FLYING THE ASH-25e

OPEN CLASS SAILPANE

A look at some specific handling qualities of a long span Open Class Sailplane to identify those characteristics that may cause departure from controlled flight.

By:

Stanley F. Nelson

Flying the ASH-25

By:

Stanley F. Nelson

DRAFT # 6 **Not for Transmission**

The following information is derived from my personal observations while flying an Open Class, ASH-25e sailplane, in various areas of the United States over the past six years. I had previously flown standard, 15 meter and 17.6 meter ships before flying the ASH25. I found that many of the flight characteristics of an Open Class ship are similar to gliders of shorter wing span that have similar limitations on g forces, dive brake operations, maneuvering and maximum airspeed. However, because of the increased mass, inertia, aeroelasticity, span, aspect ratio, lift distribution, wing bending moments and energy, some of the flight characteristics are different.

Since stall spin and spiral dive incidents continue to cause very serious accidents, I hope that sharing some of my experiences and insight into flying these Open Class ships may benefit pilots who may be considering moving up to longer spans and that pilots flying ships with shorter spans use what is applicable to them also.

There has been some discussion recently concerning the effect of deploying dive brakes at various points in the performance envelope and the resulting effect on the structure. This and other characteristics such as spins and spiral dives, flutter and thermalling will be discussed here.

Dive Brake Deployment At 60 Knots Indicated Airspeed:

First, I will discuss my observations concerning the deployment of dive brakes during a normal, low speed glide. Consider an Open Class ship in a straight, constant indicated airspeed glide of 60 knots. Mass 1654 lbs, Flap position '0'. The rate of descent should be approximately 85 - 100 fpm. Constant control stick position and forces throughout the exercise. The flight is conducted in the early morning hours with smooth atmospheric conditions.

Dive brake deployment can be an initial unlocking and cracking of the dive brake handle to deploy the brakes upward to a minimum distance of perhaps one half to one inch. Even at this minimum deployment, very significant things happen. First, laminar flow is destroyed in an area of the wing larger than the width of the brake paddles. The turbulent flow further separates, which may induce a reverse flow from the trailing edge forward on some airfoils. The majority of lift over this section is drastically reduced.

The ASH-25 has approximately 175 sq feet of wing area. The area of lift destroyed is from a very productive section of the wing, totaling for both wings approximately 40 sq feet or 23% of the wing area. Relative to lift distribution this could approach 33% of the total lift of the wing in this configuration. In addition, when the brakes are fully deployed there are vortices that develop on both ends of the extended brake paddles that spread outward and rearward at an angle approaching 45 degrees as they approach the trailing edge. The outer wing panels must now support a greater percentage of the mass of the glider. Even with a minimum deployment of the dive brakes, with no other input, the L/D decreases, sink rate increases and lift distribution moves outboard.

One critical design limitation of any glider is the maximum weight of the non-lifting parts. This is the weight of the fuselage and all its components not including the pilots. In the ASH-25 that I fly, this is 937 pounds. The empty weight of my assembled glider is 1273 pounds. The maximum all up gross weight is 1653 pounds which leaves a 380 pound useful load. The reason for this design limitation is that the glider has a structural design wing bending moment limit. During a positive 5.3 g pull up, the fuselage alone will weigh 937 pounds times 5.3 which equals 4,866 pounds. By this you can see the amount of strength that must be designed into a glider wing. I mention this only because I have water bags in my outer wing panels that, when I am flying solo, can carry 14 gallons each or 120 pounds of weight in each outer wing panel. Weight in the outer wing panels reduces wing bending moment and gives a better ride in turbulent conditions. It does however, reduce the roll rate.

Immediately upon minimum dive brake deployment, with no other input, the

ASH-25 wing bends upward to a greater extent. While maintaining a constant stick position, the indicated airspeed decays below 60 knots and the AOA increases. Angle of Attack being defined as the angular relationship between the relative wind and the chord line expressed in degrees at any given velocity.

If the pilot induces forward stick pressure to maintain 60 knots, the AOA will remain the same as prior to deployment and the wings will maintain their initial increased upward bending. Only if the airspeed is allowed to decrease will the AOA increase. Second, when the pilot maintains 60 knots with dive brakes cracked, the rate of descent will increase. Any further deployment of the dive brakes toward 100% full open will continue to increase upward bending but at a lesser rate than the original deployment. Drag rises steeply with increasing deployment causing a much greater rate of descent.

