

Airvan 10 Incident Report

The aircraft was the first production GA10 VH-XMH and was operating in the US Experimental Category for the trials period. The certification spinning program (base GA10) had been completed on the GA10 prototype VH-XGY. This program had been completed with some difficulty and it was necessary to place a limitation on the aircraft by addition of limitations on fuel quantities at the aft CG. It had been necessary to deploy the anti-spin parachute during flight tests in the truncated portion of the weight/CG envelop. (In reality, this limitation had little impact as it was extremely difficult to load the aircraft in the truncated region within the normal category limitations).

The spinning characteristics of the aircraft were described in the certification report (Ref 1) and the report detailed the critical spin configuration (an abused entry – crossed controls ie LEFT rudder, RIGHT aileron with TAKE-OFF flap set and POWER on established in a LEFT hand turn). However, the major influence on spin behaviour at the most aft CG was the bank angle at entry. The report made particular reference to the marked deterioration in spin recovery tendencies for entries from a LEFT coordinated turn. Hence the critical certification point was an abused entry from a LEFT turn – crossed controls LEFT rudder with TAKE-OFF flap set and power ON. When a spin was attempted in this manner at maximum take-off weight, and with the CG at the rear limit, the aircraft showed signs of not recovering within two turns and the anti-spin chute was deployed and the aircraft promptly recovered. This then resulted in the truncation of the envelope (effectively through a limitation on fuel) and those limits are now specified in the Aircraft Flight Manual. All spins from this program were completed using VH-XGY.

Initial spinning trials with the cargo pod fitted were completed in Australia using aircraft XGY flown by company pilots, with the aircraft configured well away from the critical flight conditions as established above. For this program, the approach of GippsAero was to use Test Pilots from the US who were DERs and who specialised in spin certifications for the more critical spins whilst in the developmental phase, and for certification trials. For these trials there was limited availability of such a test pilot for any continuous period which made scheduling a solid program in Australia difficult, and hence it was decided to send an aircraft to the NTPS facility at Mojave.

The decision to use production aircraft VH-XMH rather than VH-XGY was that a production aircraft would be more representative for spinning trials and, at the completion of the spinning trials, it could subsequently be used as a demonstrator for any marketing activities. However VH-XMH was not instrumented, and hence it would not be easy to compare identical test points between the original certification and the flights with the cargo pod fitted.

From a certification aspect, this would necessarily require more test points and hence greater exposure of the test aircraft and test crew to hazardous test flying. A standalone AHRS was sourced and added to the already installed video cameras which, it was hoped would provide sufficient attitude information to make some comparison possible. This then comprised the entire data recording suite.

Unusually, the aircraft was to be flown (when conducting spin tests) with both the NTPS test pilot and GippsAero test pilot. As the aircraft was Australian registered, it could only be flown by persons with either a CASA (Australian) Licence (The GippsAero pilot was so licenced) or a CASA authorised

validation of a FAA (US) licence. The NTPS test pilot (Greg Lewis) had flown the basic aircraft during the spinning trials with a CASA validated FAA (USA) licence, and was eligible for such a validation again, but due to considerations of recent flight time on the type, an application to CASA was not made for the operations at Mojave. Hence, the GippsAero pilot was to command the aircraft on all flights.

For the program, NTPS would provide support services as required. The hazard analysis required before each flight and the necessary flight briefings would be facilitated by NTPS personnel. Prior to the actual commencement of the trials, the aircraft was prepared for the trials by a GippsAero Australian LAME(A&P), but only the GippsAero test pilot and another company pilot (who would co-pilot the chase aircraft) would be onsite at Mojave during the actual flight trials.

The spinning flight trials commenced and proceeded until May 31 2018, when the aircraft exhibited some aberrant behaviour and the GippsAero pilots contacted the GippsAero Flight Test Engineer who was the Chief Design Engineer (CDE) and forwarded the AHRS data. The configuration for that test point was flaps UP, wings LEVEL entry, power ON, LEFT rudder, RIGHT aileron.

