Airfilm Camera Systems
6245 Aerodrome Way, Hanger 2
Georgetown, CA

Document: AFM-AM429-006
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STC SR02375LA

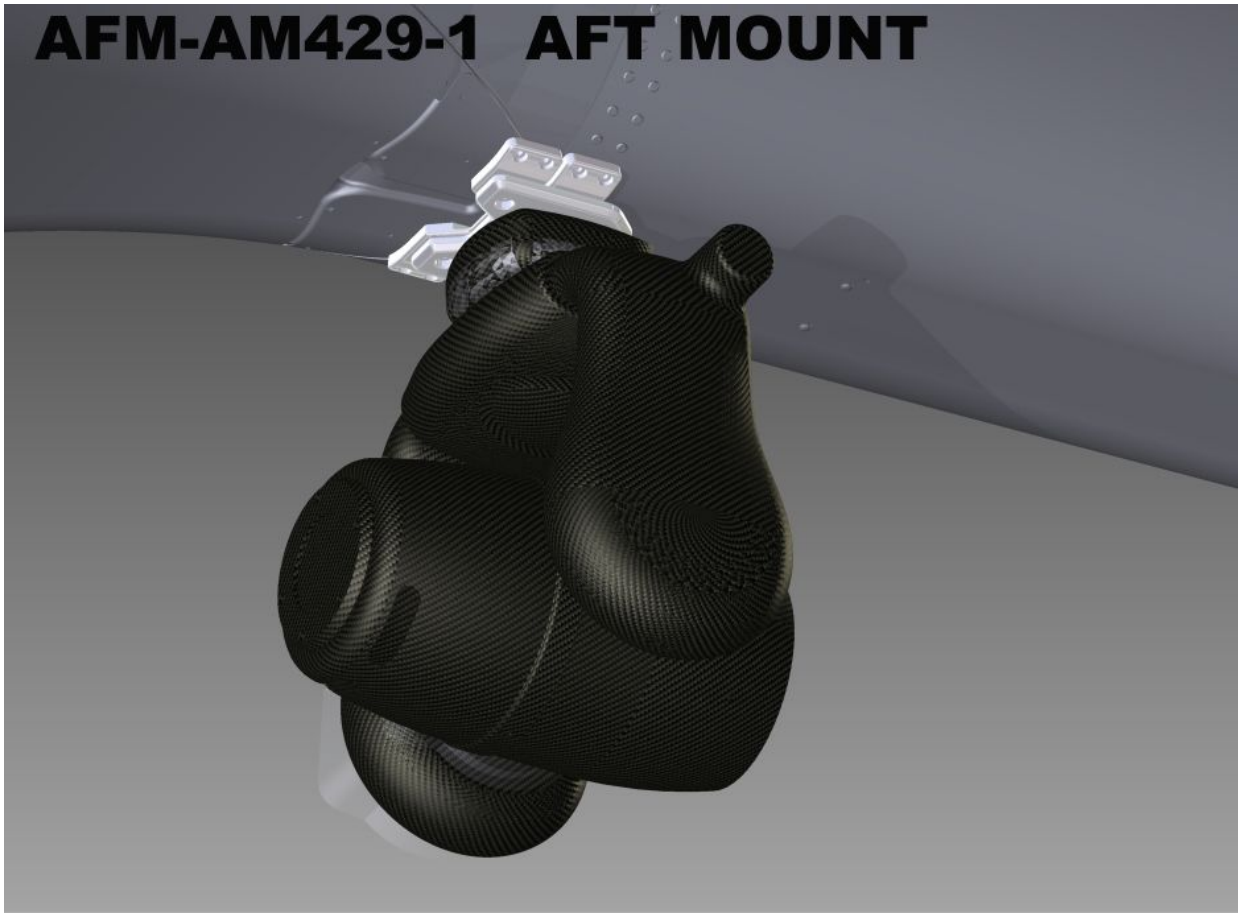
INSTALLATION INSTRUCTIONS

REPORT NO. AFM-AM429-006

AFM-AM429-1 TAIL UTILITY MOUNT

FOR THE

BELL 429 SERIES ROTORCRAFT



RECORD OF REVISIONS

Rev.	Page	Date	Description	FAA Approval
NC	1-25	10/07/11	Initial Release	FAA Approved OCT 07 2011 Los Angeles Aircraft Certification Office
A	4	Jun 6, 2012	Added payload	FAA Approved JUN 06 2012 Los Angeles Aircraft Certification Office

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1. List of Approved Sensor/Camera/Light/Downlinks

The following sensor/camera/searchlights have been installed and flown.

- SPECTROLAB SX-16 IFCO
- TRAKKA 800 SERIES

The specific sensor/cameras/searchlight not listed here is accepted with the follow-on test plan found in Appendix B.

1.1. For helicopters registered in United States or other countries recognizing FAA Certification:

Sensor/camera/searchlights or payloads listed above do not require further FAA flight testing.

Once the installation for a sensor/camera/payload not on the list above is completed by the Integrator/Operator and the flight test conducted by the Pilot/Operator and the FAA (certified) mechanic the sensor/camera/light payload can be added to the accepted list in this manual. The report contained herein must be completed and signed prior to the “return to service” for any sensor/camera/light payload.

The flight will be conducted as an “Operational Check Flight”. Operational check flights do not require a special airworthiness certificate in the experimental category. The term “operational check flight” (14 CFR § 91.407(b)) includes flight tests performed to check installation and/or operation of an approved STC, amended TC, or any other FAA-approved data after installation and return to service.

Operational check flights are performed under the current airworthiness certificate.

The purpose of this test is to ensure the approved modification and/or alteration functions properly and does not adversely affect aircraft operation.

1.2. For helicopters registered in an EU-Member State:

For a specific sensor/camera/light or downlink antenna to be added to the STC, a Minor Change is required with an EASA accepted certification program.

Once the testing is completed by the Integrator/Operator and the flight test conducted by the Pilot/Operator and EASA Engineer and the Minor Change is approved the sensor/camera/light, can be added to the accepted list in this manual. The report contained herein must be completed and signed prior to the “return to service” for sensor/camera/light.

The flights have to be conducted with a “Permit to Fly”.

The purpose of this test is to ensure the approved modification and/or alteration functions properly and does not adversely affect aircraft operation.

1.3. For all helicopters:

The installation is assumed to have a self-contained power supply or connected to the aircraft through a previously approved electrical connection. The requirements for electrical installation, FAR 27 subpart F Equipment, have not been addressed in this installation document. If modification to the ship's system is necessary to support this installation, additional minor modifications with appropriate approval is necessary.

2. Installation Introduction

This manual presents the installation instructions for the Airfilm Camera Systems model AFM-AM429-1 Aft mount for the Bell 429 rotorcraft (See Figure 1). The mount is designed to facilitate the attachment of equipment such as searchlights, FLIR cameras, video cameras, microwave downlinks, etc.

