# THE STANDSGRAM

## AH-64: USE OF THE FORCE TRIM

By CW4 Andrew Wiegand (Originally Published in Volume 1, Issue 4)

The AH-64 flight control system is designed to aid pilots in flight and reduce their workloads inside the cockpit. Data from recent Class A accidents and experimental flight testing (AH-64E Unanticipated Yaw Study was published on October 10th by the Aviation Flight Test Directorate at the U.S. Army Test Center, Redstone Arsenal) show pilots are not using the force trim system correctly and do not understand the heading hold mode. If pilots use force trim improperly, they may encounter an unanticipated yaw event or uncommanded flight control input that could result in aircraft damage or personnel injury. Improper use of the flight control system is not necessarily the sole cause of unanticipated yaw events in the AH-64E. However, this article aims to clarify the functions of, and relationship between, the SCAS, SAS, and force trim systems to help pilots maintain aircraft control and reduce the likelihood of unanticipated yaw.

The flight management computer (FMC) applies inputs to the flight controls via the Stability Command Augmentation System (SCAS), providing 10% authority in the collective, roll, and yaw axes and 20% authority in the pitch axis. SCAS enables functions such as hold modes and stability and command augmentation. The pilot interacts with this system via the force trim function, which can interrupt the FMC inputs to the flight controls and center the Stability Augmentation System (SAS) sleeve within the servo actuator, allowing full SCAS authority.

Through data collection and pilot observation, aviators make significant flight control manipulations without interrupting force trim when maneuvering the aircraft. In addition to the added workload on the pilot due to fighting against the magnetic brakes and feel springs, flying in this manner can cause an unanticipated yaw. While operating the aircraft below 40 KTS, the heading hold is active unless force trim is interrupted. When decelerating from high-speed flight (>40 KTS) to slow-speed flight (<40 KTS)—such as when conducting an approach to an Out-of-Ground Effect (OGE) hover—heading hold becomes active without indication to the crew.

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If the pilot does not interrupt force trim and make appropriate pedal inputs to maintain heading, the SAS can saturate, and the helicopter may no longer be able to maintain its heading without pilot action. In this case, "SAS SATURATED" will not be displayed to the crew for the yaw axis with the Attitude (ATT) or Altitude (ALT) hold modes off, nor will the aural tone be heard. When the SAS saturates, and further yaw SAS input is required to maintain heading, the helicopter will begin to yaw (most likely to the right). If the yaw SAS reaches its limit (in other words, it becomes saturated) while applying power to achieve In-Ground Effect (IGE) or OGE hover power, the right yaw will accelerate as the collective is increased to stop the aircraft from descending. In this case, the pilot must be ready to react and provide pedal input to prevent the yaw; otherwise, it could accelerate to an un-recoverable profile.

That said, the recommended technique for manipulating flight controls is with the force trim release switch (FTR) actioned/pressed. In other words, the pilot should press the FTR, manipulate the controls to their desired position, and then release the FTR. FTR manipulation should be a continuous process as the pilot maneuvers the aircraft. This technique has several benefits:

1. The magnetic brakes release when the pilot presses the FTR switch, making it easier for the pilot to manipulate the controls.

2. It allows the SAS to center, giving more authority to the SCAS system (3-5 seconds provides time for the SAS to center).

3. It interrupts the command signal sent to the flight controls from the Flight Management Computer (FMC). Ultimately, this technique helps prevent SAS saturation and reduces the pilot's workload.

Pilots must understand the flight control system, its functions, and how their inputs affect the system. Pilots must continuously be in control of the aircraft and make the appropriate flight control inputs when required. Over-reliance on the SCAS system and/or hold modes could be dangerous if the pilot does not monitor the aircraft. If pilots encounter an unanticipated yaw, they must make pedal inputs to correct the yaw. If the yaw is out of control, the pilot must use the recovery procedure published in STACOM 24-04. The AH-64E unanticipated yaw study published by the Aviation Flight Test Directorate can be found in the Knowledge Sharing folder of the DES SharePoint.