

BAE SYSTEMS

Active inceptor systems

Pilot controls for commercial aircraft



What are inceptor systems?

Inceptors are the controls that pilots use to direct and maneuver the aircraft. They are flight critical. Commonly referred to as "sticks," inceptors cover a variety of pilot controls on fixed- and rotary-wing platforms including side sticks, center sticks, throttles, cyclics, and collectives.

Inceptors traditionally are connected to directional aircraft surfaces and power controls through mechanical linkages.

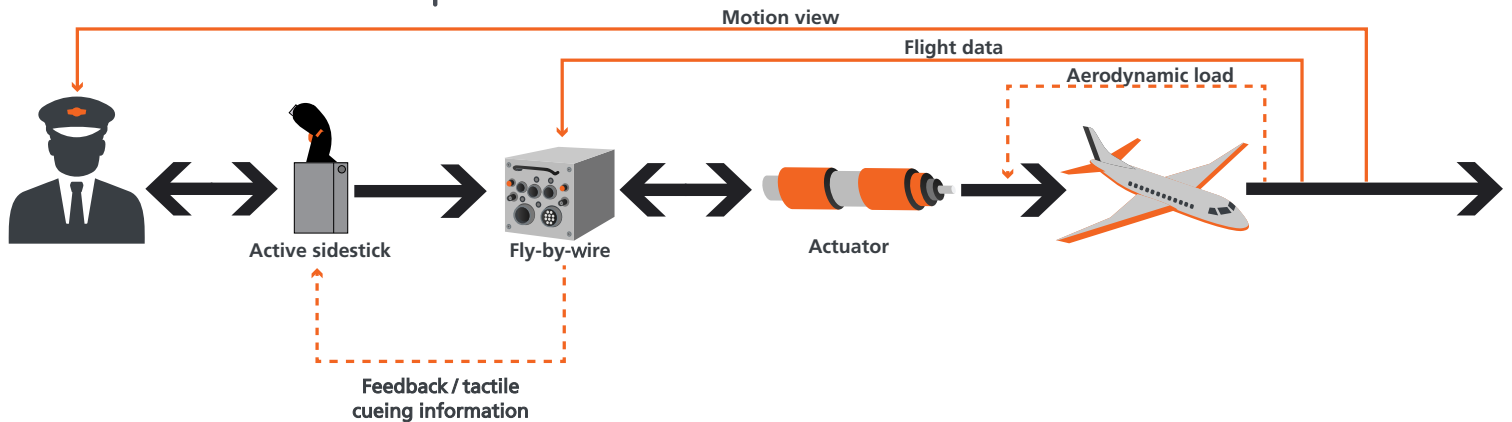
On fly-by-wire aircraft, the inceptors transmit pilot inputs to the flight control computer, which translates them instantaneously to commands that adjust directional surfaces and power.

Active inceptor systems feed information from the aircraft's fly-by-wire system to the pilot through the inceptor (see diagram below). This "tactile cueing" is one of the many benefits of an active inceptor system.

In an active inceptor system, two inceptors can be electronically coupled as if they were mechanically linked. Dual-pilot aircraft can thus benefit from the additional feel and cueing capabilities without the weight and through-life cost penalties of actual mechanical linkages.



How active inceptors work



Why active inceptor systems from the world leader?

BAE Systems is the world's only provider of flight-worthy active inceptors, with more than 25 years of design experience in active stick technology. Our inceptors meet the highest levels of reliability and integrity for both military and commercial aircraft applications.

Active inceptor systems technology



The next step in the evolution of commercial flight controls is the introduction of active pilot controls. These systems are already used in military aircraft, replacing traditional, passive pilot controls. Active inceptors provide force feedback directly into the pilot's hand, in real time. This force feedback, or tactile feedback, may take the form of various pilot cues — such as variable gradients, force breakouts, detents, ramps, gates, and soft stops — to warn of mode engagements or impending flight envelope limits.

Benefits

- Reduced through-life cost
- Future growth capability through programmable features
- Improves pilot and co-pilot awareness through electrical linking
- Unrestricted views of the displays
- Improved safety and performance through the use of tactile cues
- Lower system weight and reduced mechanical complexity over conventional column and wheel (C&W)
- Introduction of active technology allows simplified control laws and more intuitive feel / control modes

Active inceptor systems versus other systems

Requirements	Column & Wheel	Passive Stick	Active Stick
System offers unrestricted view of displays	Does not have capabilities	Has capabilities	Has capabilities
Easy pilot ingress and egress with a comfortable body position	Does not have capabilities	Has capabilities	Has capabilities
Replication of a Q feel system	Has capabilities	Does not have capabilities	Has capabilities
System offers a variable amplitude stick shaker	Does not have capabilities	Has capabilities	Has capabilities
Jams - allow full authority to unjammed stick	Does not have capabilities	Has capabilities	Has capabilities
Forces, breakouts, damping can be easily changed during flight	Does not have capabilities	Has capabilities	Has capabilities
Eliminates field maintenance	Does not have capabilities	Has capabilities	Has capabilities
Force sensor inputs to control law	Does not have capabilities	Has capabilities	Has capabilities
Tactile feedback for dual pilot inputs	Has capabilities	Does not have capabilities	Has capabilities
Installation benefits	Does not have capabilities	Has capabilities	Has capabilities
Cockpit layout and arrangement benefits	Does not have capabilities	Has capabilities	Has capabilities
System training benefits through the use of linked mode	Has capabilities	Does not have capabilities	Has capabilities
System capable of high bandwidth tactile cues	Does not have capabilities	Has capabilities	Has capabilities
Autopilot back-drive moves the stick as a visual cue	Has capabilities	Does not have capabilities	Has capabilities
Offers sidestick handling quality improvements	Does not have capabilities	Has capabilities	Has capabilities

 Has capabilities
 Does not have capabilities



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