Figure 1

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The AFM-AM429-1 Tail Utility attaches at the fuselage to tail boom joint located at FS 361.0/WL 51.0. See Figure 2.

Searchlight/camera/sensor payloads are attached to various available payload arms either direct or with the use of DT-1 (dovetail), QDD-1 (quick disconnect) or other factory approved adaptor hardware configurations. See Figures 13 and 14.

2.1. General

These instructions cover the AFM-AM429-1 aft mount installation

Precautions:
- All precautions will be in **bold face**

Reference publications
- (AC) 43.13-2 and (AC)43.13-1B
- BHTI-429-MM-1 maintenance manual

Distribution:
- Installation instructions shall accompany the maintenance manuals of aircraft on which the mount is installed.

Definitions/Abbreviations:
- FLIR: forward looking infrared
- BHTI: BELL HELICOPTER TEXTRON INC.

Standards of measurement:
- all measurements in 100ths of an inch
- all weights in US pounds
- all torques in inch pounds

Tools Required
- ¼ Drive ratchet set
- 3/16 T-handle hex wrench
- # 30/# 10 wedge lock clecos
- # 30 drills
- 0.189 reamer with # 30 pilot
- 0.189/#30 drill bushing
- Hi-Lok/ Hi-Lok pin gauge set

3. Control & Operational Information

Special procedures / precautions:

3.1 Maximum mount payload:

AFM-AM429-1 Aft mount
Weight = 100 lbs.
Frontal area = 2.25 square feet

3.2 Ground Clearance:

Minimum ground clearance of installed payload = 36 inches

3.4 Installation of mount must not interfere with any existing installed equipment.

3.5 All Hi-Lok™ fasteners are installed in accordance with data provided by Hi-Lok. All holes are final reamed to size on installation.

4. Installation Information

4.1 Reference Figures 2 through 12.

4.2 Gain access through rear doors to aft fuselage tail boom attach point. See Figures 3 and 4. Remove electrical connectors; remove rivets from cannon plug support plate to ease installation of AFM-AM429-1 components.

4.3 Remove 22 existing Hi-Lok pins (BHTI P/H: 100-161). See Figures 5 and 6.

4.4 Locate and install: Fwd left hand ear bracket (P/N: AFM-AM429-11), Fwd right hand ear bracket (P/N: AFM-AM429-10), Bridge bracket (P/N: AFM-AM429-12). Install all 3 parts with # 30 wedge lock clecos. Each part has 2 ea pilot holes drilled to provide a firm install, allowing the remaining holes to be back drilled from the airframe. The -10 and -11 Brackets may be trimmed to fit as necessary. See Figure 7.

4.5 Install Tie plate (P/N: AFM-AM429-14), using supplied hardware. The tie plate will allow proper alignment for back drilling. Tie plate must remain in place while all Hi-Lok pin holes are being opened to final size. To insure a proper seating of the bridge support, if required; insert AN960 washers between forward left/right/aft support and bride (maximum total thickness 0.100”). See Figures 8 and 9. Shim washers can remain for final install.

4.6 Back drill from inside aircraft all holes with drill bushing; 0.189 outer diameter/#30 inner diameter. Open all holes; install # 30 wedge lock clecos.

4.7 Using 0.189/#30 pilot reamer, open all holes from inside the aircraft, through the mount parts, final size. Remove exterior mount parts. Deburr all holes, etch, alodine and prime.

4.8 Locate in place, 4 ea shims: AFM-AM429-15/16 (fuselage side radius blocks) and AFM-AM429-17 (2 ea, identical), tail boom side shims. See Figures 10 and 11.

4.9 Trim shims to suit for best fit. The -15/-16 shims have one ea #30 pilot holes drilled, install #30 wedge lock to hold in place. From outside the aircraft, use drill bushing from step 4, open remaining holes to #30. Repeat step 4.6 and 4.7, from outside the aircraft. Shims -17 are not drilled, hold firmly in place, spot with 3/16 drill, open on bench to #30, re-install with #30 wedge locks. Repeat step 4.7 from outside the aircraft on radius both -17 shims.

4.10 Install all AFM-AM429 parts:
- Bond interior shims -15 / -16 and -17, 2 plcs. using 299-947-100 TY CL2 ADHESIVE or Magnabond 6398.
- Install exterior left/right ear and bridge supports with 3M tape P/N: 2000-00015-00 or A2008 protective cloth tape or AMS3276 sealant. Install tape or sealant on supports, mating surface side.
- Install Tie plate to insure proper alignment of all parts.
- Install exposed Hi-Loks in right and left support, with Tie plate in place. Install using BHTI 100-161-6-(measure grip length) Hi-Lok Pins with BHTI 30-297-6 Tension Collars. BHTI 30-297-6W can be used, if required. Hi-Lok Pins can be installed in either direction to ease installation.

4.11 Remove Tie plate, install remaining BHTI 100-161-6 Hi-Lok pins/BHTI 30-297-6 Tension Collar.

4.12 Install Tie plate with supplied 6 ea. MS35338-44 lock washer/NAS1351-4-10R (or AN4-15A) bolts. Torque to 50-70 inch-lbs.

