



RECORD OF CONVERSATION

All persons listed were interviewed by Zoë Keliher:

The following is a summary of conversation:

PETE (DANIEL) STOGSDILL (AFT SEATED PILOT) AND ROHAN MORAJKAR (FORWARD-SEATED PILOT)

You can plainly see that the drive link is disconnected exactly where I had thought. I had inspected the spoiler connections during the first Conditional inspection and thought that the link that closes the spoiler was very weak looking. It's hard to inspect that area without a good mirror and flash light when the wing is removed from the aircraft, and it's impossible to inspect it when it's assembled.

There's lots of structure to force them to open but DG welded what looks like a bearing to a push/pull tube and with 25 years of pulling on that bearing, I now think it may have had cracks or had been hardened by the manufacturing methods used and years of pulling against the outer ring flexed it until it let go.

The additional forces of the wing bending moment, and the air loads trying to suck it out caused the weakened ring to fail.

The Grob G103 Twin II gliders have a recurring inspection on the spoiler system. Due to the stresses imposed during closing them. The Grob however has a lot more metal around each of its connections.

The Elan Flight and Maintenance Manual has very little inspection requirements outside of preflight and annual inspection. There is one Service Bulletin that addresses adjustment of the drive link but has nothing for inspection of the rod end that failed. There may be more but I did not find any additional spoiler related items.

I'll ship you that as well. What I felt was really odd though is that there is no special inspection material for aerobatic imposed issues. Like pulling too many "G's" or over speed, and accidental tail slides. I was going to pull the aircraft out of service the following week at the approximate 10 hour mark and just look things over. Due our increased acro flying and a second hand report of a hard landing the day prior. I had also planned to contact the USAF to see if they would share any inspection program information relating to their DG1000 gliders. We just didn't get there.

I'll work on that information tonight.

Thanks Dan(Pete) Stogsdill

It's pretty obvious now, how it could work harden. DG May have already addressed this issue. I pulled what SB's I could find but does not mean there not out there. Also since this aircraft was built by Elan, DG May have changed this component prior to them building them for Standard Airworthiness Certification. I don't know how many DG500's are in service that could be affected. I will make contact with one of the USAF former commanders tomorrow and see if they have encountered anything like this on the DG1000 they operated. The aircraft look very similar in construction and design.

The maneuvers planned during this flight were to be the Sportsman Glider sequence. The maneuvers began 3 miles north of the El Tiro Gliderport at 7,000 feet above ground level (AGL). We had completed the Reverse Half Cuban, Lay Down Humpty, Loop, 90 Degree Turn and ¼ clover. The next maneuver was to be the Sharks Tooth. At an altitude of approximately 5,000 feet AGL. a pitch up to the 30° up line was initiated and then the roll to inverted. The nose dropped to approximately 20° above the horizon but I elected to continue the maneuver thinking this would be a common mistake and was intending to evaluate whether this

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was to be allowed. The aircraft slowed and stalled in the inverted position. I verified that the stick was full forward and removed my hand from the control stick.

I called the pull to the vertical down line. The rear-seated pilot stopped about 5° to 10° short. I repeated pull to vertical and nudged the control stick aft to get to the vertical and called for recovery. The rear-seated pilot responded with too easy of a pull on the stick and the front-seat pilot eased the stick back to establish a 4g recovery. At this stage the airspeed shot from around 90 kts. right up to the VNE in what seemed almost instantaneously. The recovery up to that point seemed to be normal but as we approached the level attitude the ASI continued to increase in speed. I saw the needle swing past 155 kts. and then around this time we experienced a high frequency elevator flutter with the nose still below the horizon.

We were now climbing out of the dive but still accelerating. The rear-seated pilot smoothly added additional back pressure at that point moving the g-loads towards the upper limits in an attempt to slow down quicker. Soon after the increased back pressure, the right spoiler suddenly slammed to full deployment causing a jerk to the right. The spoiler control was still in the locked position. The aircraft was still below but was now approaching the horizon attitude and yawing to the right. When the spoiler deployed, the elevator flutter decreased in frequency but increased in amplitude causing large forward and aft movements of the control stick. The rear-seated pilot decrease the resistance on the stick to reduce the resistance on the elevator control circuit. The front-seated pilot had hoped to just dampen the elevators movement as opposed to just increasing the resistance on the joints.

The glider slowly rotated to a nose high attitude and the last glance at the ASI indicated they airspeed was in excess of 160 kts. The flutter stopped as the aircraft slowed and stabilized in a nose-up climbing right turn and then stabilized into a normal pitch flight attitude but still banking right. Just shortly before the elevator vibration stopped, the front-seated pilot felt what seemed like something just let go in the control circuit.

The glider felt as though there was no elevator control and they were 4,500 feet AGL. The right spoiler was still full open and the left side worked normally; the ailerons and rudder felt functional. The front-seated pilot decided to make a precautionary landing back at the gliderport and became proficient in controlling the glider with the remaining controls that were operable. As they descended down to 1,000 ft AGL, they both decided they felt more comfortable landing the glider than parachuting out. The front-seated pilot made a series of "S" turns and circled to loose altitude with an intention to land on runway 35L.

On the way to the runway and having a lower angle view of the horizon, the decent rate was higher expected due to the right spoiler open and flying in a crab. Upon seeing the tree line approaching he decided to land in a flat area of desert just south of the runway and use the trees and bushes for cushioning and braking. The approach to the selected landing area went well at 20' I raised the nose for a level attitude and slowed but the slight wind was reduced at about the height of the small trees and we settled sooner than he planned. The main wheel touched down onto a berm at the base of a small bush and broke off the empennage.

