



There have been an unacceptable number of fatal accidents over recent years and there appears to be a common thread amongst them. Although no fatality is acceptable, and a small percentage is unavoidable, it is the avoidable accidents that we can do (and must do) something about. Of the avoidable accidents, a large percentage has been “nose-over”, leading to negative ‘G’ and consequent total loss of control of the aircraft. This type of incident is normally fatal, with very few exceptions. A second common factor exists in these negative ‘G’ accidents and that is the predominance of gyro’s fitted with nose cones or pods.

To understand what is happening in this situation, we must go back to the basic forces acting on an aircraft, Lift, Weight, Thrust and Drag. All these forces balance out in constant straight and level flight, but when that straight and level flight is disturbed, the severity of the resulting reaction depends on a countless number of factors. The main factor that I am considering in this letter is the basic pitch stability of the aircraft, when disturbed from straight and level flight. The disturbance can be either mechanical (pilot induced or machine failure) or aerodynamic (one or more of the forces out of balance).

A stable aircraft is considered to be one that tends to return to straight and level after a disturbance whereas an unstable aircraft would tend to diverge more and more from straight and level if left to its own devices. The less basic stability that an aircraft has, the more pilot input is required on the controls to keep it in check. Consequently, a less stable aircraft has less effective control movement, and when flown outside the ‘normal’ envelope, is an accident waiting to happen. What is considered the normal flight envelope for one aircraft could well be extremely dangerous for another. Similarly an otherwise stable aircraft could become unstable with minor modifications. Such could be the case if a nose cone were to be fitted without any other modifications. In this case should a large pitch down occur, then the possibility exists for the incoming air to exert a greater force on the frontal area compared to the rear, resulting in the nose lowering further and aggravating the condition until a point is rapidly reached where the machine uncontrollably tumbles forward.

The positions of the vertical centre of gravity and the vertical centre of drag in relation to the thrust line play a large part in the pitch stability of the aircraft. The vertical centre of gravity varies with pilot and fuel loads while the vertical centre of drag varies with airspeed, making it very complicated to calculate an ideal thrust line for maximum pitch stability. This is not peculiar to gyroplanes but common to all aircraft. To offset this problem an effective horizontal stabilizer should be fitted to all gyroplanes, the size of which would depend on the extent of modifications to the basic aircraft. An open frame ‘Bensen’ style machine flown at low airspeed can benefit from a small stabilizer whereas an enclosed two seater flown at higher speeds **must** have a large stabilizer. It would be impossible to calculate just how large a stabilizer should be but as a starting point, if you were to increase the frontal area (looking down from the top) by 100% with the addition of a nose cone, then the horizontal stabilizer area should also be increased by 100% to maintain the original stability. The aircraft would also need to be re-hung to a new set of criteria to maintain correct joystick position and travel.

This letter has been sent to all owners of legally registered gyroplanes as a warning to re-examine their machines should it have a pod, and a “normal” sized horizontal stabiliser or a pod has been fitted without a corresponding increase in horizontal stabiliser area. I intend to write to all ASRA technical advisors seeking their findings on the size of horizontal stabilizers, but until then it would be safer to err on the side of safety – i.e. too big rather than too small, and as far back as is practical. If in doubt, ask a technical advisor who is personally experienced in the design, construction and testing of a nose cone or cabin. A technical advisor must also sign off any modifications that could affect the performance or aerodynamics of the gyroplane. The ASRA Technical Officer should be notified by mail of the modifications, including a new photo if there is any visible difference from the original photo.

Tim McClure
ASRA Technical Officer
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