4.13 Re-install cannon plug mounting bracket, removed in step 4.2.

4.14 Re-install electrical connectors removed in step 4.2.

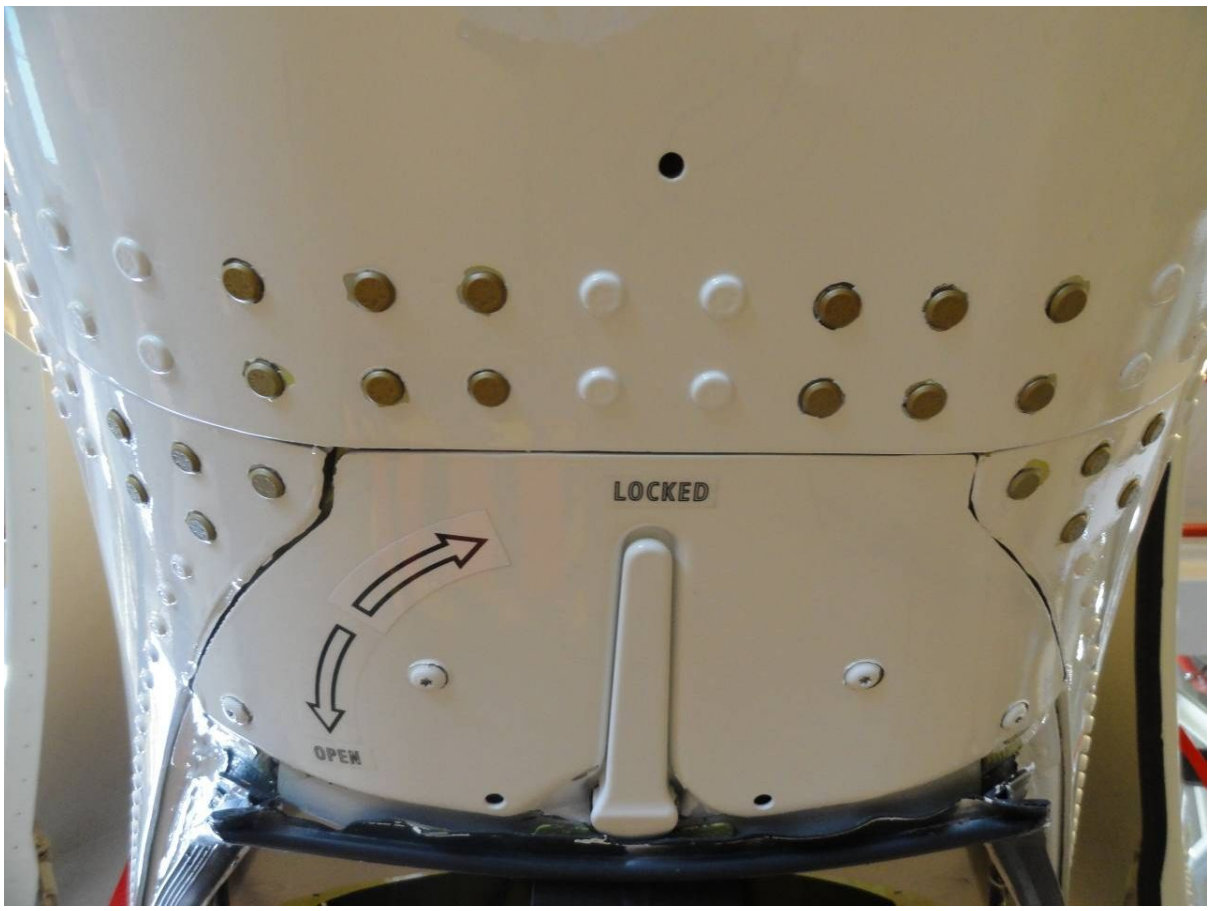

Figure 2: Installation Location for Mount

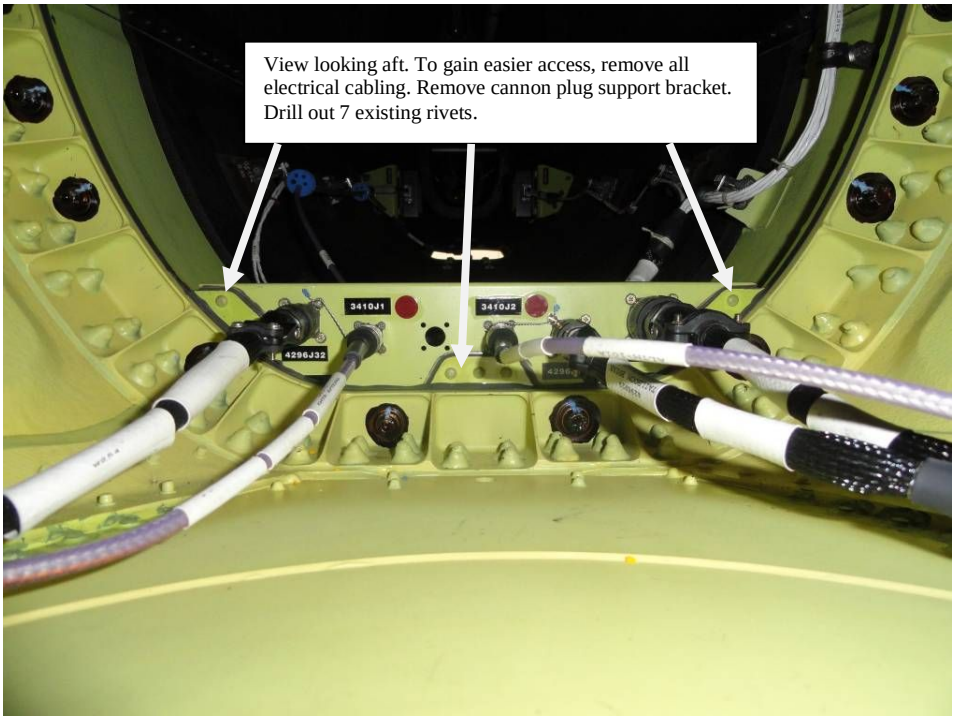

Figure 3

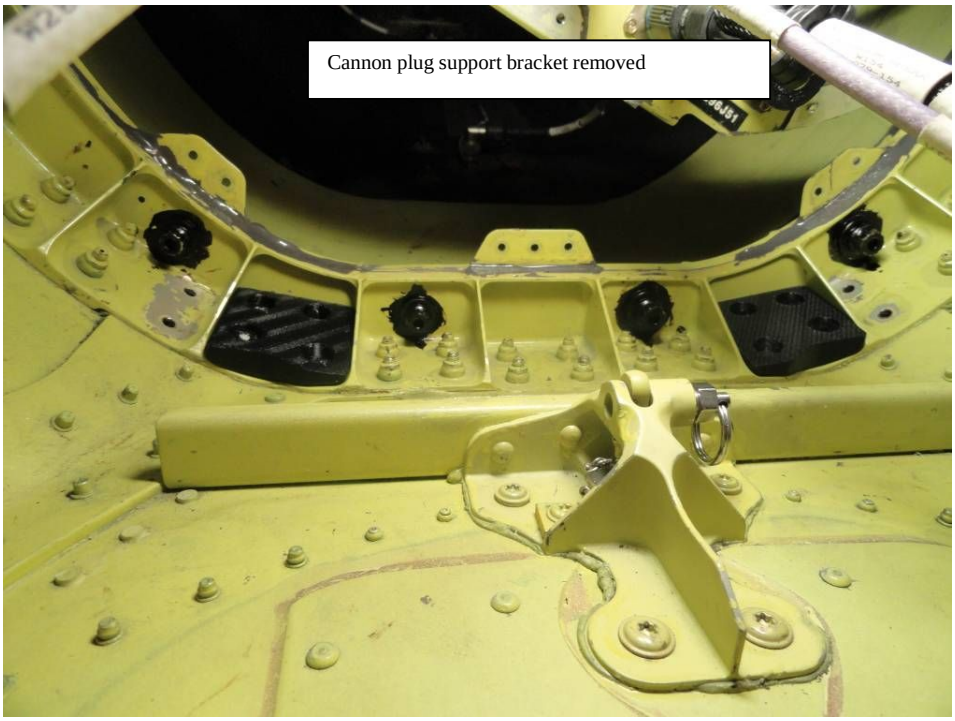

Figure 4

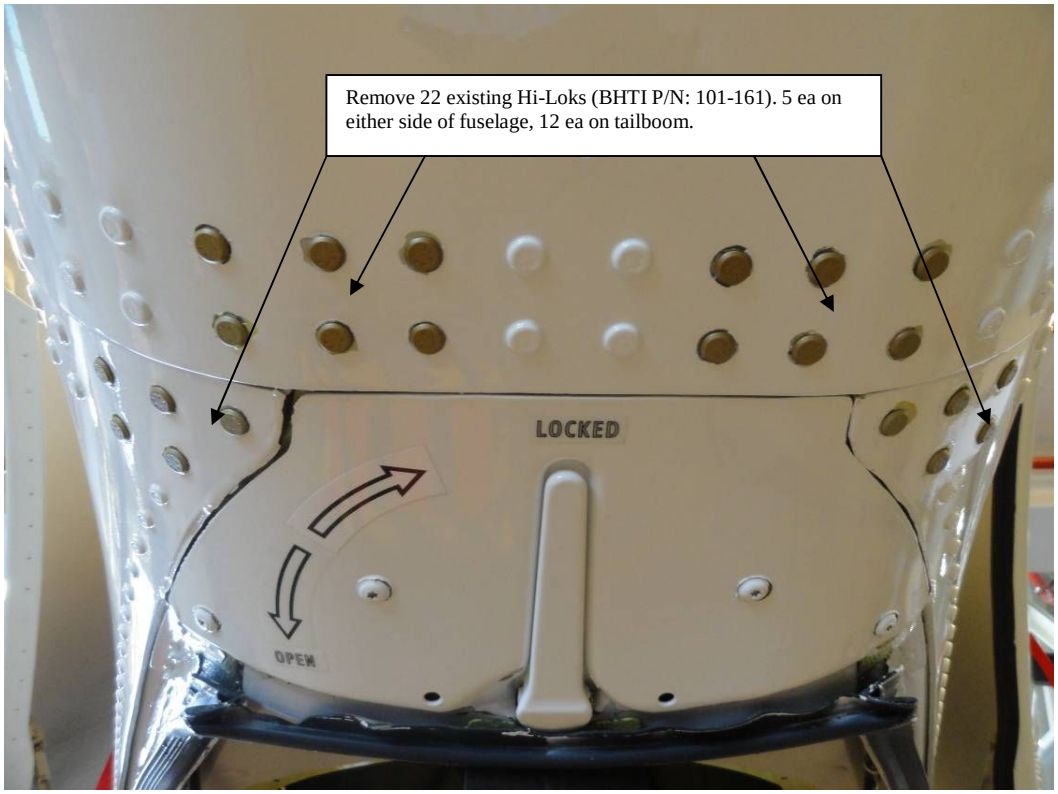

Figure 5

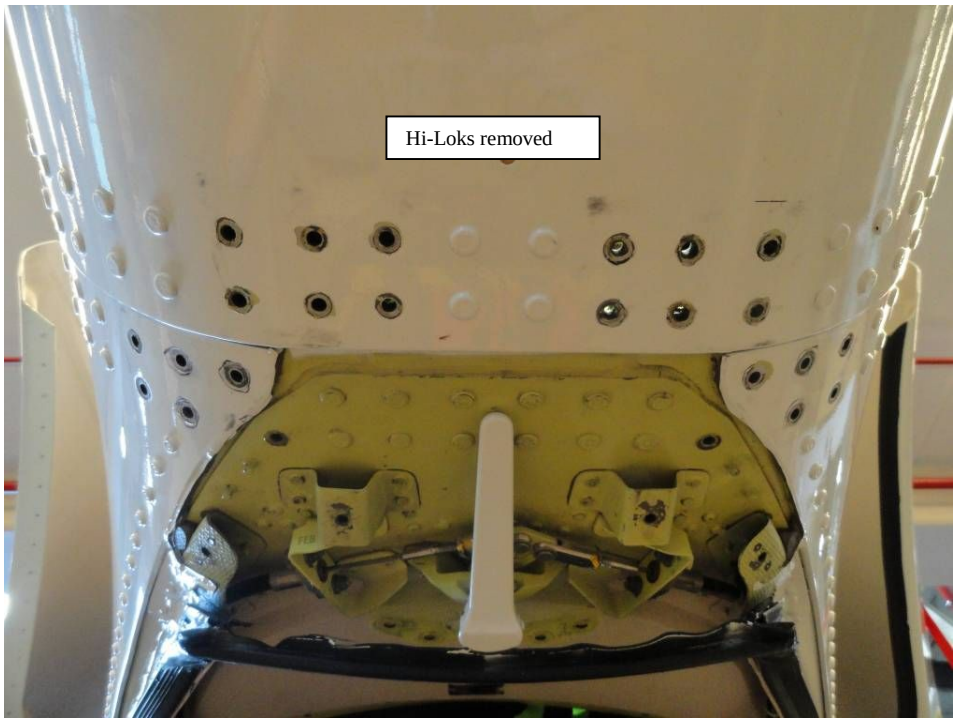

Figure 6

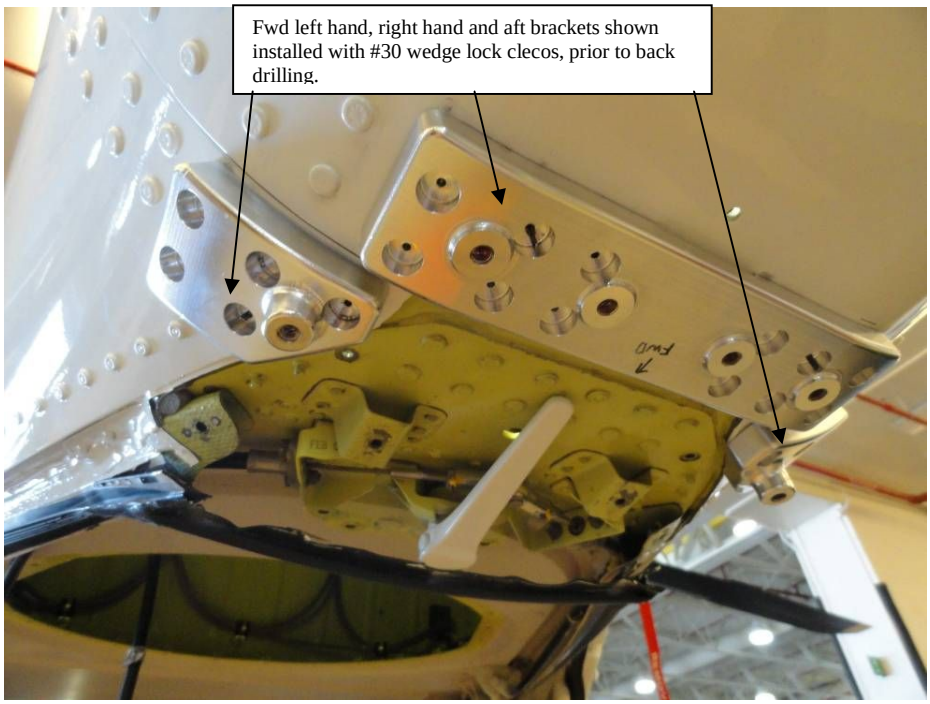

Figure 7

Figure 8

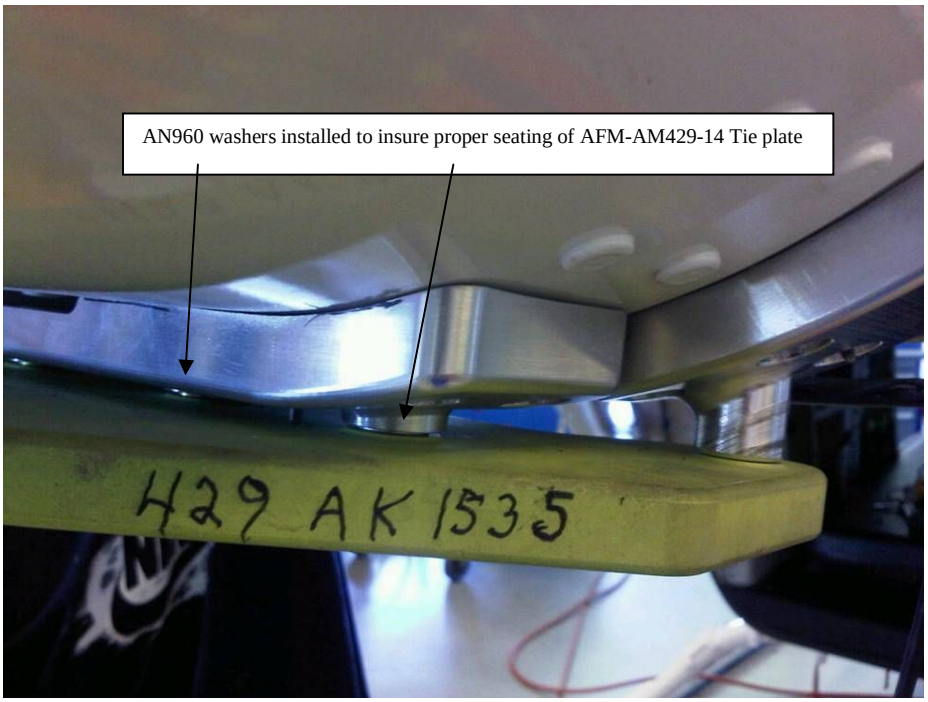

Figure 9

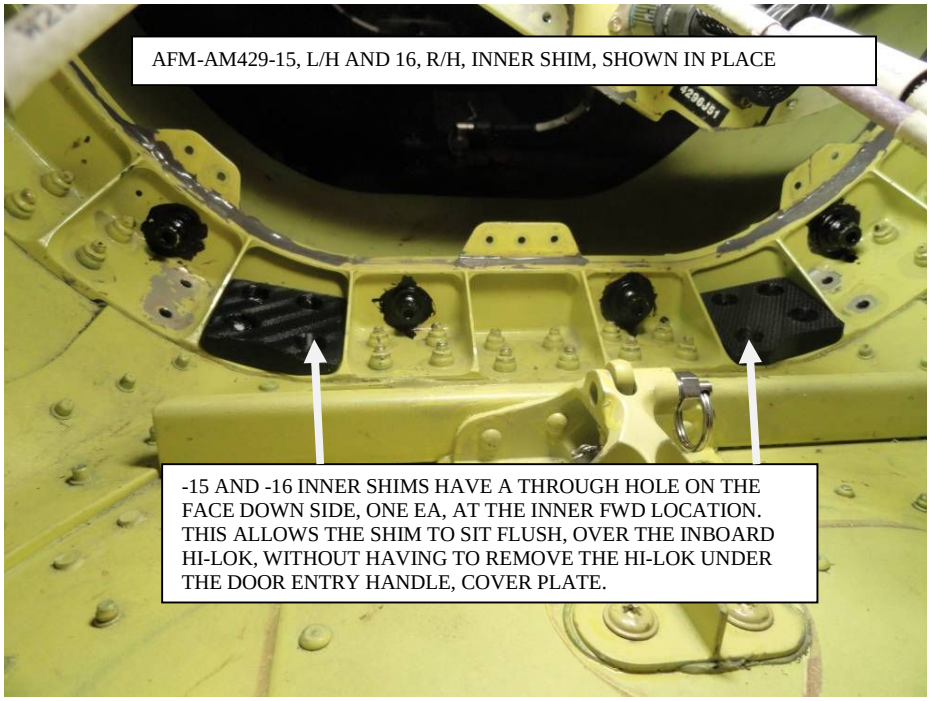

Figure 10

Figure 11

5. Final Installation Instructions:

5.1 Check entire mount for security and proper bolt torque settings.

5.2 Calculate weight and balance.

5.3 Make log book entries as required.

5.4 Return aircraft to service

6. Removal Instructions:

To remove AFM-AM429-1 mount from aircraft:

6.1 Follow directions in reverse order and replace all original hardware/fixtures that were removed for installation of AFM-AM429-1 mount.

6.2 Remove any AFM-AM429-1 placards from cockpit.

6.3 Calculate weight and balance.

6.4 Make appropriate log book entry.

6.5 Return Aircraft to service.

7. Weight & Balance

The following table presents the location of the weight center of gravity of the mount and payload sensor/camera for adjustment of the aircraft weight and center of gravity with the mount installed.

Table 1 Weight & Center of Gravity Locations (US)

DESCRIPTION	WEIGHT (lbs))	STATION (in)	BL (in)
AFM-AM429-1	4.0	363.00	0.0
PAYLOAD	AS INSTALLED	363.00	0.0

Table 2 Weight & Center of Gravity Locations (Metric)

DESCRIPTION	WEIGHT (KG)	STATION (mm)	BL (mm)
AFM-AM429-1	1.81	9220.20	0.0
PAYLOAD	AS INSTALLED	9220.20	0.0

Table 3 Miscellaneous Weights (US)

PART NO.	DESCRIPTION	WEIGHT (LBS)
DT-11	Dovetail	2.0
QDD	Quick Disconnect	3.5

Table 4 Miscellaneous Weights (Metric)

