

Modifications For Cessna Cardinals

by DON DOWNIE / AOPA 188441

Cessna is picking up the tab for a 26-item modernization program on the 177/*Cardinal*. The factory's service letter points out that "Operation Cardinal Rule" is a program that will provide "several important improvements, with real customer benefits, at Cessna's expense.

"'Operation Cardinal Rule' should be incorporated in all 177/*Cardinals* in the field as soon as practical. Of particular importance are [six] to be completed immediately [within the next ten hours of aircraft operation]."

One of the right-now modifications is "a stabilator slot installation where slots are incorporated in the leading edge for improved airflow and stabilator control at slow speeds."

Another item on the list is replacement of the mass balance weight on the stabilator with a weight equal to 100% of the static weight, rather than the 75% used on the original 1,000 production models.

Part of the same modification package is a tail-skid modification with an extended, widened and strengthened casting.

As one of the reporters who commented in print about the original *Cardinal's* over-sensitive stabilator control (Nov. 1967 *PILOT*, "The *Cardinal* Flies West"), it was most interesting for me to fly one of the recently modified *Cardinals* with W. D. Thompson, manager, flight test and aerodynamics, Commercial Aircraft Division, Wichita.

In AOPA's original *Cardinal* evaluation I had commented, "In weather that I'd term at least 'moderate' turbulence, the big stabilator proved quite sensitive. There was a slight tendency for the gust loads to transfer back to the wheel and trap the pilot into fighting the wheel and over-controlling (pilot-induced-oscillation.)"

So, after cussing and discussing this flying tail during a 14-hour delivery

flight to San Francisco, I had a very personal interest in getting behind the controls of Cessna's "fix" for the extra-sensitive flying tail.

Bill Thompson explained that the tail modification included inverted slots on the inner one-third of the span of the leading edge of the stabilator as well as the increase in counter-balance weight and tail bumper.

The slot in the stabilator is designed to keep the center one-third of the tail flying rather than stalling. It is a conventional wing slot installed upside down since flight loads on the stabilator are to keep the tail down. Thompson explained that the original choice of the flying tail for the *Cardinal*—a new departure for Cessna—was dictated by moving the wing far enough aft to give complete pilot visibility forward of the leading edge. Sufficient elevator control was required to assure a smooth flare-out in an extreme forward center-of-gravity situation with two heavy pilots, no passengers and no baggage.

The powerful, light control touch of the *Cardinal's* stabilator system presented a unique challenge to new pilots on checkout and several aircraft were damaged by over-control of the powerful flying tail. In some cases, both nose gear and tail tiedown were permanently impressed.

The new "Operation Cardinal Rule" had just been put into effect when Bill Thompson, passenger Rudy Adler and I climbed into a *Cardinal* for a brief flight check. Thompson is a veteran member of the Society of Experimental Test Pilots (SETP) while I've been an associate member for nearly six years.

It was a typical Kansas day with surface winds gusting to 30kn, fortunately down Cessna's delivery runway, so we broke ground quickly and climbed to 3,500 feet. During the climb out in the turbulent air, I let go of the control wheel and trimmed the climb by

tab alone. The "fixed" *Cardinal* was most responsive and had no tendency to pitch or buck despite the turbulence.

In level flight, there was virtually none of the original model's tendency to assume unusual angles of climb or dive in rough air and there was no noticeable elevator "nibble." Stalls, both with flaps up and down, were routine and docile. Accelerated stalls out of a steep dive required sufficient control pressure so that pilot induced oscillation would be very difficult to obtain. All stalls broke cleanly with a more-than-adequate prestall buffet. There was complete control throughout the entire stall.

Cessna's reed-type stall-warner wails in anguish whenever you approach a stall. It still sounds like a tired, out-of-tune bag-pipe.

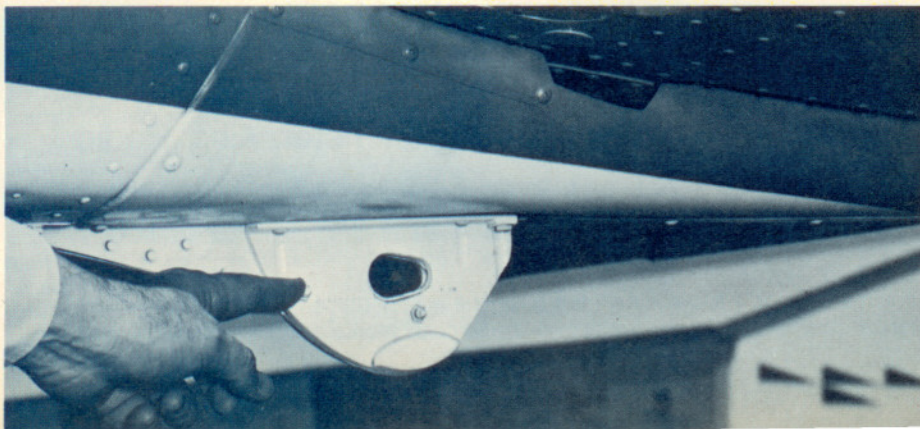
On landing, I deliberately tried to drag the new tail bumper. I made a half-flap, full-stall landing with a little power added to hold the tail down. However, we were fairly light aft with only one passenger and no baggage, so I didn't take any paint off the enlarged tail tie-down bracket.

After the previous complaints, I was most pleasantly surprised by the efficiency of the new modification. I'd "guesstimate" that at least 85% of the comments I'd made about the original *Cardinal* tail have been rectified. Don't judge the longitudinal control of this beautiful new Cessna bird until you've flown the modified *Cardinal*.

Perhaps the factory will even name the modified model, the "*Cardinal II*." □



Cessna's W.D. Thompson points out to Don Downie the stabilator fix given a *Cardinal* under the company's *Cardinal* modification program.



Close-up of the new *Cardinal* tail bumper, designed to help remove some of the sensitivity of the plane's "flying" stabilator and give pilot better control in turbulence.