The front-seated pilot stated that he thought the damage to the glider in flight was because of the excessive speed they reached during the maneuver recovery. He stated that the event was because:

1. the nose high angle being less than optimum and even though they stalled (it was not an accelerated) they did not have the normal speed reduction for a properly executed Sharks Tooth maneuver.
2. The pause at the negative down angle gave additional time to accelerate.
3. The rear-seated pilot had made a lighter than required move to pull up the and was too slow for this unusual recovery.
4. The front-seated pilot delayed the recovery and the glider exceeded Vne of 146 Kts.
5. The front-seated pilot stated that he should have initiated at the recovery at the on set of the low angle up line and taken the controls right after the vertical line was not met. The Shark tooth is one of the~ maneuvers to do even with it's down line requirement. He had done it at least 6 times in the glider with different cockpit and CG loads and there was no problem with recovery

The pilot performed a post-accident inspection of the glider and noted: the drive link is disconnected where it closes the spoiler. That area is hard to inspect without a good mirror and flash light when the wing is removed from the aircraft, and it's impossible to inspect it when it's assembled. There's lots of structure to force them to open but there appears to be a bearing to a push/pull tube welded it may have had cracks or had been hardened by the manufacturing methods used and years of pulling against the outer ring flexed it until it let go. The additional forces of the wing bending moment, and the air loads trying to suck it out caused the weakened ring to fail.

He further stated that: The Grob G103 Twin II gliders have a recurring inspection on the spoiler system. Due to the stresses imposed during closing them. The Elan Flight and Maintenance Manual has very little inspection requirements outside of preflight and annual inspection. There is one Service Bulletin that addresses adjustment of the drive link but has nothing for inspection of the rod end that failed. There is no special inspection material for aerobatic imposed issues. Like pulling too many "G's" or over speed, and accidental tail slides.

JELMER WASSENAAR - DG-FLUGZEUGBAU GMBH (HEAD OF DESIGN ORGANIZATION)

Hello Zoe,

My answers to your questions are written in blue:

-Have you seen any other failure like this (in the rod-end of a spoiler)?

We've had cases reported in the past of the air brakes being pulled out in negative g-flight, which lead to an AD of the German authorities at the time. Please refer to the attached technical note TN348-4T. As this was in 1994, I cannot tell you whether there were also cases where the rod end broke off.

-Is there anyway to retract/release the spoiler in an emergency?

It should have been possible to deploy the other air brake with the normal controls to compensate the asymmetric behaviour and have some (reduced) control over the approach glide path.

-Does DG have any pilot guidance for a spoiler malfunction?

The air brakes (spoilers) should not be used for normal aerobatics, but can be deployed for emergencies. There is no emergency procedure described in the FM for air brake malfunction.

-Is there any maintenance checks on the spoilers? Especially if used for acrobatic purposes?

The inspection, as given in pages 2 and 3 of the TN348-4T, is part of the annual inspection and as such listed in the maintenance manual. The over centre force has to be measured and set accordingly. If the rod end on the air brake side broke off, the stiffness of the air brake control in the wing should be inspected to exclude any damage to the air brake control support structure on the root rib.

It's likely the loose air brake fluttered by itself (with a lower frequency than the elevator) and possibly after some time the rod end snapped (since the airspeed was far over V_{ne}, as the ASI in our gliders typically has a scale up to 160 kts max. and they were even above that) We do factory flutter testing up to 10% over V_{ne}, so they were above that. If I understand correctly, no damage was found on the elevator control after the accident (to substantiate the snapping that was felt in the controls).

From FAA Glider Handbook

Spoiler/Dive Brake Malfunctions Spoiler/dive brake system failures can arise from rigging errors or omissions, environmental factors, and mechanical failures. Interruptions or distractions during glider assembly can result in failure to properly connect control rods to one or both spoilers/dive brakes. Proper use of a comprehensive checklist reduces the likelihood of assembly errors. If neither of these spoilers/dive brakes is connected, then one or both of the spoilers/dive brakes may deploy at any time and retraction becomes impossible. This is a very hazardous situation for several reasons.

Another reason is that the spoilers/dive brakes might deploy asymmetrically: one spoiler/dive brake retracted and the other spoiler/dive brake extended, resulting in yaw and roll tendencies that do not arise when the spoilers/dive brakes deploy symmetrically.

If asymmetrical spoiler/dive brake extension occurs and the extended spoiler/dive brake cannot be retracted, several choices must be made. Roll and yaw tendencies due to 8-25 asymmetry must be overcome or eliminated. One way to solve this problem is to deploy the other spoiler/dive brake to restore the symmetry. The advantages include immediate relief from yaw and roll tendencies and protection against stalling with one spoiler/dive brake extended and the other retracted, which could result in a spin. The disadvantage of deploying the other spoiler/dive brake is that the glide ratio is reduced. If the spoiler/dive brake asymmetry arises during launch or climb, the best choice is to abort the launch, extend the other spoiler/dive brakes to relieve the asymmetry, and make a precautionary or emergency landing.

Mechanical failures can cause asymmetrical spoiler/dive brake extension. For example, the spoiler/dive brake extend normally during the prelanding checklist but only one spoiler/dive brake retracts on command. The other spoiler/dive brake remains extended, due perhaps to a broken weld in the spoiler/dive brake actuator mechanism, a defective control connector, or other mechanical failure. The glider yaws and banks toward the wing with the extended spoiler/dive brake. Aileron and rudder are required to counteract these tendencies. To eliminate any possibility of entering a stall/spin, maintain a safe margin above stall airspeed. If the decision to deploy the other spoiler/dive brake is made to relieve the asymmetry, controlling the glider becomes much easier but gliding range is reduced due to the additional drag of the second spoiler/dive brake. This may be a significant concern if the terrain is not ideal for landing the glider. Nevertheless, it is better to make a controlled landing, even in less than ideal terrain, than it is to stall or spin.