Many flight tests have shown that waviness or irregularities in the upper surface of a wing designed for laminar flow, that exceed 0.003 to 0.005 of an inch, will trip the laminar flow causing turbulent flow which increases drag significantly. Turbulent flow has far less drag than flow that has separated. Separated flow may cause stagnant bubbles where there is little or no airflow movement on the surface of the airfoil. Designer take great pains to eliminate stagnation bubbles on the bottom of laminar wing airfoils by the use of strategically placed zigzag tape or blow holes. The degree to which separation occurs is dependant on the airfoil and chord wise position of the waviness. The ASH25 can come with blow holes on the bottom of the wing which introduces airflow from inside of the wing through the lower wing skins into the stagnation areas on the bottom rear surface of the wing. I discuss this only to point out the major changes in airflow on laminar wings caused by small changes in profile. The deployment of dive brakes causes a major change in flow and has considerable effect on performance and on the structure. Most glider pilots are aware of the performance changes with respect to drag but probably do not think too much about the structural aspects of dive brake deployment especially at high speeds.

With dive brake deployment, the outer wing sections are now supporting much of the mass of the glider. On the ASH-25, the dive brakes are located in the outer wing panels, so most of the inner wing panel section is still providing lift. On gliders which have the dive brake panels located on the inner wing panels, the inner wing panels will provide proportionally less lift when the dive brakes are deployed. .

Dive Brake Deployment at 120 Knots Indicated Airspeed

Once again assume a steady state descent at 120 knots. The AOA is now considerably less than that required for the 60 knot steady descending flight. The rate of descent in this configuration will be greater than 500 fpm with dive brakes closed.

As a side bar: at this speed the wing induced drag has reduced to a minimum value. Most of the drag is parasite drag. If the pilot were to pull the stick back and establish 2 g's, the AOA and induced drag would not rise significantly. However if the pilot were to pull back and establish 2 g's at 80 knots indicated airspeed, there would be a sharp increase in AOA and induced drag. This is why steep pull ups while dolphin flying are counter productive. The induced drag rise and energy loss is counter productive.

A minimum deployment of the dive brakes at this velocity will cause a strong instant longitudinal deceleration force. The force emanates from the outer wing panel dive brake box and dive brake spar attachment fixtures. On the ASH-25 the rearward decelerating force is transferred to the outer wing panel spar stub and into the inner panel. From the inner panel to the fuselage through the attach pins. The mass of the non lifting component, fuselage, and its stored energy must be decelerated by the force exerted by the dive brakes. This force is irrespective of the upward bending forces simultaneously being exerted on the wing structure caused by the outward shifting lift distribution.

The Open Class gliders having the dive brakes located in the inboard wing panels have force distributions somewhat different than the ASH25e, which has the dive brakes located in the outer wing panels. When inboard dive brakes are deployed; a greater proportion of lift is shifted to the outer wing panels because the wing area outboard of the dive brakes is proportionately greater relative to the ASH25e.

At 120 knots indicated airspeed, there is a doubling of velocity but energy has increased as a quadratic or four times the energy that exists at 60 knots. At this velocity, the glider structure is now challenged and special limitations come into effect.

First, the maneuvering speed for the ASH-25e is 100 knots indicated airspeed in smooth air and is also the maximum speed at which full control deflection may still be used. Below this speed full control deflection will cause the airfoil to stall before the maximum g limitations are exceeded. Above 100 knots full control deflection will exceed the g limitations of the glider. The 100 knot limitations are positive 5.3 and negative 2.65 with the dive brakes closed. Theoretically, at 100 knots indicated airspeed in smooth air, if the pilot pulled full back on the stick he should not exceed the positive g limitation of 5.3 g's.