PART NO.	DESCRIPTION	WEIGHT (KG)
DT-11	Dovetail	1.0
QDD	Quick Disconnect	1.6

APPENDIX A - DRAWINGS AND REFERENCES

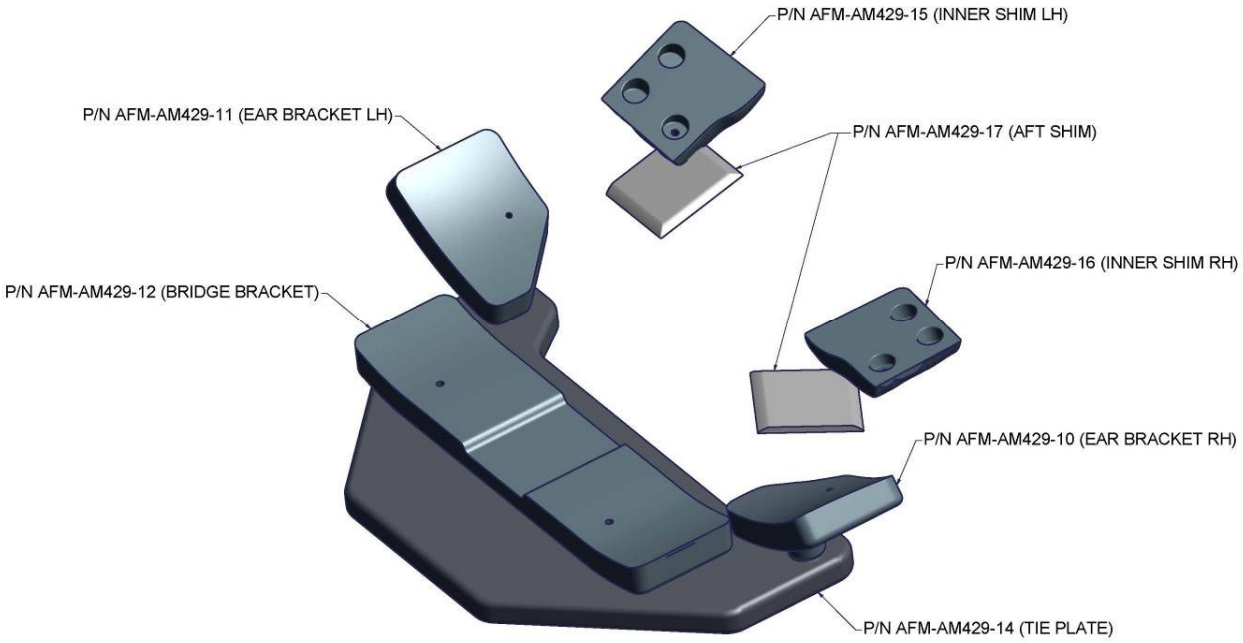

Figure 12 - AFM-AM429-1 Drawing

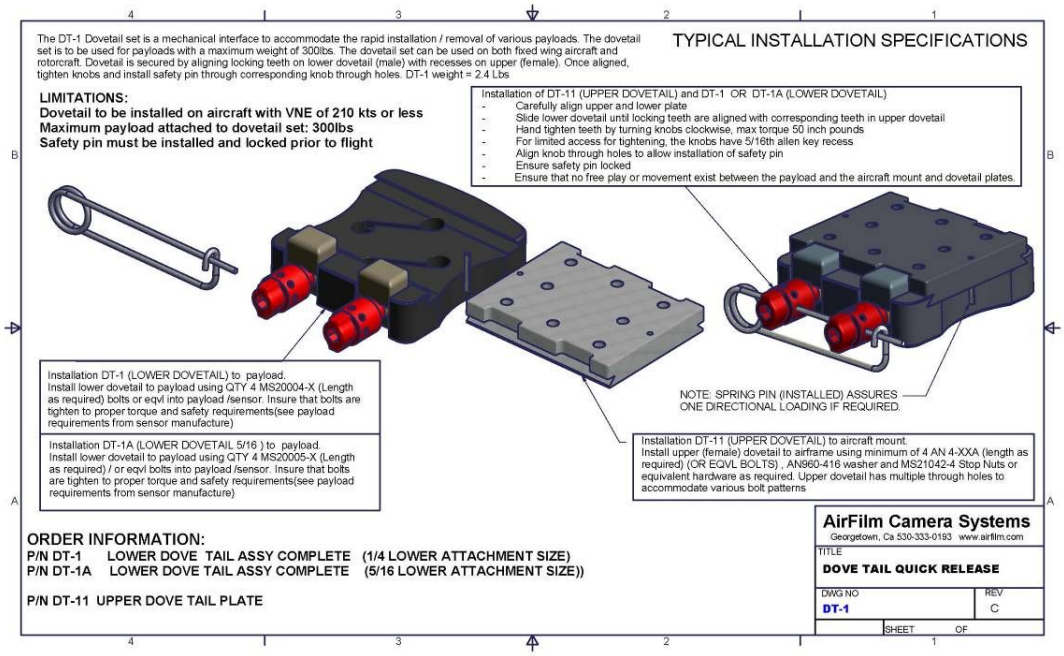

Figure 13 – DT-1 Drawing

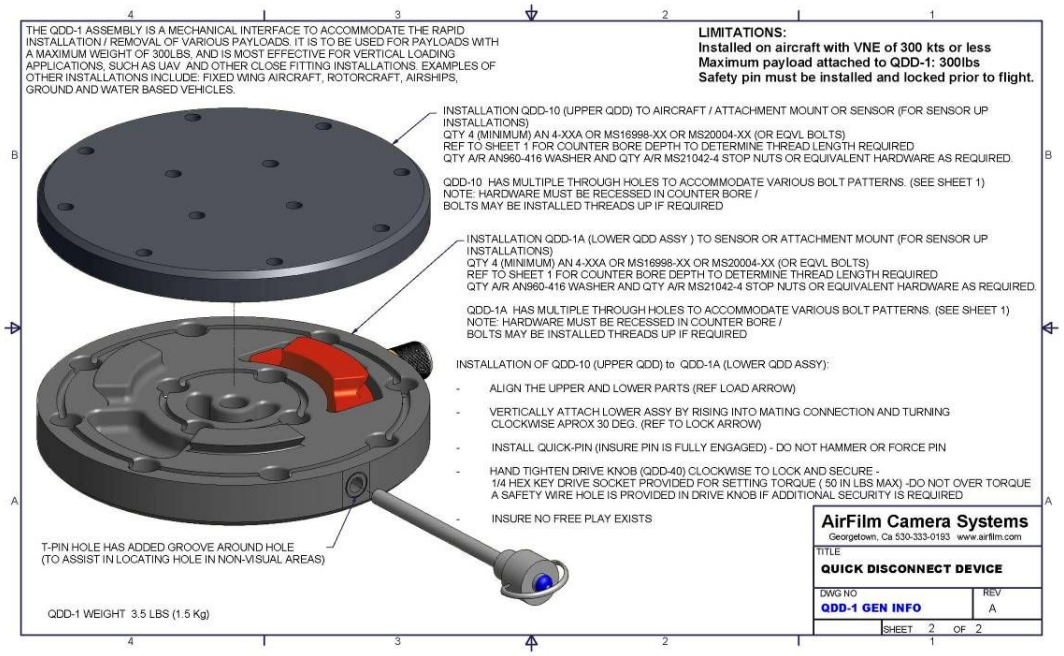

Figure 14 – QDD-1 Drawing

APPENDIX B - METHOD OF ADDING ADDITIONAL SENSOR/CAMERA/PAYLOADS

1. Overview

This Appendix provides the requirements necessary to qualify additional sensor/camera/light payloads not listed in the front of this manual. It may also be used as a check list for previously approved sensor/cameras/light payloads if desired.

