AIRFILM CAMERA SYSTEMS

DOCUMENT AF-R44-006

INSTALLATION INSTRUCTIONS

AIRFILM CAMERA SYSTEMS UTILITY MOUNT

FOR ROBINSON R44/R44II AND R66 AIRCRAFT

REVISION DATE: 08/05/2019

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LOG OF REVISIONS

REVISION	DATE	PAGES AFFECTED	COMMENTS
N/C	08/16/2016	ALL	Original Issue
A	11/29/2016	ALL	Corrected Weight and Balance, Added Note for Gasket.
B	11/20/2017	All	Corrected max payload weight on pg. 3, section 2.8, Updated Placard Section 2.9.
C	01/24/2018	ALL	Minor Change - Revised instructions to include 4 upper mount fasteners.
D	08/05/2019	ALL	Minor Change – Corrected weight of max load in Section 1

1. INTRODUCTION AND DESCRIPTION:

This document presents the instructions for installation of the Airfilm Camera Systems R44 Nose Utility Mount. The document will list the steps needed to install and remove the utility mount to the Robinson R44/R44II and R66 model helicopters.

The R44 Nose Utility Mount allows for the attachment of utility equipment such as cameras, lights, and sensor instruments to be hard mounted on the Robinson R44/R44II and R66 aircraft. The R44 Utility Mount attaches to the exterior of the aircraft, over the existing landing light housing area. The mount can carry a maximum load of 50 pounds and can be installed and removed without any permanent aircraft modifications. Figure 1 displays a rendering of the component.

Figure 1 – (LH) Rendering of R44 Nose Utility Mount (camera shown for reference only), (RH) Picture of Mount installed on R44

2. R44 UTILITY MOUNT INSTALLATION:

1. Remove existing landing light cover and gain access to back of the landing lights by tilting the cockpit instrument panel aft as shown in Figure 2.

2. 10 fasteners are transferred from the light cover where the 4 outside upper fasteners are located by transferring onto the plastic template (supplied with kit). Fastener locations are shown in Figure 3. Using the original landing light cover as a template, align upper edge of original cover on the Mounting Bracket AF-R44-001 top edge. With the top edge aligned, align the original cover longitudinally with the mating surface of the component. Carefully mark the 10 existing holes onto Mounting Bracket. Ensure that all marked hole locations have sufficient edge distance and that the mount does not interfere with existing aircraft equipment.

Figure 2 – Inside Cockpit View with Landing Light Cover Removed

Figure 3 – R44 Nose Utility Mount fastener locations, shown inside red circles

3. Pilot drill marked holes with No. 30 drill. Cleco original cover to the mount and check for sufficient edge distance. Finish opening pilot holes with no.16 drill. Deburr holes.

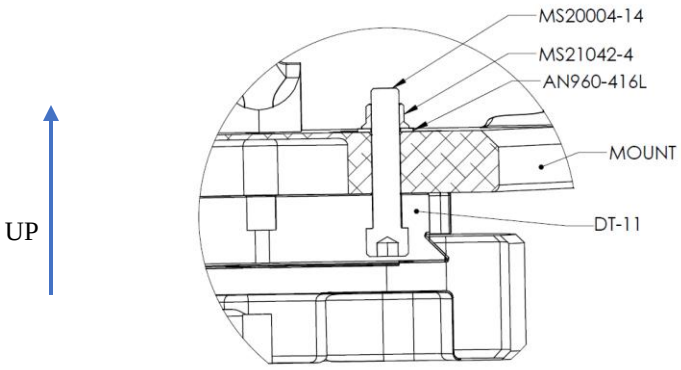
4. Using the supplied clear plastic template, mark the outside upper holes, 2 on each side, as well as the holes from the landing light cover to provide the correct location. Transfer the marked holes on to Mounting Bracket, finish opening holes with no.16 drill. Deburr.

5. Mark the supplied rubber gasket with the hole pattern from the Mounting Bracket. Open holes in rubber gasket by drilling or with countersink rosebud.