Above 100 knots the load factor limitations reduce from 5.3 g's down to positive 4.0 g's and the negative g limitation reduced down to -1.5 g's at 151 knots Vne. (Velocity Never Exceed) Above 100 knots, if you pull full, back on the stick, you will pull considerably more than 5.3 g's and you may cause the structure to fail. In normal flight, pilots rarely pull full back on the stick. But, when recovering from a spiral dive or a spin, this could happen. Do not make full or abrupt control movements above 100 knots, because under certain conditions the sailplane may be overstressed by full control movement. At 120 knots, the extrapolated limit is approximately 4.6 g's. According to the flight manual, flight above 100 knots IAS is to be done only in smooth air and when exceeding 100 knots, full control movements may overstress the sailplane. At 151 knots, only 1/3 control deflection is allowed

It is important to emphasize that in rough air a gust may impacts the aircraft at the same instant the pilot pulls on positive g from the cockpit. The two forces will combine putting the total g load over 5.3 g's. Pilots are very susceptible to overstressing their ships unintentionally during competition finishes in rough air conditions. A finish at 120 knots in rough conditions with an aggressive pull up after crossing the finish line can result in overstressing the glider. Experienced pilots are very gentle during their pull ups in these conditions.

When the brakes are deployed, the maximum positive g force is 3.5 at ANY speed. This means that when the brakes are deployed, caution must be used when pulling positive g force even when you are below the maneuvering speed of 100 knots. Since at 100 knots indicated airspeed, full back stick will generate 5.3 positive g's, you must NEVER pull full back on the stick at any speed when the dive brakes are deployed. Full back stick will generate 3.5 positive g's at a much lower speed than 100 knots indicated airspeed.

Special attention has to be paid to the flap limitation indicated airspeeds. Flap Position #1: 151 knots, Flap Position # 2: 124 knots, Flap Position # 3: 124 knots, Flap Position # 4: 86 knots, Flap Position # 5, 86 knots, Flap Position Land: 76 knots. These speeds are good up to 9843 feet MSL at which point they should be reduced as the Vne Indicated Airspeed is reduced at higher altitudes because of increasing True Airspeed. Vne is ultimately a function of True Airspeed. This will be covered later in this paper.

Exceeding these speeds risks the failure of linkage or failure of the flap itself. The flight manual cautions that if you enter a spin with positive flaps deployed you must reduce the flaps to neutral because recovery will be achieved more quickly with flaps reduced to neutral. Intentional spins with Landing flaps are not approved. The manual also notes that dive brake deployment in a spin does not noticeably affect the spin recovery but WILL increase the height loss when pulling out of the dive during spin recovery. Once again bear in mind that if the dive brakes are deployed during the spin recovery, the maximum positive g force allowed is 3.5.

Thermalling

Due to aspect ratio and span of an Open Class ship, there is a substantial difference, in a turn, between the outer wing panel flow velocity of the inside low wing, versus the flow velocity of the outer wing panels of the outside high wing. Establishing a bank of 30 to 45 degrees for the purpose of initiating thermalling turns requires leading with the rudder. Once again, the rudder will negate some of the negative effects of adverse yaw caused by the ailerons when initiating the bank.

Use of the ailerons constantly changes the angle of attack of the airfoil section as they move. When entering a left bank, the right wing aileron sections move downward increasing the angle of attack of much of the right wing. This increased induced drag creates adverse yaw which holds the wing back and discourages the turn. This, and inertia, is why Open Class ships have a slower roll rate than 15 meter ships. By fairly aggressive initial use of left rudder, the adverse yaw tendency can be overcome.

Bear in mind that every time you use the ailerons you are reducing the efficiency of the airfoil. Once the bank is established you will need to use opposite aileron to keep the ship from increasing its banking tendency because the outer wing is moving so much faster, developing more lift.

To avoid using continuous opposite aileron to prevent over banking, it is recommended by experienced Open Class pilots, to use some top rudder pressure during the turn. This means using some right rudder in a left banking turn.

This technique keeps aileron use to a minimum, maximizing the efficiency of the airfoil in the climb. You are in effect putting the ship into a mild slip into the turn. Slips by the way, do not induce spins. Skids are what get you in trouble real fast. You will notice that the yaw string will be displaced slightly to the right in a left banking turn. This is far more efficient that flapping the ailerons in the turn to maintain the desired bank angle. If you can do all this in a smooth manner without dumping lift by excessive aileron movement, your climb rate will improve. While thermalling, the inner wing can be easily stalled by rough use of the flight controls.