The STC flight testing was conducted and the STC approved with the largest and heaviest payload expected for use with this mount. The specific sensor/cameras/light not listed in the installation manual of equal or lesser than the limit case are accepted with this follow-on test plan.

2. Sensor/Camera/Payload

Make & Model _____

3. Test Team

Pilot/s

_____ _____
Print Name

Mechanic and/or Engineer and/or Camera Operator

_____ _____
Print Name

4. Test Aircraft Configuration and Location

Aircraft Model, Registration & Serial Number

_____ _____ _____
Model Registration Number Serial Number

Test Configurations
Empty weight with appropriate fuel and camera system installed
Takeoff Gross weight with crew

Configuration	Gross Weight	Longitudinal CG	Lateral CG
Empty Wt			
Takeoff Wt			

Test Location

_____
Airport or Test Site

5. Test Conditions

Date: _____

Weather: Ceiling _____ Visibility _____ Winds _____

Altimeter _____ Field Elevation _____

Flight Time: Engine Start _____ Shut Down _____ Flt Time _____

6. Flight Test

6.1. Overview

Applicable regulations demonstrated for compliance are indicated with the following symbol ➔. The testing required for the compliance findings of this installation will be made by as a subject/qualitative evaluation. Although the most critical CG is considered to be at the aft limit for most tests this configuration is mounted forward of the mast should not approach the aft limits. This also depends on crew loading. The test team conducts the following tests and evaluations and mark initial the box at the end of each section if the configuration successfully passes the requirements.

6.2 FAR § 27.51 Takeoff

6.2.1 Applicable Regulation

➔(a) The takeoff, with takeoff power and rpm, and with the extreme forward center of gravity -
➔(1) May not require exceptional piloting skill or exceptionally favorable conditions; and
(2) Must be made in such a manner that a landing can be made safely at any point along the flight path if an engine fails.
(b) Paragraph (a) of this section must be met throughout the ranges of -
(1) Altitude, from standard sea level conditions to the maximum altitude capability of the rotorcraft, or 7,000 feet, whichever is less; and
(2) Weight, from the maximum weight (at sea level) to each lesser weight selected by the applicant for each altitude covered by paragraph (b)(1) of this section.

6.2.1 Method of Compliance

The recommended takeoff procedure must be demonstrated to remain clear of the HV "avoid" areas without requiring exceptional piloting skill or exceptionally favorable conditions.

A qualitative evaluation of the ability to safely land at any point along the flight path will be made using judgment and experience with the basic aircraft. No engine failure testing at low altitude will be conducted.

The normal takeoff procedures will be used for the sensor/camera/light payload and mount installation.

6.2.2 Findings

Satisfactory ☐

6.3 FAR § 27.71 Glide Performance

6.3.1 Applicable Regulation

➔For single engine helicopters and multiengine helicopters that do not meet the Category A engine isolation requirements of Part 29 of this chapter, the minimum rate of descent airspeed and the best angle of glide airspeed must be determined in autorotation at -
(a) Maximum weight; and
(b) Rotor speed(s) selected by the applicant.

6.3.2 Method of Compliance

(1) Performance capabilities during stabilized autorotative descent are useful tools to assist the pilot when all engines fail. This information is also useful in determining the suitability of available landing areas along a given route segment.

(2) Two speeds are of particular importance, the speed for minimum rate of descent and the speed for best angle of glide. These speeds along with glide distance information are required as flight manual entries per FAR § 27.1587.

The best angle of glide performance will be evaluated at a single speed and low power (needles joined) descent. An autorotative descent starting at least 1000 feet above the ground and at the speed published in the RFM, 100% RPM value will be demonstrated. Small turns will be conducted in the descent.

The aircraft should be easily controllable and the difference between the mount and camera/sensor/light payload and the clean configuration is the evaluation point.

6.3.3 Findings

Satisfactory _____ Altitude Band H_P _____ Fuel Gage Reading _____

6.4 FAR § 27.143 Controllability and Maneuverability

6.4.1 Applicable Regulation

➔(a) The rotorcraft must be safely controllable and maneuverable -
- ➔ (1) During steady flight; and
- ➔(2) During any maneuver appropriate to the type, including -
  - ➔ (i) Takeoff;
  - ➔ (ii) Climb;
  - ➔ (iii) Level flight;
  - ➔ (iv) Turning flight;
  - (v) Glide;
  - ➔ (vi) Landing (power on and power off); and
  - (vii) Recovery to power on flight from a balked autorotative approach.

➔(b) The margin of cyclic control must allow satisfactory roll and pitch control at VNE with -
- (1) Critical weight;
- (2) Critical center of gravity;
- (3) Critical rotor rpm; and
- (4) Power off (except for helicopters demonstrating compliance with paragraph (e) of this section) and power on.

(c) A wind velocity of not less than 17 knots must be established in which the rotorcraft can be operated without loss of control on or near the ground in any maneuver appropriate to the type (such as crosswind takeoffs, sideward flight, and rearward flight), with -
- (1) Critical weight;
- (2) Critical center of gravity;
- (3) Critical rotor rpm; and
- (4) Altitude, from standard sea level conditions to the maximum altitude capability of the rotorcraft or 7,000 feet, whichever is less.

(d) The rotorcraft, after failure of one engine in the case of multiengine rotorcraft that meet Transport Category A engine isolation requirements, or complete engine failure in the case of other rotorcraft, must be controllable over the range of speeds and altitudes for which certification is requested when such power failure occurs with maximum continuous power and critical weight. No corrective action time delay for any condition following power failure may be less than -
- (1) For the cruise condition, one second, or normal pilot reaction time (whichever is greater); and
- (2) For any other condition, normal pilot reaction time.

(e) For helicopters for which a VNE (power off) is established under § 27.1505(c), compliance must be demonstrated with the following requirements with critical weight, critical center of gravity, and critical rotor rpm:
- (1) The helicopter must be safely slowed to VNE (power off), without exceptional pilot skill, after the last operating engine is made inoperative at power on VNE.
- (2) At a speed of 1.1 VNE (power off), the margin of cyclic control must allow satisfactory roll and pitch control with power off.

6.4.2 Method of Compliance

The general requirements for control and for maneuverability are summarized in section (a), which is largely self-explanatory.

Section (b) specifies flight at V_{NE} with critical weight, center of gravity (CG), rotor RPM, and power. Adequate cyclic authority must remain at V_{NE} for nose down pitching of the rotorcraft and for adequate roll control.

The helicopter will be flown between 1000 and 3000 feet above ground. The test altitude will be dependent on traffic and terrain and conditions close to sea level pressure are desirable. V_{NE} will be the value stated in the RFM for the test density altitude.