6. Trim Mounting Bracket as necessary so that there is no interference with airframe or other fasteners. Etch, alodine, and prime any exposed Mounting Bracket surfaces.

7. Install and secure the Utility Mount, supplied rubber gasket, and original landing light cover to the aircraft using Qty 10, AN525-832R8 Structural Machine Screws on the holes that are within the landing light over, into the existing anchor nuts. On the 4 holes outside the landing light cover, accessed from the cockpit instrument panel area, install with Qty 4 AN525-832R9 and MS21042L08 locking nuts. Torque the screws to 20-25 Inch lbs.

8. If the (optional) Airfilm Dovetail (P/N DT-1-1) quick release is used, attach the Upper Dovetail Plate (P/N DT-11) to the Utility Mount using (6X) MS20004-14 Bolts, AN960-416L Washers, and MS21042-4 Locknuts. Torque the Locknuts 30-40 Inch Lbs.



9. Install camera/sensor to Mount using the sensor manufacturers mounting instructions.

10. Route any control wire into aircraft so as not to interfere with the operation of doors, flight controls, and/or flight systems.

11. Inspect R44 Utility Mount assembly for flight integrity. System should be secure and not have any free play in the mating surfaces.

12. Revise weight and balance per the following table:

The following table presents the location of the weight/center of gravity of the mount and payload sensor/camera. Use the values to adjust aircraft weight and center of gravity.

DESCRIPTION	WEIGHT (lbs)	STATION (in)	BL (in)
Utility Mount (AF-R44-1)	3.0	2.36	0.0
Dovetail (DT-1) (Optional)	2.4	2.36	0.0
GPS Antenna Kit (AF-R44-GPS)	.75	2.5	0.0
PAYLOAD	Use Measured Value (**MAX 50 lbs)**	2.36	0.0

13. Attach the following Placard in full view of pilot

WITH A PAYLOAD INSTALLED ON THE NOSE UTILITY MOUNT REDUCE THE PUBLISHED VNE BY:

10 KIAS when payload frontal area of .7 ft^2 or less.

30 KIAS when payload frontal area of .71 ft^2 to 1.5 ft^2.

14. Make appropriate log book entry for installation.

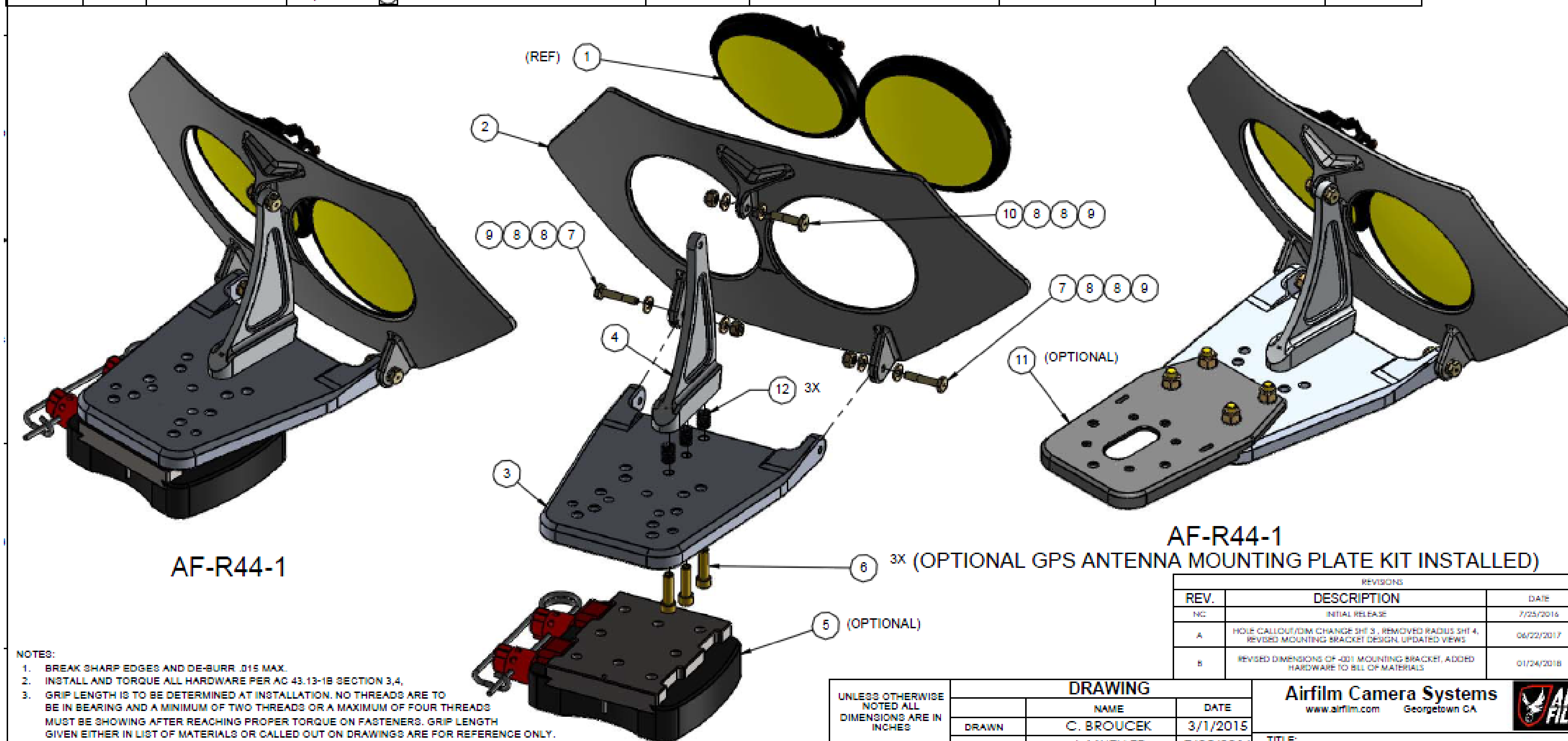
15. Return aircraft to service.

3. REMOVAL INSTRUCTIONS:

1. Remove hardware and utility mount from the aircraft.
2. Reconnect landing light wiring, if changed.
3. Re-install original light cover and replace original-type hardware.

BILL OF MATERIALS

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPEC	FINISH	FINISH SPEC	STOCK ID
1	2	REF LIGHT ASSEM						
2	1	AF-R44-001	MOUNTING BRACKET	6061-T651	AMS-QQ-A-250/11 ALT: AMS-QQ-A-200/8	BLACK ANODIZE HARD	MIL-A-8625 TYPE III CL II	A/R
3	1	AF-R44-003	TRAY	6061-T651	AMS-QQ-A-250/11 ALT: AMS-QQ-A-200/8	BLACK ANODIZE HARD	MIL-A-8625 TYPE III CL II	A/R
4	1	AF-R44-005	WEB GUSSET	6061-T651	AMS-QQ-A-250/11 ALT: AMS-QQ-A-200/8	BLACK ANODIZE HARD	MIL-A-8625 TYPE III CL II	A/R
5	1	DT-1-1	DOVE TAIL QUICK RELEASE (OPTIONAL)					
6	3	NAS1351-4H14	SHCS (ALTERNATE P/N MS16998-45 OR MS20004H14)					
7	2	AN3-14	BOLT					
8	6	AN960-10	WASHER					
9	3	AN365-1032A	STOP NUT					
10	1	AN3-13	BOLT					
11	1	AF-R44-GPS	GPS ANTENNA MOUNTING PLATE KIT (OPTIONAL)					
12	3	91732A737	HELICOIL					
13	10	AN525-832R8	WASHER HEAD SCREW [7]					
15	4	AN525-832R9	WASHER HEAD SCREW [7]					
16	4	MS21042L08	NUT, LOCKING [7]					



