

# GRIPEN LIKELY TO FLY AGAIN SOON

CAROLE A. SHIFRIN/LONDON

**A** preliminary report on the crash of the Swedish JAS 39 Gripen fighter earlier this month has put blame on the flight control system's high amplification of stick commands combined with the pilot's "large, rapid stick movements."

"This led to the stability margin being exceeded and the aircraft entering a stall," Sweden's accident investigation board said. The panel said a contributing factor was the late display of the aircraft's "STYRSÄK" flight attitude warning, which gave the pilot too little time to react.

The board said action should be taken to eliminate the risk of pilot-induced oscillation in the aircraft's envelope. After this has been implemented and verified, the board said it saw no safety reason why flights should not be resumed.

The preliminary report of the Aug. 8 accident ruled out a system or design deficiency in the Gripen's advanced flight control system, which had caused the crash of the first prototype in February, 1989. A finding of a serious design fault would have caused a major reevaluation of the multirole Gripen (AW&ST Aug. 16, p. 78).

The problem will be relatively easy to correct and the aircraft should be flying again within the next three to five weeks,

Swedish air force officials said.

The preliminary report on the crash, which occurred during an air display over central Stockholm, said that Saab Military Aircraft test pilot Lars Radestrom had entered a low-speed turn at a 280-meters (919-ft.) altitude with lit afterburner and a speed of 285 km./hr. (154 kt.). During the left turn, the aircraft's angle of bank was about 65 deg., loading about 2g and angle of attack about 21 deg.

When leaving the turn, the pilot applied an almost maximum movement of the control stick to the right as he was pushing it forward to assume level flight. The large stick movement caused the aircraft to roll over to the right while the angle of attack decreased. Attempting to level quickly, Radestrom then applied a large movement of the stick to the left while continuing to push forward to lower the nose.

The elevons moved with maximum speed, changing the aircraft's flying characteristics and reducing its stability margin. This is when the control system sent a signal to the aircraft's STYRSÄK warning system that the maximum rate of elevon deflection had been reached. The aircraft responded to the pilot's command with a roll to the left combined with a nose-up movement.



To correct these movements, Radestrom moved the stick almost all the way to the right and somewhat forward. The aircraft then rolled to the right with an angle of bank of about 35 deg. in combination with a nose-down movement to -7 deg. angle of pitch. Radestrom then moved the stick rapidly backwards and to the left to lift the nose at the same time that the aircraft's stabilizing functions attempted to lift the nose.

"This caused the nose-up movement to be amplified so much that the stabilizing effect of the elevons was insufficient, whereupon the aircraft went into a superstall and became uncontrollable," the preliminary report said.

The STYRSÄK warning to the pilot that

# TAIWAN INDUSTRY SEEKS MAJOR GROWTH

MICHAEL MECHAM, TAIPEI, TAIWAN

**T**aiwan aerospace companies, which now have annual military and civil aerospace programs valued at some \$1 billion, want to grow six times as large by the end of the decade through joint-venture work with foreign partners.

That theme was stressed last week at the Taipei Aerospace Technology Exhibition, which attracted 230 exhibitors from 15 nations—60% more than in its first outing two years ago. The exhibition is proving such a draw that organizers are considering the inclusion of flying displays for 1995.

**THE REPUBLIC OF CHINA'S** IDF fighter was shown only in a full-scale mockup version inside the exhibition hall. But two of the first production models—single- and twin-seat versions—were publicly

displayed for the first time at the nearby Shun-Shan air base. They appeared alongside the AT-3 advanced jet trainer, shown in a single-seat light fighter configuration and as a twin-seat trainer. Taiwan Aerospace hopes to compete the AT-3 in the U. S. Joint Primary Aircraft Training System competition.

By government estimate, Taiwan's annual aerospace growth rate will be 20% through 1996. Achieving \$6 billion in annual maintenance and production work by 2000 would be even more spectacular. But David R. C. Chu, director of the Committee for Aviation and Space Industry Development (CASID), said it should be possible, using the pending British Aerospace/Taiwan Aerospace agreement to jointly produce the RJ re-

gional commuter jet and the pending F-16 and Mirage 2000-5 fighter acquisitions as springboards.

CASID, the government agency charged with promoting Taiwan aerospace development, has strong backing from President Lee Teng-hui. In an address prepared for the exhibition, Lee emphasized that of the eight key industrial technologies identified in his national economic stimulus package, seven are applicable to aerospace.

