effects of wind must be reflected in the hover performance information.

(ii) Hover OGE performance with the critical engine inoperative for OEI continuous and time-limited power ratings for those weights, altitudes, and temperatures for which certification is requested.

(2) These OEI performance requirements do not replace performance requirements that may be needed to comply with the airworthiness or operational standards (14 CFR 29.865 or 14 CFR Part 133) for external loads or human external cargo.

**(f) RFMS.**

(1) The RFMS must contain, at a minimum:

(i) Limitations necessary for safe operation of the SAR system, including:

(A) Minimum crew requirements.

(B) Maximum SAR weight.

(C) Engagement criteria for each of the SAR modes to include MUH, as determined in paragraph (c)(3) of these Special Conditions.

(ii) Normal and emergency procedures for operation of the SAR system (including operation of the hoist operator control) with AFCS failure modes, AFCS degraded modes, and engine failures.

(iii) Performance information:

(A) OEI performance and height-loss.

(B) Hover OGE performance information, utilizing OEI continuous and time-limited power ratings.

(C) The maximum wind envelope demonstrated in flight test.

(D) Information and/or advisory information concerning operations in a heavy salt spray environment, including any airframe or power effects as a result of salt encrustation.

**(g) Flight Demonstration.**

(1) Before approval of the SAR system, an acceptable flight demonstration of all coupled SAR modes is required.

(2) The AFCS must provide fail-safe operations during coupled maneuvers. The demonstration of fail-safe operations must include a pilot workload assessment associated with manually flying the aircraft to an altitude greater than 200 feet above the surface and an airspeed of at least the best rate of climb airspeed ( $V_y$ ).

(3) For any failure condition of the SAR system shown to not be extremely improbable, the pilot must be able to make a smooth transition from one flight mode to another without exceptional piloting skill, alertness, or strength.

(4) Failure conditions that are shown to not be extremely improbable must be demonstrated by analysis, ground testing, or flight testing. For failures demonstrated in flight, the following normal pilot recovery times are acceptable:

(i) Transition modes (Cruise-to-Hover/Hover-to-Cruise) and Hover modes: Normal pilot recognition plus 1 second.

(ii) Cruise modes: Normal pilot recognition plus 3 seconds.

(5) All AFCS malfunctions must include evaluation at the low-speed and high-power flight conditions typical of SAR operations. Additionally, AFCS hard-over, slow-over, and oscillatory malfunctions, particularly in yaw, require evaluation. AFCS malfunction testing must include a single or a combination of failures (such as, erroneous data from and loss of the radio altimeter, attitude, heading, and altitude sensors) that are shown to not be extremely improbable.

(6) The flight demonstration must include the following environmental conditions:

(i) Swell into wind.

(ii) Swell and wind from different directions.

(iii) Cross swell.

(iv) Swell of different lengths (short and long swell).

Issued in Fort Worth, Texas on May 19, 2017.

Lance T. Gant

Manager, Rotorcraft Directorate,  
Aircraft Certification Service.

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