NOTES:
1. BREAK SHARP EDGES AND DE-BURR .015 MAX.
2. INSTALL AND TORQUE ALL HARDWARE PER AC 43.13-1B SECTION 3,4.
3. GRIP LENGTH IS TO BE DETERMINED AT INSTALLATION. NO THREADS ARE TO BE IN BEARING AND A MINIMUM OF TWO THREADS OR A MAXIMUM OF FOUR THREADS MUST BE SHOWING AFTER REACHING PROPER TORQUE ON FASTENERS. GRIP LENGTH GIVEN EITHER IN LIST OF MATERIALS OR CALLED OUT ON DRAWINGS ARE FOR REFERENCE ONLY.
4. UNLESS OTHERWISE NOTED ALL PARTS SHALL BE PROCESS FINISHED BEFORE ASSEMBLY
5. UNLESS OTHERWISE NOTED IDENTIFY ALL PARTS BY ENGRAVING TEXT .005 TO .010 BELOW PART SURFACE USING 0.065 BALL END MILL, OR LABEL WITH PERMANENT INK AND STAMP, OR LABEL WITH PERMANENT ADHESIVE PART LABEL, OR LASER ENGRAVING AFTER PROCESS COATINGS.

[6] ALL UNDIMENSIONED FEATURES DEFINED BY SOLID MODEL P/N AF-R44-XXX.XX.SLDPRT WHERE 'XXX' DENOTES THE RESPECTIVE PART NUMBER AND 'XX' DENOTES THE REVISION LEVEL.

[7] BAG AND TAG HARDWARE FOR INSTALLATION.

REVISIONS

REV.	DESCRIPTION	DATE
NC	INITIAL RELEASE	7/25/2016
A	HOLE CALLOUT/DIM CHANGE SHT 3 , REMOVED RADIUS SHT 4, REVISED MOUNTING BRACKET DESIGN, UPDATED VIEWS	06/22/2017
B	REVISED DIMENSIONS OF -001 MOUNTING BRACKET, ADDED HARDWARE TO BILL OF MATERIALS	01/24/2018

UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN INCHES

TOLERANCES:
.X ± .1
.XX ± .03
.XXX ± .010
ANGULAR: ± .5°

BREAK ALL SHARP EDGES

DRAWING	NAME	DATE
DRAWN	C. BROUCEK	3/1/2015
CHECKED	J. MUELLER	7/25/2016
APPROVED	S. RIOLINO	7/25/2016

Airfilm Camera Systems
www.airfilm.com Georgetown CA

TITLE: R44 LIGHT WEIGHT BRACKET

SIZE: C | DWG. NO. AF-R44 | REV: B

SCALE 1:2 | DO NOT SCALE DRAWING | SHEET 1 OF 4

APPENDIX A –
METHOD OF ADDING ADDITIONAL SENSOR /CAMERA / PAYLOADS

A1. Overview

This Appendix provides the requirements necessary to qualify sensor / camera / light payloads – IF NEEDED.
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.

Sensor/ Camera/ payload

Make & Model _____

A2. Test Team

A2.1. Pilot(s)

_____ _____
Print Name

A2.2. Mechanic and/or Engineer and/or Camera Operator

_____ _____
Print Name

A3. Test Aircraft Configuration and Location

A3.1. Aircraft Model, Registration & Serial Number

_____ _____ _____

Model Registration Number Serial Number

A3.2. 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			

A3.3. Test Location

_____

Airport or Test Site

A4. Test Conditions

Date: _____

Weather: Ceiling _____ Visibility _____ Winds _____

Altimeter _____ Field Elevation _____

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

A5. Flight Test

A5.1. 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.

A5.2. FAR § 29.51 Takeoff

A5.2.1. Applicable Regulation

➔(a) The takeoff data required by Secs. 29.53, 29.55, 29.59, 29.60, 29.61, 29.62, 29.63, and 29.67 must be determined--
(1) At each weight, altitude, and temperature selected by the applicant; and
(2) With the operating engines within approved operating limitations.
➔ (b) Takeoff data must--
(1) Be determined on a smooth, dry, hard surface; and
(2) Be corrected to assume a level takeoff surface.
(c) No takeoff made to determine the data required by this section may require exceptional piloting skill or alertness, or exceptionally favorable conditions.