**CHU DESCRIBED TAIWAN'S** goal as being an Asian aerospace "hub" in league with foreign partners rather than any grander scheme of acquiring technology now in hopes of setting off later on an independent course.

"Our goal is to be the best partner of the best companies," he said.

Neither Dassault nor ROC Defense Ministry officials will discuss details of the pending sale of Mirage 2000-5s. Of particular interest is what type of offset agreement might be achieved for the fighter.



First JAS 39 delivered to the Swedish air force crashed during a flight display in Stockholm.

he was beginning to saturate the control system was displayed 1 sec. after the rapid stick movement. Just 6.2 sec. elapsed from the time the pilot gave the command to leave the turn until he ejected.

The delay in display of the STYRSÅK warning meant the pilot did not have a chance to react, the report said. The low altitude did not give him the opportunity to take action to regain control of the aircraft, and his decision to eject was correct, it concluded.

Officials said the problem that caused the accident had been identified during the development program. But the risk of the situation occurring in flight was considered "negligible." ■

The model is most likely to be the agreement now being implemented with Lockheed for the F-16. It calls for offsets worth 10% of the \$6-billion contract for 150 aircraft.

**LOCKHEED OFFICIALS** are expected to begin canvassing 19 Taiwan factories this week to select candidates for offset work.

Chu said Taiwan does not have priorities for the offsets. Maintenance and re-supply are expected to be the major elements, although original parts supply could be an element in later block deliveries, he said.

Most important is to hear Lockheed's analysis of the local industry, he said. "We have little experience, so we have to rely on Lockheed's expertise," he said.

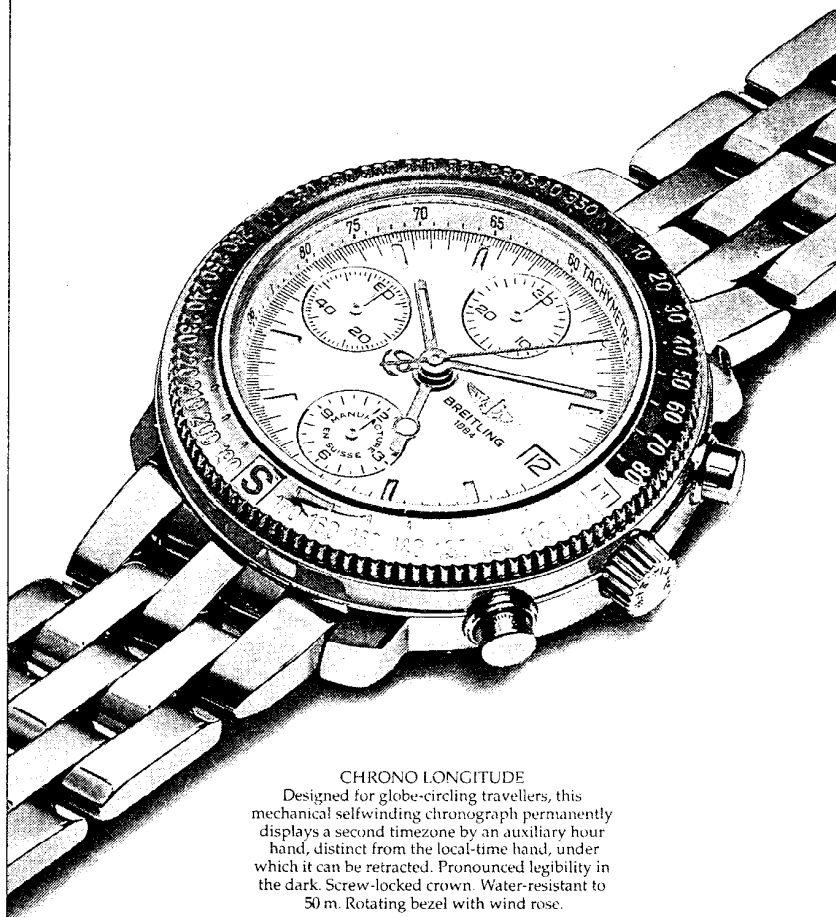
Taiwan's metallurgy industries are expected to provide the core for the offsets, which means air frame and perhaps some engine parts will be produced. That is because Taiwan should be able to achieve certification in airframe parts faster than in military electronics, Chu said. ■



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