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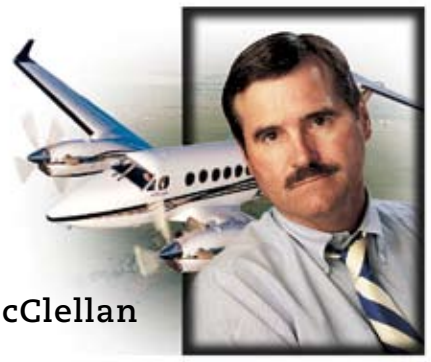
FLYING

Product Analysis:

Why You Want an Autothrottle

Left Seat



By J. Mac McClellan
EDITOR-IN-CHIEF

Why You Want an Autothrottle

It has been 50 years since Safe Flight Instrument Company developed the first practical autothrottle system, but only a small minority of pilots have been able to fly this most useful and safety enhancing equipment. But that is starting to change. Safe Flight is now offering its AutoPower system in midsize business jets, when before it had only been installed in airline and large business jets such as Gulfstreams and Global Expresses. It's not an impossible dream that autothrottles will someday be available even in single-engine airplanes.

Back in 1956 Safe Flight introduced a system it called AutoPower in a DC-3 as the first autothrottle system. The company had pioneered angle of attack sensing and stall warning equipment, and AutoPower was a logical next step. Safe Flight had already developed a device it called Speed Control that measured angle of attack and commanded the pilot, by means of a cockpit instrument, to add or reduce power to maintain optimum speed for climb or approach. AutoPower connected servos to the throttles to automatically adjust power to follow the Speed Control commands.

You can imagine how easy it would be to fly an ILS approach when the airspeed was automatically and perfectly controlled, and that's what AutoPower did in 1956, and what autothrottles do today. AutoPower was a technical success, but not a big seller. The real acceptance of autothrottles came when Safe Flight linked the system to airspeed, not just angle of attack.

The modern autothrottle controls power, and thus airspeed, from takeoff to touchdown. A press of the takeoff go-around (TOGA) switches on the thrust levers sets computed takeoff thrust automatically. You dial in the climb airspeed, and the throttles adjust to maintain it. In cruise, you select indicated airspeed or Mach number, and power is continuously monitored and adjusted to maintain that exact airspeed as weight and atmospheric conditions change. Pilot workload is greatly decreased, while fuel efficiency and airplane