Spin Recovery

According to the ASH25e Flight Manual for the model I fly, when the

ASH-25e is spinning with a forward CG, depending on aileron position; the glider will not sustain a steady spin. It will immediately or within a few turns develop a spiral dive or slipping turn similar to a spiral dive. These conditions will both be terminated by: 1. Applying Opposite Rudder 2. Applying Aileron opposite the Bank. When you read in a flight manual to "Apply Opposite Rudder", this does not mean "Opposite Rudder Pressure". This means "Rudder Displacement". That is, an aggressive displacement of the rudder in the opposite direction to the spin. Many manuals will say, "Full Opposite Rudder" to emphasize this.

When the Center of Gravity moves toward the aft limit, there is a greater tendency for the glider to sustain a steady spin. Generally, steady state spins do not build up airspeed as quickly as a spiral or slipping turn dive. If a spiral dive is entered at 50 knots because of an upset caused by turbulence, rough use of the flight controls, etc, the glider could approach Vne in 10 seconds unless immediate application of full opposite rudder is followed by the rest of the factory recommended recovery procedure. Ten seconds sounds like a short time, but in this flight regime, it is an eternity.

Full Displacement Opposite rudder should be used first, at anytime an open class ship shows low speed instability with wing drop. It should be second nature. Full Opposite Rudder when an Open Class ship's wing drops will nip an insipient spin or spiral dive in the bud in short order. Recovery can be accomplished with a minimum loss of altitude.

Applying large amounts of opposite aileron, initially at wing drop, could aggravate the situation due to the introduction of adverse yaw. Opposite aileron creates the adverse yaw by the movement of the low wing aileron to a downward deflection. This deflection increases the angle of attack and induced drag of the low wing, pulling the low wing even further back and encouraging rotation of the whole glider toward the lower wing. At thermalling speed and attitude, the lower wing is nibbling at stall. If the lower wing stalls because of the sudden relative motion of the lower wing to the rear, reducing airflow, you have a spin. If the lower wing continues to nibble at the stall, you enter a spiral slipping dive.

By now your nose is down 20 to 30 degrees. Not good. Despite this unusual

attitude, with full opposite rudder applied, you must gently ease the stick forward to unload the airfoil. We are not talking about displacement on the stick in this case. Facilitate recovery using the remainder of the factory procedure. Do NOT pull on g forces until you have the wings level in the dive with reference to the horizon. If you recover from the spin and find yourself still in somewhat of a bank, and pull some g's you may enter a secondary spiral dive. Taking the bank out first will certainly decrease the time it takes to get the nose back up to the horizon. The dive recovery should be accomplished
with 4 g's or less below 151 knots Indicated Airspeed to prevent failing the structure. If you are already above 151 knots, you are now a test pilot and obviously must be super gentle using less than 4 g's.

At these high speeds it does not take very much back stick pressure to generate 4 g's. Once you pull any amount of significant positive g's, your ailerons do not work as advertised and you may never get the bank out. That is why you must take the bank out before you begin the dive recovery. If you take an aerobatic lesson you will find that when you are recovering from a loop and pulling 3 to 4 g's and simultaneously move the stick left and right you will note the ailerons to be ineffective. The g forces separate the flow in the area of the ailerons making them relatively sluggish.

The general factory spin recovery procedure is straightforward: 1. Opposite Rudder. 2. Simultaneously moving the stick gently forward until rotation stops. 3. Neutralize Rudder. 4. Gently pull out of the dive. You notice that there is no mention of using opposite aileron in the recovery, and for good reason as previously stated.

Throughout the manual I have noticed the emphasis on "gently". When operating this glider above 100 knots, I try to be as smooth and gentle as possible in order to not load the structure past its limits. Even in the spin recovery procedure, the factory recommends, "gently moving the stick forward". The consequence of moving the stick forward with force or aggressively in an Open Class glider is that you may achieve a nose down attitude from which there is no recovery. When you find yourself with a serious nose down attitude, you may be logically encouraged to deploy the dive brakes. This is the wrong thing to do. In some Open Class gliders the flaps deploy during the last few degrees of travel of dive brake handle. At very high indicated airspeeds, this could overstress the flap system. Second, you will use more altitude in the dive recovery pull out with brakes deployed than using the 'gentle' recovery recommended by the manual. If you exceed Vne, then you have become your very own test pilot as already noted. According to the Flight Manual, violent applications of rudder or aileron would result in a spiral dive, spinning or side slipping depending on cg location. Height loss from entering an incipient spin during thermalling can be up to 495 feet.

