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FAA APPROVED
Rotorcraft Flight Manual Supplement
to the
Robinson R44 Pilot's Operating Handbook and
FAA Approved Rotorcraft Flight Manual

HeliSAS

Aircraft Reg. No. _____ Aircraft S/N _____

This supplement must be attached to the Robinson R44 Pilot's Operating Handbook and FAA-Approved Rotorcraft Flight Manual, Report No. RTR 461 when the aircraft is modified by the installation of a Hoh Aeronautics HeliSAS stability augmentation system (SAS) in accordance with STC No. _____ .

Information contained herein supplements or supersedes the basic flight manual, RTR 461, only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic flight manual.

APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE: _____

Log of Revisions & List of Effective Pages

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SECTION 1: GENERAL

INTRODUCTION

This supplement contains the changes and additional data applicable when the HeliSAS stability augmentation system (SAS) and optional autopilot is installed.

The SAS maintains helicopter attitude during cruise by applying corrective inputs to the cyclic stick. An autopilot option can add altitude hold, heading hold, navigation signal tracking, and vertical (approach) navigation features depending on installed avionics.

CAUTION

SAS is intended to enhance safety by reducing pilot workload. It is not a substitute for adequate pilot skill nor does it relieve the pilot of the responsibility to maintain adequate outside visual reference.

SECTION 2: LIMITATIONS

FLIGHT AND MANEUVER LIMITATIONS

Pilot's hand must be on cyclic grip under the following conditions:

During SAS engagement or intentional disengagement

At indicated airspeeds less than 44 KIAS

At indicated airspeeds greater than 127 KIAS

When operating in the vicinity of radio broadcast towers, radar antennas, large airports, high tension wires, or any other source of a high power radio field.

SECTION 3: EMERGENCY PROCEDURES

SAS DISENGAGEMENT OR FAILURE

SAS disengagement or failure is indicated by four beeps in the headset and/or erratic motion of the cyclic control or unexpected deviations in pitch or roll attitude.

1. Immediately assume full manual control. Override the SAS/autopilot as necessary and disengage the system as soon as possible.

2. If SAS annunciator is green (engaged mode), disengage SAS.

3. If SAS annunciator is amber or white (standby mode), re-engagement may be attempted at pilot's discretion.

CAUTION

If unexpected attitude deviations occur, and/or the cyclic forces and motions are erratic, disengage SAS immediately.

An uncommanded disengagement of an autopilot mode is indicated by a single beep in the headset. Take appropriate corrective action for unassisted vertical and horizontal navigation. The basic SAS is still functional after a single beep.

SECTION 3: EMERGENCY PROCEDURES (cont'd)

LOSS OF OUTSIDE VISUAL REFERENCE

1. Immediately engage SAS (if not already engaged) and allow system to maintain attitude.

2. Promptly execute gentle turn toward conditions of improved visibility.

NOTE

The SAS should always be in standby mode, even if not engaged. This allows immediate engagement if required.

SAS DOES NOT DISENGAGE

If the SAS does not disengage using normal procedures, it is possible to disengage by pulling the SAS circuit breaker.

SECTION 4: NORMAL PROCEDURES

GENERAL

The SAS performs a self test and enters standby mode during aircraft start and warm-up. Standby mode is indicated by a steady amber OFF annunciation on the SAS on-off button (basic system) or a white annunciation above the SAS mode button (autopilot systems). These indicators flash during power-up and self test. An aural warning test (four headset beeps) is part of the self test.

NOTE

SAS will not enter standby mode until the attitude gyro bank angle is less than 6 degrees.

Once the system is in standby mode and while still on the ground and wearing the headset, the system should be engaged with friction off. The cyclic should exhibit a centering tendency. Disengage the system using the SAS OFF button on the cyclic and note 4 beeps in the headset. Note that the cyclic forces are nearly zero with the system disengaged.

HeliSAS may be engaged at pilot's discretion using the on-off button or SAS mode button. White or amber indications turn green when the system is engaged. The SAS may also be engaged by pressing the TRIM button on the cyclic stick for more than 1.25 seconds. For autopilot systems, additional autopilot modes may be engaged using the other mode buttons.

The SAS may be used throughout the flight envelope (including hover and autorotation) at pilot's discretion.

NOTE

Autopilot modes will not function below 44 knots or above 127 knots indicated airspeed.

SECTION 4: NORMAL PROCEDURES (cont'd)

GENERAL (cont'd)

NOTE

Cyclic friction must be off for the SAS or autopilot to work properly. Engaging cyclic friction inhibits the ability of the SAS to stabilize the helicopter.

When the SAS is initially engaged, it will attempt to maintain attitude. The system will not trim to attitudes greater than 6 degrees nose-down pitch, 11 degrees nose-up pitch, or 5 degrees bank. If the system is engaged with the aircraft in an unusual attitude, it will attempt to trim to a nearly level attitude. After engagement, trim attitude may be adjusted using the TRIM button on the cyclic stick. The system will maintain the attitude at which the trim button was released, within the above limits.

To re-trim, use a small amount of force to override the SAS and then push and release the TRIM button at the desired attitude. SAS is designed to remain engaged during maneuvering. If the stick force to override the system is objectionable, the system may be disengaged, or the TRIM button may be held down while maneuvering. SAS inputs to the cyclic are disabled while the trim button is held down.

NOTE

The T-bar controls should be wound such that the pilot's cyclic grip is spring loaded to fall to the pilot's lap to facilitate immediate takeover if the SAS disconnects.