A5.2.2. 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.

A5.2.3. Findings

Satisfactory _____

A5.3. FAR § 29.71 Glide Performance

A5.3.1. Applicable Regulation

➔For each category B helicopter, except multiengine helicopters meeting the requirements of Sec. 29.67(b) and the powerplant installation requirements of category A, the steady angle of glide must be determined in autorotation--
(a) At the forward speed for minimum rate of descent as selected by the applicant;
➔ (b) At the forward speed for best glide angle;
(c) At maximum weight; and
➔ (d) At the rotor speed or speeds selected by the applicant

A5.3.2. Method of Compliance

(1) Performance capabilities during stabilized autorotative descent are useful pilot tools to assist in the management of a Category B rotorcraft 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 § 29.1587. The recommended speed for autorotation is usually optimized to assure an effective flare capability and yet be slow enough to allow a controlled, relatively slow touchdown condition. Recommended autorotation speed is ordinarily between the minimum rate of descent and maximum glide angle speeds.

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 maneuver will be terminated with power at a safe altitude.

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.

A5.3.3. Findings

Satisfactory _____ Altitude Band HP _____ Fuel Gage Reading _____

A5.4. FAR § 29.143 Controllability and Maneuverability

A5.4.1. 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);

➔(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 (f) 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 § 29.1505(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.

A5.4.2. Method of Compliance

The general requirements for control and for maneuverability are summarized in section (a) of the AC, 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}, not more than the published RFM limit 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.

A5.4.3. Findings

Satisfactory _____ Cruise Altitude HP _____ Fuel Gage Reading _____

A5.5. FAR § 29.171 Stability: General

A5.5.1. 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.

A5.5.2. 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. Demonstrate that the aircraft can be satisfactorily flown throughout the maximum endurance capabilities of the rotorcraft including night and turbulence conditions if those are critical. 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.

A5.5.3. Findings

Satisfactory _____

A5.6. FAR § 29.251 Vibration

A5.6.1. Applicable Regulation

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

A5.6.2. Method of Compliance

This flight requirement may be both a qualitative and quantitative flight evaluation. Section 29.571(a) contains the flight load survey requirement that results in accumulation of vibration quantitative data. Section 29.629 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 be evaluated at 20 kt increments out to the RFM VNE 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 §29.143 Controllability and Maneuverability.

A5.6.3. Findings

Satisfactory _____

A5.7. FAR § 29.773 Pilot Compartment View

A5.7.1. Applicable Regulation

(a) Nonprecipitation conditions. For nonprecipitation conditions, the following apply:
➔ (1) Each pilot compartment must be arranged to give the pilots a sufficiently extensive, clear, and undistorted view for safe operation.
➔ (2) Each pilot compartment must be free of glare and reflection that could interfere with the pilot's view. If certification for night operation is requested, this must be shown by night flight tests.
(b) Precipitation conditions. For precipitation conditions, the following apply:
(1) Each pilot must have a sufficiently extensive view for safe operation—
(i) In heavy rain at forward speeds up to VH; and
(ii) In the most severe icing condition for which certification is requested.
(2) The pilots must have a window that—
(i) Is openable under the conditions prescribed in subparagraph (1) of this paragraph; and
(ii) Provides the view prescribed in that subparagraph.

A5.7.2. 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.

A5.7.3. Findings

Satisfactory _____

A5.8. FAR § 29.787 Cargo & Baggage Compartment

A5.8.1. 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. 29.561.
(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. 29.561, 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. 29.561 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.

A5.8.2. Method of Compliance

Amendment 29-31 adds two subparagraphs to § 29.787(c) which clarifies 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.

A5.8.3. Findings

Comment: _____

Satisfactory _____

A5.9. FAR § 29.1301 Function and Installation.

A5.9.1. 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.

A5.9.2. 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.

A5.9.3. 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

_____