Test flying ceased pending the analysis of the data. That data showed a good correlation with a set of results obtained in the original trials. However, that set of results were for spins at the most aft CG where compliance was just demonstrated by the aircraft (VH-XGY). Hence, now, it was clear that flights more adverse could not be contemplated. The FTE described the spins at this point as the aircraft being "on the ragged edge". To provide a margin for any further flights, a CG further forward of this last test point was established as a CG point, aft of which flight was not permitted. Further flights at this more forward position were authorised for flaps up and TO with a limited matrix mainly to examine in more detail the aberrant behaviour as noted in the previous flight at the more forward CG and flying recommenced.

At the final briefing prior to the next flight, spins at landing flap were inserted into what had previously been agreed without further consultation with the CDE at GippsAero. The GA10 flight crew considered spins with land flap selected to be more benign than the other flap settings.

Spins on the final flight are briefly described below. However, given, the concern about the trials, it is surprising that the day's trials did not commence spins of lesser criticality before proceeding to abused entry with power on and land flap.

The FIRST spin.

The first spin was an abused entry, conducted with power ON, LAND flap, wings LEVEL entry, LEFT rudder, RIGHT aileron. The behaviour of the aircraft was unacceptable and required a full 2 turns to recover. No input was made to deploy the anti-spin parachute. It was noted from the subsequent examination of the inflight video post flight, that flaps had been retracted during the spin. This extended the period of the recovery, and it appears that it was only a matter of phasing of the various inputs which caused the aircraft to recover. The reaction of the crew in the chase plane was that unless something in the technique used for spin recovery could be found deficient, then the flight should be terminated. The NTPS test pilot replied that he believed the application of recovery rudder had been tardy and suggested that the test point should be repeated.

The SECOND spin.

This was the same configuration as the first, but the recovery did not include flap retraction. The resulting data showed it to be more typical of the behaviour of the aircraft without the cargo pod.

The THIRD spin.

Turning flight was introduced so that the entry conditions were power ON, LAND flap, LEFT turn at entry, LEFT rudder RIGHT aileron. Irrespective of the impressions gained during this particular trial, entries from a left turn needed to be approached with extreme caution. However, the technique used for recovery reverted to flap retraction as a means of recovery. The plotted data indicates a turn rate approximately 20% higher than that for a straight and level entry. The data does show signs of the aircraft recovering, with a marked reduction in the rate of rotation followed by 2 seconds of a stabilised rate of rotation. However, the elevator is at 50% nose down at that point, and full nose down elevator has not been completely applied until 2.2 seconds later, by which point, the rate of rotation had started to increase, and continues to increase until 4 seconds later when it stabilises at 100 degrees per second.

CONCLUSIONS

- (1) The spinning trials were planned without a clear demarcation between the responsibilities of GippsAero and NTPS. It should however, have become apparent to all, that the GippsAero team which consisted of only two pilots was not adequate for any tasks beyond test flying of the aircraft.
- (2) NTPS provided a DER test pilot
- (3) The ancillary services involving support personnel were inadequate possibly due to the above.
- (4) The aircraft was minimally instrumented with only video camera and three portable AHRS (which in the end gave excellent data). Data reduction was a complex process which did not facilitate the rapid exchange of data post flight from any particular flight.
- (5) Spins during the penultimate flight of the aircraft did cause concern, and flight testing was stopped with the data being forwarded to the CDE at GippsAero. The data showed that the aircraft had reached the boundary of acceptable behaviour and that the program should be curtailed. It was agreed that flights at aircraft Centre of Gravities further forward and in the same configuration could be judiciously flown in an attempt to determine if the previous results were aberrant. Flights were authorised for flaps up and, and if satisfactory, then spins with flaps TO could be flown.

- (6) Contrary to this stipulation from the CDE, Spins were attempted at land flap (38 degrees) proceeding straight to the critical aircraft configuration (power on, abused entry) with no "work towards", say starting with, a normal entry. Turning flight was included in the entry conditions for this configuration .
- (7) Flap retraction was employed as a spin recovery procedure. This would have been unacceptable as a recovery technique both in terms of certification due to its unorthodoxy and it would also be at variance with the published techniques for spin recovery for GA8 and base GA10.
- (8) Application of the elevator for recovery only used 50% deflection.

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Colin Nicholson
Chief Design Engineer

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(Ref 1) **GA10 Spinning Flight Test Report D16-01-06**