Qualitative measurement techniques (pilot opinion) will be used. The tests will include:

Takeoff
Climbing flight
Forward flight to V_{NE} at MCP (maybe less than MCP)
Left & right 30 degree bank turns at V_{NE} and at MCP (maybe less than MCP)
Take-off & Landings (Power on only).

The aircraft should be easily controllable and adequate cyclic margins should exist throughout the flight test points. The difference between the mount and sensor / camera / light payload and the clean configuration is the evaluation point.

6.4.3 Findings

Satisfactory ☐ Cruise Altitude H_P _____ Fuel Gage Reading _____

6.5 FAR § 27.171 Stability: General

6.5.1 Applicable Regulation

➔The rotorcraft must be able to be flown, without undue pilot fatigue or strain, in any normal maneuver for a period of time as long as that expected in normal operation. At least three landings and takeoffs must be made during this demonstration.

6.5.2 Method of Compliance

Compliance with the requirements of this section can often be obtained for the VFR condition without any specific or designated flight testing. This test should be conducted with minimum required systems in the aircraft and with minimum flight crew.

Compliance for this requirement will be evaluated throughout the test program.

6.5.3 Findings

Satisfactory ☐

6.6 FAR § 27.251 Vibration

6.6.1 Applicable Regulation

➔Each part of the rotorcraft must be free from excessive vibration under each appropriate speed and power condition.

6.6.2 Method of Compliance

This flight requirement may be both a qualitative and quantitative flight evaluation. Section 27.571(a) contains the flight load survey requirement that results in accumulation of vibration quantitative data. Section 27.629 generally requires quantitative data to show freedom from flutter for each part of the rotorcraft including control or stabilizing surfaces and rotors.

The aircraft should have a good track & balance for this evaluation. The airspeed should evaluated at 20 kt increments out to the RFM V_{NE} speed. Variations in rotor RPM expected in normal flight should be evaluated. Changes in vibration are best sensed in the cyclic and pedal controls. The stability of the camera/sensor image will be a good indicator.

The pilot will make a subjective evaluation of the difference between the mount and sensor / camera/ light payload and the clean configuration is the evaluation point.

Compliance with this requirement will be evaluated during testing of FAR § 27.143 Controllability and Maneuverability.

6.6.3 Findings

Satisfactory ☐

6.7 FAR § 27.773 Pilot Compartment View

6.7.1 Applicable Regulation

(a) Each pilot compartment must be free from glare and reflections that could interfere with the pilot's view, and designed so that--
➔ (1) Each pilot's view is sufficiently extensive, clear, and undistorted for safe operation; and
(2) Each pilot is protected from the elements so that moderate rain conditions do not unduly impair his view of the flight path in normal flight and while landing.
➔ (b) If certification for night operation is requested, compliance with paragraph (a) of this section must be shown in night flight tests.

6.7.2 Method of Compliance

The section outlines requirements for pilot view in fairly general terms. The aircraft was approved with the installed glareshield and instrument panel that meet the rules. Any additional equipment/monitors must be positioned so as not to limit or obstruct the pilot's field of view. There will be some cases where the installation will be temporary and for a unique mission and consideration should be given for these limited cases and time.

If night operations are expected with an operational system, a "dark cockpit" or night evaluation will be necessary to insure the glare/reflection will not interfere with the pilot duties. A limitation to the use at night is an option.

Satisfactory _____

6.8 FAR § 27.787 Cargo & Baggage Compartment

6.8.1 Applicable Regulation

Cargo and baggage compartments.

(a) Each cargo and baggage compartment must be designed for its placarded maximum weight of contents and for the critical load distributions at the appropriate maximum load factors corresponding to the specified flight and ground load conditions, except the emergency landing conditions of Sec. 27.561.

(b) There must be means to prevent the contents of any compartment from becoming a hazard by shifting under the loads specified in paragraph (a) of this section.

➔ **[**(c) Under the emergency landing conditions of Sec. 27.561, cargo and baggage compartments must--

(1) Be positioned so that if the contents break loose they are unlikely to cause injury to the occupants or restrict any of the escape facilities provided for use after an emergency landing; or

(2) Have sufficient strength to withstand the conditions specified in Sec. 27.561 including the means of restraint, and their attachments, required for the maximum authorized weight of cargo and baggage at the critical loading distribution.**]**

(d) If cargo compartment lamps are installed, each lamp must be installed so as to prevent contact between lamp bulb and cargo.

6.8.2 Method of Compliance

Amendment 27-27 adds two subparagraphs to § 27.787(c) which clarify that cargo and baggage compartments should be designed to protect occupants from injury by the compartment contents during emergency landings. This may be done by location or by retention provisions.

The sensor/camera/light controllers and power supply must be located and secured in a position that will not endanger occupants in an emergency landing impact.

Consideration should be given to stowage and egress when filming in hovering flight. In some cases this might not be possible.

6.8.3 Findings

Comment: _____

Satisfactory ☐

6.9 FAR § 27.1301 Function and Installation.

6.9.1 Applicable Regulation

Each item of installed equipment must--
➔ (a) Be of a kind and design appropriate to its intended function;
(b) Be labeled as to its identification, function, or operating limitations, or any applicable combination of these factors;
(c) Be installed according to limitations specified for that equipment; and
➔ (d) Function properly when installed.

6.9.2 Method of Compliance

For optional equipment, the emphasis on functioning is rather limited compared to that for required equipment. The conditions under which the optional equipment is evaluated should be recorded in the report. The major emphasis for this type of equipment should be to ensure it does not interfere with the operation of systems that are required for safe operation of the rotorcraft, and that the failure modes are acceptable and do not create any hazards.

During flight operations, operate all avionics and electrical systems. Complete the matrix below. The matrix is laid out with the newly installed equipment listed at the top of the page and all aircraft systems listed down the left side of the page. Note any EMI or RFI either TO or FROM the installed equipment. Note any anomalies or EMI/RFI interference to other instruments or indications during all testing phases of flight.

Each item must be checked. Check off each block if no interference is noted. If interference is present during the test, DO NOT CHECK THE BOX and explain in Comments section at end of section. If applicable, note relevant conditions (i.e. frequencies, OBI selection, function modes) under which the interference occurred.

6.9.3 Findings

Interference? 	Camera/Sensor/Light	Position Controller
Camera/Sensor/Light		
Position Controller		
VHF Comm 1		
VHF Comm 2		
VHF Comm 3		
VHF NAV 1		
VHF NAV 2		
ADF 1		
XPONDER 1		
Other Radios		
Audio 1		
Audio 2		
Standby Compass		
Engine Inst		
Fuel Gage		
Clock		
Voltmeter		
Ammeter		
Other		

EMI / RFI Comments:

Satisfactory ☐

Signatures

General test findings _____

Pilot Signature _____

Mechanic/Engineer _____

Other Flt Personnel Signature & Function

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