Spiral Dives

A departure from controlled flight in an Open Class glider will be preceded by certain cues. To sample some of these cues in a particular ship, a flight should be made when the glider is flown at minimum controllable airspeed. Check the flight manual stall speeds prior to the flight. Generally, flight manual stall speeds are publish at the maximum gross weight of the glider. Do this exercise with an instructor on board at a safe altitude. Establish a slow speed stable glide in level flight and slowly reduce the airspeed until the glider begins to become unstable in pitch, roll and yaw. See how long you can control the glider by judicious use of the rudder to keep the aircraft from stalling or rolling off into a spin or spiral dive. The reason that this exercise has so much training value is that laminar flow wings provide less warning than a non-laminar wing as the AOA approaches the critical angle. Some laminar airfoils may not exhibit the "buffet" that precedes a stall that airplane pilots are used to experiencing. In airplanes this maneuver is known as "slow flight."

A maneuver known as a "rudder controlled stall" was also once practiced to give pilots a feel for the effectiveness of the rudder. I can remember practicing this maneuver in military pilot training. It was similar to a falling leaf maneuver that never allowed the aircraft to develop into a full stall or spin. .

It is important to understand that there is but ONE reason a glider stalls.

THE WING HAS EXCEEDED ITS CRITICAL ANGLE OF ATTACK. The angle between the "relative wind" and the "chord line" has exceeded the airfoil designer's limit. This normally runs from 15 degrees to 20 degrees depending on the particular airfoil. The chord line is an imaginary line drawn from the leading edge straight back through the trailing edge of the airfoil. The ONLY time that stall speed relates to the critical angle of attack at which the airfoil stalls is at 1 positive g. At all other positive g loading the airfoil will stall at a higher speed. A glider can be stalled pointing straight down, straight up or in a thermalling turn. It really has little to do with "speed" but everything to do with "angle of attack".

For instance, in turbulence when the relative wind is rapidly changing directions, the critical angle of attack can approach stall when a gust impacts the airfoil from below. Wind Shear is normally discussed concerning landing and taking off. However, wind shear also exists at altitude and has a great effect on a glider thermalling at just above stall speed. This is due to gusts impacting the airfoil from different angles. In this case the stall speed increases substantially.

When thermalling, if the bank angle approaches 60 degrees it requires positive 2 g's just to maintain a stable turn. In this case the stall speed has increased by the square of 2, which is 1.414. The stall speed in a 60 degree bank is now 41% higher than at 1 positive g. For an airfoil that stalls at 40 knots at 1 g, the airfoil in a 60 degree bank will stall at 56 knots. The critical angle of attack will be reached at 56 knots. Throw in some turbulence such as thermalling in rotor and the "stall speed" could be over 60 knots. Stall speeds increase approximately 10 % in a 30 degree bank and 20% in a 45 degree bank.

Part of the design characteristic of some laminar flow wings is that they may give less warning when approaching the critical angle of attack. The ASH25e Flight Manual states that there will be a stall warning buffet in this design.

When an Open Class ship departs from controlled flight into a spiral dive airspeed builds up rapidly. Unlike a spin when both wings could be in a state of flow separation and the glider path takes on a vertical component, a spiral dive can be identified by rapidly increasing airspeed. With the cg in the forward range, a spiral dive can develop after the glider has entered a spin.

Opposite rudder must be applied immediately. The height loss and airspeed increase in a spiral dive is dramatic and critical. You will loose far more altitude recovering from a spiral dive than a spin. The flight manual does not state the altitude loss for a spiral dive but Carl Herold has investigated this flight regime and states that the height loss can be in excess of 2000 feet for an untrained pilot.

The reason is that the ailerons are ineffective in leveling the wings. Full displacement opposite rudder must be applied immediately when the rotation begins. Flaps must be moved from the thermalling setting to neutral setting. Dive brakes must NOT be used.