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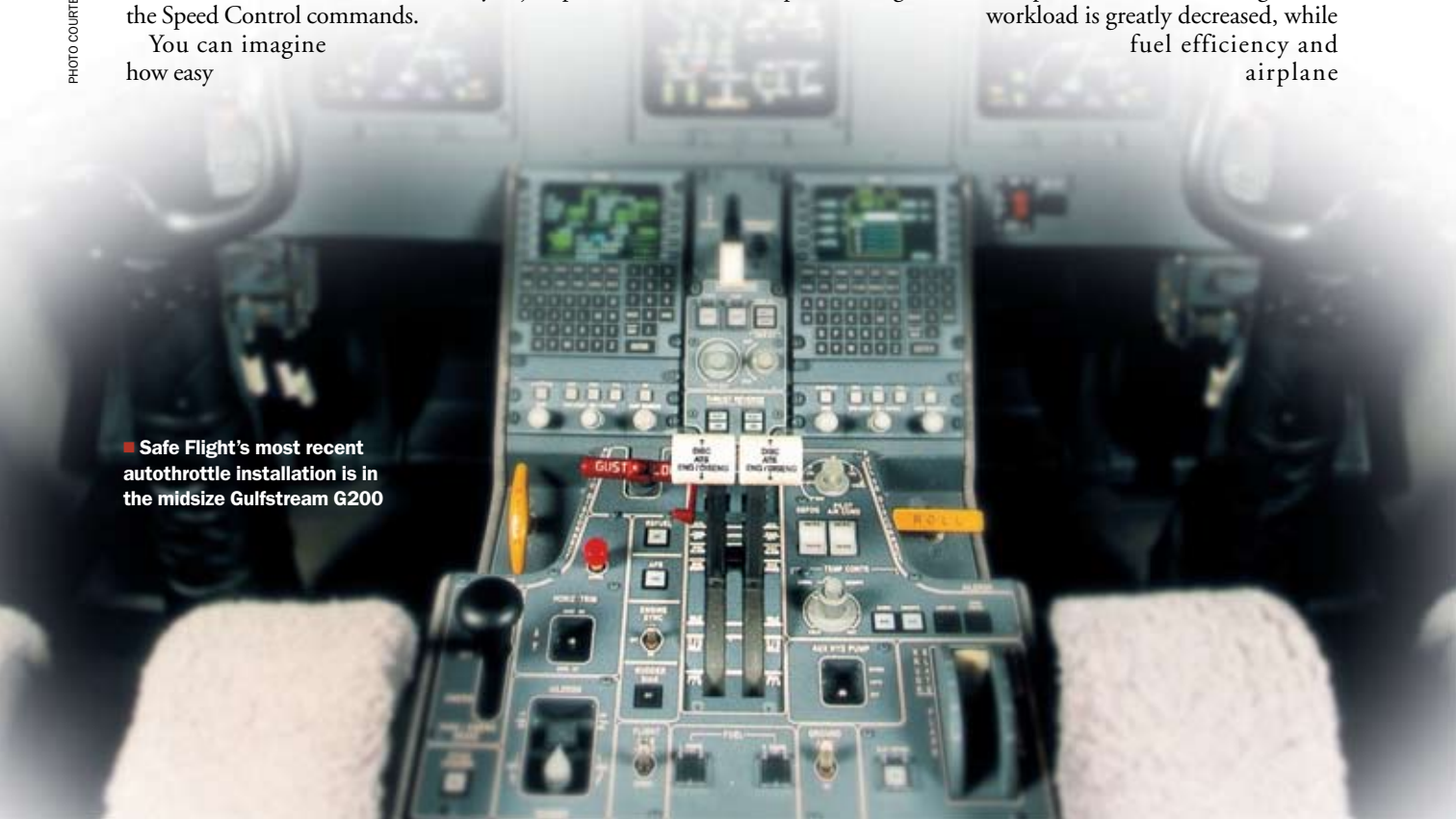
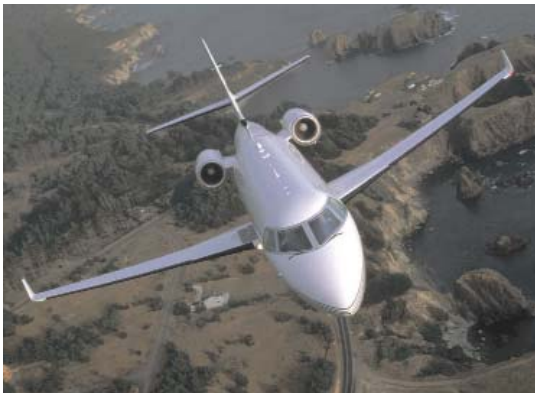


■ **Safe Flight's most recent autothrottle installation is in the midsize Gulfstream G200**

performance improve because of the precision of power management.

The reason autothrottles have been restricted to the most capable and costly jets is that the system is complicated. Before electronic computers came along (fadec) to control jet engines, the autothrottle had the job. The system had to be smart enough not to exceed engine limits, which could easily be done if the autothrottle shoved the levers to the stops. The autothrottle also must be integrated with the autopilot for fully coupled flight, but still be capable of maintaining selected airspeed when the human pilot is hand flying.



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An autothrottle system also needs servos in the power quadrant to move the levers as power changes. It would be possible to connect the autothrottle system directly to the engines and not involve movement of the actual power levers, but Safe Flight and other U.S. companies have not gone that route. Airbus, with its fly-by-wire cockpits, has chosen to not move the actual power levers in some of its airplanes because computers are manipulating every control surface in any case. People who believe—and that includes me—that the power lever position should always match the power selected, no matter if it's a human or the autothrottle changing power, call the Airbus method "limp sticks." Most of us want to see and even feel the power levers moving, just like we want to see the autopilot moving the controls and wiggling the pedals.

However, the biggest reason I'm hopeful that autothrottles will become available in more and more airplanes is the coming of computerized engine control. With fadec managing all aspects of engine operation, the autothrottles mission is reduced to adjusting available power to maintain selected airspeed without worry of exceeding engine limits or calculating available power for takeoff or climb. The fadec handles that. Also, digital air data computers' prices have come way down, so the fundamental raw data for the autothrottle, precise airspeed, is now available in many airplanes.

`There is, however, one fadec feature that is a problem for autothrottles, and that's throttle detents for takeoff, climb and so on. The autothrottle servo moving the power lever doesn't need the detents, but it can stumble over them as it smoothly and continuously adjusts power. A solution appears to be virtual detents that can be detected by the human pilot, but be invisible to the autothrottle when it is engaged and moving the levers.

I had never dared to dream of an auto-throttle in a personal airplane, turbine or even piston, but then I never imagined glass cockpits with solid state attitude and heading systems in piston singles would be here. I can't predict when autothrottles will be available in even light jets, much less piston airplanes, but I do believe they are on the way. And once you fly with it, you won't want to tackle a tight approach without it.

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(914) 946-9500 www.safeflight.com

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