Standard Spin Recovery Technique

John O'Halloran

Recovery Use standard recovery technique. Recovery is almost immediate.
Approved Flight Manual & Pilot's Operating Handbook, Airtourer.

This rather benign statement describes how to recover from a major killer in aviation. This is not a criticism of the current Flight Manual as it is copied exactly from the original Pilot's Handbook. Nevertheless, such an important emergency procedure requires amplification.

When the Airtourer was introduced it replaced aircraft such as the Tiger Moth and Chipmunk and spinning was a well established part of the training syllabus. Since then manufactures have made aircraft spin resistant and in many cases intentional spinning is prohibited. As a result a lot of spin knowledge previously accepted as normal airmanship has been lost and the term "Standard Recovery Technique" is no longer appropriate. There remains confusion regarding stall/spin behaviour and recovery techniques so it is worthwhile to look at the historical development of spinning before attempting to determine the standard technique.

All aeroplanes can be made to spin if abused badly, those that claim to be spin-proof are usually limited so that they cannot be abused badly enough. This is the case of the Airtouer as discussed in other articles in this current Newlsetter.

Each aircraft type spins differently and in some cases a standard technique is not appropriate nor will some of the following discussion apply to all aircraft. In these cases very specific spin information and recovery techniques will be provided in the Flight Manual. Unfortunately human factors can come into play and the well established behaviour of reverting to previous knowledge under pressure can lead to use of incorrect techniques. A friend of mine experienced this on pilot's course when flying the Macchi jet. On a solo handling sortie a stall turn did not work out and resulted in a spin. The Macchi required the elevator to be placed neutral as part of the recovery procedure but when the spin did not recover in the expected time the pilot reverted to the technique learned months earlier on the CT4 and placed the column full forward. The minimum ejection altitude, out of control, was 10,000ft so when he saw the altimeter rapidly unwinding past 7,000ft he pulled the ejection seat handle and lived to tell the tale. Subsequently it was determined that the Macchi entered an inverted spin from the mishandled stall turn and full forward column prevented it from recovering whereas the correct position of neutral would have eventually been successful.

One of the earliest documented procedures was published in Practical Flying of 1918, which quoted "placing the controls – rudder and stick – central". This will work for many aeroplanes currently flying but was

inadequate for many of that time where two distinct control movements were required. The National Advisory Committee for Aeronautics (NACA) was the predecessor or the current NASA and provided extensive information and advice to the aviation community. In it's Technical Note No 555 Procedure (1936) it advised:

1) Briskly move the rudder to a position full against the spin.
2) After the lapse of appreciable time, say after at least one-half additional turn has been made, briskly move the elevator to approximately the full down position.
3) Hold these positions of the controls until recovery is effected.

There are some very important points in this advice. Firstly the rudder input should not only precede the elevator but there should be a pause between the two. The primary purpose of the rudder is to check the yaw rate, in doing so the nose of the aircraft should go down and the elevator become more effective. On many aircraft, and to a limited extent the Airtourer, the elevator shields the rudder with the stick full forward (elevator full up). Delaying the application of down elevator increases the overall effect of the rudder. On the Airtourer the rudder is mostly forward of the elevator however when held full up the vertical vane that extends into the tail cone will provide an additional surface similar to the rudder.

The rudder input should be brisk, the Technical Note goes on to state, "In certain cases it has been found that, with a slow and cautions reversal of the rudder and elevator, spinning will continue indefinitely; whereas brisk operation of these controls would have effected recovery".

World War II saw rapid development in aviation. Powerful engines with large propellers and their associated gyroscopic effects introduced new influences into spinning characteristics. The 1943, Cadet's Handbook of Elementary Flying Training, advised the following:

1) "…apply full opposite rudder…with your full strength.."
2) "…when you see that the rotation has practically stopped, press the stick forward…."
3) "…and finally ease off the rudder…"

Again the emphasis on rudder to oppose the rotation and then elevator to unstall the wings. It goes on to include an *emergency action* of, "Throughout, always keep full opposite rudder applied", then describing use of elevator and power to rock the aircraft out of the stall.

Later the RAF Manual of Flying Vol. 2 introduced a step to keep the ailerons neutral. Ailerons can be a powerful influence on the spin characteristics, the actual influence depends on their effectiveness in the conventional sense and the balance between the aerodynamic and gyroscopic effects. On high performance jet aircraft where most of the mass is in the fuselage the gyroscopic effect is such that outspin aileron can pitch the aircraft from an erect to an inverted spin. I experienced this at ETPS on the Hawk and the Hunter, only one of them intentionally! The RAAF experienced some cases where the CT4 was reluctant to recover from a spin and inadvertent application of small amounts of aileron was suspected to be the cause. The CT4 has a marker stripe on the instrument panel for alignment of the control column to ensure ailerons are neutral.