Flutter

One of the most important aspects of flutter prevention, which is seldom discussed, begins on the ground. When you are doing your thorough preflight inspection before each flight, you will check the flight controls. This check is more than just insuring that the controls are connected. First a visual check of the controls, hinges and attach points should show no cracking of the gel coat or cracked fittings or structure. The check should also be made to insure that no play or slack exits in the flight control system from the control surface to the control stick. This check does not require excessive force exerted by the hands by either the person moving the flight controls or the person holding the stick in the cockpit. This check does require two persons. The person in the cockpit prepares to hold the stick firm in the center position when asked. The person at the flight control surface moves the flight control gently to each mechanical stop or limit. Then the cockpit person is asked to hold the stick firmly in the center position. I would recommend that the pilot in command be at the control surface. Pressure is applied to the control surface in each direction to sense for slack in the linkage or looseness in the attach fittings. Gentle pressure should also be applied longitudinally or sideways to see if the surface will slide to any degree.

This simple check will determine if the airframe has experienced flutter prior to this flight. It is possible for an airframe to approach flutter which causes a buzz in the control system but may not continue to full blown flutter where aircraft parts separate from the aircraft. When the pilot feels this in flight, he knows something is wrong and may slow down immediately to prevent triggering flutter.

Even this approach to flutter will cause a loosening of the control system. If the control system has slack that can be felt by this preflight check, that particular glider will flutter at a much lower speed than the manufacturer has guaranteed.

Flutter is caused by aerodynamic forces exciting the surface by dynamic inertia coupling of the natural frequency of the surface. When the control surface is manufactured, calculations are made to determine how to best mass balance the total surface to achieve balance of the material forward and aft of the hinge point. Many times this requires some lead weight forward of the hinge point. Anytime a surface is re-gelcoated, painted or repaired, these calculations must again be made by the repair station to insure the surface is mass balanced according to factory specifications. When a broken fuselage is repaired or a landing gear box structure is repaired it is possible that control linkages may be affected. These must be checked for slack.

Designers are seriously concerned and challenged by flutter onset whether it be the designing the Concorde SST or a glider. The design of an Open Class glider is as challenging as any aircraft because of the balancing act among factors such a performance, weight and strength capable of resisting the destructive effects of aerodynamic forces.

To pilots, flutter is pretty much a mystery, until it happens to them. Ask a glider pilot who has experienced it.

There is an additional qualification to the term Vne. (Velocity Never Exceed) Vne is only applicable up to 9,843 feet MSL on a standard day in the ASH-25. The speed at which the wing or other control surfaces may flutter is based on True Airspeed. Above 9,843 feet MSL the maximum indicated airspeed reduces to 135 knots Indicated Airspeed at 16,404. This is absolutely essential knowledge when you are charging down the White's at 17,000 MSL, in 10 knots up and you encounter moderate turbulence.

The maximum indicated airspeeds for increasing altitudes on a standard day for an ASH25e are:

Pressure Altitude:	9843	Maximum Indicated Airspeed:	151 kts.
	16,404		145 kts
	22,966		121 kts
	29,528		108 kts
	36,089		94 kts
	42,651		81 kts

I am sure many pilots have flown into strong sustained lift. Normally this is not a problem since the aircraft should be free from flutter up to VNE at altitudes below 9,843 feet MSL. At higher altitudes special care must be exercised when flying into strong sustained lift so as not to exceed the flutter limitation True Airspeed. During the Open Class Nationals at Minden in 1997 the task was Minden, Independence, Basalt, Minden. On the leg from Independence to Basalt I was flying near 16,000 feet when I encountered strong sustained lift of 10 plus knots. At this time I was cruising at approximately 90 knots indicated airspeed. There was a penalty in this contest if you flew above 17,500 feet MSL. The strong lift while flying straight ahead caused me to approach 17,000 feet which was my personal maximum altitude to give me a cushion of 500 feet before I exceeded 17,500.

As I approached 17,000 I began to push over with a resultant increase in airspeed. I began a gentle turn to the west toward the valley to exit the strong lift. As I did, it became more and more turbulent before I exited the strong lift.

The combination of high altitude, strong lift and turbulence are the ingredients needed to lure an unsuspecting pilot into a bad situation.