For systems with autopilot option, some or all of the following modes may be available depending on installed avionics:

Heading Mode (HDG) – holds heading as selected by the heading bug on the directional gyro or Horizontal Situation Indicator (HSI). If no instrument with heading bug is installed, HDG holds the current aircraft GPS track. The commanded GPS track may be reset by overriding the system to achieve a desired track angle and pressing and releasing the TRIM button on the cyclic grip.

Navigation Mode (NAV) – tracks the VLOC or GPS navigation signal being viewed on the Course Deviation Indicator (CDI). If no CDI is installed, NAV will track the active GPS course.

SECTION 4: NORMAL PROCEDURES (cont'd)

GENERAL (cont'd)

Backcourse Mode (BC) – similar to NAV but with reverse sensing for backcourse approaches. Course on CDI should be set to inbound front course in this mode (tail of HSI course needle points toward runway).

Altitude Hold Mode (ALT) – holds altitude at time of mode engagement. The target altitude is reset each time the TRIM button is pressed and released. Note that autopilot uses pitch attitude to control altitude so airspeed will vary with power setting.

Vertical Navigation Mode (VRT) – tracks an ILS glideslope or GPS VNAV profile. Note that autopilot uses pitch attitude to maintain glideslope so that airspeed will vary with power setting. Recommend slowly reducing collective to approximately 18 inches MAP just prior to glideslope intercept.

SAS may be disengaged using the panel-mounted SAS button or autopilot control panel button or by using the red SAS OFF button on the cyclic stick. If an autopilot mode is engaged a single push of the SAS OFF button disengages the autopilot but retains SAS attitude hold. A second push of the SAS OFF button or holding the button for more than 1.25 seconds completely disengages the system.

NOTE

The pilot's hand must be on the cyclic when the SAS is disengaged.

Safety monitors automatically disengage the SAS/autopilot if a malfunction is detected. Automatic disengagement of an autopilot mode while the SAS remains functional is indicated by

a single beep in the headset. Automatic or intentional disengagement of the entire system is indicated by four beeps in the headset.

SECTION 4: NORMAL PROCEDURES (cont'd)

STARTING ENGINE AND RUN-UP

After "Warning lights", add:

SAS . . . . . Standby or engaged

NOTE

Verify aural warning function (four beeps in headset) by engaging and disengaging SAS prior to liftoff.

CRUISE

CAUTION

With SAS engaged, pilot must always monitor the flight controls and aircraft attitude, and be prepared to immediately assume full manual control if required.

CAUTION

The pilot's hand must be on the cyclic when operating in the vicinity of radio broadcast towers, radar antennas, large airports, or any other source of a high power radio field. Such fields can cause erratic motions of the cyclic and consequent loss of control of the helicopter if the cyclic is not constrained by the pilot's hand. Pilot should disengage the SAS and/or be prepared for automatic disengagement in the vicinity of high power radio fields.

Indications of high power radio fields include random illumination of warning lights, strong interference in the intercom system and aircraft radio receivers, and erratic operation of the governor and tachometer operation.

SECTION 5: PERFORMANCE

No change.

SECTION 6: WEIGHT AND BALANCE

No change.

SECTION 7: SYSTEMS DESCRIPTION

The basic SAS consists of two electric servomotors, a flight control computer, a special panel-mounted attitude indicator which provides the computer with attitude information, an on-off button on the instrument panel, two control buttons on the cyclic stick, and interconnecting cables. One servomotor controls pitch and is installed in the control tunnel forward of the cyclic stick. The other servomotor controls roll and is installed on the inboard panel under the pilot's seat. The servomotors are connected to the cyclic through electromagnetic clutches. The computer is installed on the forward panel under the pilot's seat. The autopilot option replaces the panel-mounted on-off button with a control panel for autopilot mode selection. Available autopilot modes depend on installed avionics.

The SAS senses aircraft attitude using a combination of sensors in the flight control computer and attitude indicator. The computer sends signals to the servomotors to apply small corrections to the cyclic as required to maintain attitude.

The panel-mounted on-off button is used to engage and disengage the system. The button is internally lit with amber OFF indicating that the system is in standby mode and green ON indicating that the system is engaged. Flashing indicates the system is performing a start-up self test.

The cyclic-mounted buttons are the TRIM and SAS OFF buttons. The trim button is used to reset the trim attitude. In addition, holding the trim button for more than 1.25 seconds engages the system from standby mode. The SAS OFF button allows disengagement with hands on controls.

SECTION 7: SYSTEMS DESCRIPTION (cont'd)

Safety monitors automatically disengage the system if a malfunction is detected. Four beeps sound in the headset anytime the system is disengaged either automatically or by the pilot. The four beep sequence also occurs once during each start-up self-test.

When installed, the autopilot control panel is used to engage various autopilot modes. Available modes may include altitude hold, heading hold, navigation signal tracking, and approach guidance depending on installed avionics. The far left button controls the basic SAS. The SAS must be engaged prior to engaging an autopilot mode.

Safety monitors can automatically disengage autopilot modes due to detected malfunctions or loss of navigation signal. Automatic autopilot disengagement is indicated by a single beep in the headset. The basic SAS (attitude hold) is still functional after a single beep. Intentional disengagement of an autopilot mode does not trigger a headset beep.

The SAS is powered via a dedicated circuit breaker on the avionics bus.

SECTION 8: HANDLING AND MAINTENANCE

No change.

SECTION 9: SUPPLEMENTS

No change.

SECTION 10: SAFETY TIPS

The SAS provides stability to reduce pilot workload and enhance safety. It is important that pilots do not misuse this capability and allow their attention to be diverted from monitoring helicopter attitude and looking for traffic and other obstacles. Due to the unstable nature of helicopters, SAS disengagement requires immediate pilot attention. Pilots must always be prepared to take immediate manual control.