One recurring theme in the various recommended spin recovery techniques was the possibility of the spin taking some time to recover. The NACA Tech. Note states:

"It is not uncommon for a bad-spinning airplane to make at least 5 turns before the recovery control begins to give any satisfactory results…. In the event, then, of a vicious spin, a rule of great importance is to hold the controls applied for recovery for at least 5 turns before attempting any other measure to promote recovery."

Over time we have seen a gradual development in the awareness of the different influences of various controls on the recovery from the spin. The initial use of rudder and elevator progressed to the interrelation of the two and the importance of rudder blanking and the requirement to counter the yaw rate before unstalling the wings. Later, propeller effects and the use of aileron were introduced and finally the acknowledgement that a spin could take many turns to recover.

The most recent authoritative standard recovery procedure I have found was published by the UK CAA in the British Civil Airworthiness Requirements, paper No. K711 dated 9th April 1991.

Standard recovery procedure is as follows:

a. Close throttle;
b. Centralise ailerons;
c. Apply full rudder to oppose yaw rate;
d. Pause;
e. Push the control column forward as necessary until rotation ceases;
f. When rotation ceases, centralise the rudder and recover from the ensuing dive.

So where does this leave us in answering the original question of what is the "standard technique" for the Airtourer. From my experience the UK CAA procedure, which incidentally was the same procedure I was first taught on the Winjeel, will work. However simpler techniques will also work on the Airtourer but if it is being used to teach spinning a case could be made to use the standard procedure.

SOUTH AUSTRALIAN BRANCH AIRTOURER FLYIN

NOT RESTRICTED TO AIRTOURERS, WE LIKE THINGS THAT FLY IN THIS STATE
30th September 2005 to 3rd October

How to get there! For most of Australia navigation is easy, follow the river , or keep the coast on your right, water on your left, coming from the eastern states,(reverse the process to go home). Fly at 3500ft once out of eastern states and you can't hit anything.
From western state keep land on the left, water on the right, when you see a plane in your windscreen 500 feet above or below he is coming from the other direction and with a bit of luck you have both arrived at port Lincoln as South Australia is strategically placed in the centre of the southern coast for purposes of easy navigation. (Failing that punch up the GPS).

A Test Pilot's Observation 40 Years On

John O'Halloran

I purchased my Airtourer almost 20 years ago and less than a year after graduating from the Empire Test Pilot's School. Naturally I conducted an evaluation of my new acquisition in the light of my recent training. One thing that struck me was the lack of aft stick travel, in particular at the point of stall where the backstop was encountered just after the point of stall. Additionally, I found the spin interesting if not a little disappointing. Rather that a stable conventional spin it appeared to be bordering on a spiral and appeared to recover when pro-spin controls were relaxed. At the time I was stationed at the Aircraft Research and Development Unit (ARDU) which had a range of aircraft including some CT-4As. The spinning characteristics of these CT4s were quite different from my Airtouter despite the similar shape.

Although I first soloed on the Winjeel the initial part of my Pilot's Course proper was on the CT4 and at the time intentional spinning was banned. The RAAF had mixed experience with spinning the CT4 and in the late '70s tasked ARDU to complete a detailed evaluation. This was done well before my time so I reviewed the report and did some spin investigation myself. The CT4 spin had many similarities to the Airtourer as described in the report on page 10. The main problem was the possibility, after four turns, of entering a high rate spin that could flatten out. In this case a number of turns would be required to recover. Additionally, there were engine problems with loss of oil pressure causing the propeller to overspeed or the engine stopping altogether. Overall it was assessed that a student pilot may not have sufficient experience to successfully recover from this high rate, flat spin mode and hence intentional solo student spinning was prohibited. Subsequently there were reports of reluctance to recover during instructional sorties and eventually fully developed spins were banned. At one point some bush lawyer discovered that intentional inverted spinning was not specifically banned and since it was smooth and non-oscillatory the inverted mode was being used to demonstrate spinning. Eventually the system caught up and the words "Intentional inverted and erect stable spins are prohibited…." were inserted into the RAAF Flight Manual. However, the Kiwis assessed it differently and allowed intentional solo student spinning. I am not aware of any CT4 being lost due to a spin training accident. Current CT-4As subject to the Pacific Aerospace Corporation Flight Manual are approved for intentional spinning.

Armed with the foregoing knowledge I discussed Airtourer spinning with Henry over a bottle(s) of red at Griffith. I felt adjusting the elevator stop to allow more up elevator would keep the wings in the stall and possibly allow a more stable spin to develop. He replied, "Ah yes, but you must remember to remove the rudder stop as well!" He went on to complain that, "They castrated my aeroplane."

The Airtourer was certified to ANO 101.1 current in October 1960. I don't have a copy of the relevant ANO however the spinning requirements would have included the ability to recover from a multi turn spin, possibly as many as eight, using the "standard method", usually within 1 ½ turns. The second paragraph of the article above explains this was not possible and the elevator and rudder deflections were restricted to ensure the flat mode spin could not be induced.