Flutter did not occur in my case. The airspeed had reached 110 knots indicated airspeed. One hundred ten knots indicated airspeed at 17,000 computes out to 148 knots True Airspeed on a standard day. This speed was lower than the maximum speed of 175 Knots True Airspeed recommended by the flight manual to avoid flutter. Fortunately, I was able to fly out of the strong lift and continue on to Basalt and Minden without exceeding the envelope.

The flutter speed for the ASH-25 is based on a limitation of 175 knots true airspeed in smooth air. All bets are off when you are flying faster than 100 knots indicated airspeed through turbulence. In turbulence, flutter can be induced at a lower true airspeed than 175 knots. A speed of 175 knots true can be approached fairly easily in wave or strong thermal conditions in the west. There is Open Class pilots much more experienced with this than I am. Once again, when you exceed the Flight Manual limitations, you become a test pilot.

The dive brakes have never deployed inadvertently in flight in my ASH-25. The locking mechanism is in the outer wing panel close to the spoiler box. I have had my brakes deploy in other types on the ridge at Newcastle. This is very exciting at 100 feet AGL and 100 plus knots. Dive brake locking mechanisms must be properly adjusted.

Training

In retrospect, it would have been wise for me to seek some instruction and training from one of the old heads in Open Class flying in a two place Open Class ship. Training is the key to safety in flying any type of glider but most of us think we can handle it on our own. It is now my recommendation that pilots, whose major experience is in airplanes, really do need a significant amount of instruction and training before being safe in an Open Class ship. Even though I had moved up from a VentusCM 18 meter span ship in which I had over 500 hours, I still had a lot to learn about flying a long "winged" bird. My primary flight experience was in airplanes and my current job was flying airplanes. The reason for this is, during an emergency, pilots often revert to the "Primacy of Instruction" rule. That is, if they are not properly trained in the type of glider they are flying, in an emergency the pilot will revert back to what he was taught long ago in a totally different type.

For instance, I was initially taught to recover from spins in a military AT-6 trainer in 1954. I can still remember by rote the spin recovery procedure for the T-6. It was drilled into me. It may be the last thing I ever remember. However, if I entered a spin in the ASH25, and reverted to the AT-6 recovery procedure, I would undoubtedly fail the structure of the ASH25. This may sound far fetched but I have seen pilots do this on check rides when they were rusty. This is why currency in type is absolutely necessary.

This is no joke. We need to be honest, swallow some pride and seek out training. Once trained, we must stay current. This is not a matter of age; this is a matter of simple knowledge and skill retention. The deterioration of skills resulting from age is highly overrated. I have seen a great many pilots a lot older than me fly as well or better. A focused older person with proper training and currency is as safe as a younger person and judgment wise, probably safer. It is currency and training in type that makes the difference. Ask your insurance company, they know what causes accidents. They won't even insure you unless you have ten hours in type. Which, by the way, is a pretty good indicator of the minimum amount of instruction you should seek in an Open Class ship before you go solo. I realize that it is not easy to find an Open Class ship to take training in and it is time consuming and expensive. However, the benefits far outweigh the inconvenience.

Additionally, if you do not fly a glider for six months, you are a candidate for training. During the off season, put you glider together as if preparing for a flight. Sit in it. Turn everything on. Go through the motions. Practice ingress and egress with your parachute on. Schedule three flights with an instructor in a Duo Discus or a DG1000/505 etc before beginning the season. I know that training works. When I was a pilot for NASA, I attended Flight Safety training 42 times in just one type of aircraft during 22 years, once each six months.

In addition I also attended Ft. Rucker helicopter emergency procedures training during the same period each six months. This amounts to a training cycle each three months for twenty some years. It has been my experience that six months is about the maximum period that a person can retain a complex series of tasks with a minimum acceptable performance level. Make no mistake about it; glider flying requires complex tasks to be performed correctly. As a result of my personal training along with the pilots and maintenance persons in my flight operation, we had no accidents for 29 years from 1965 to 1994.

Credit

It is a testament to the designers and all the men that build these incredible flying machines that they bring us home even when we sometimes fly "outside the box".

As pilots, it is our responsibility to be knowledgeable, properly trained and current to fly within the design envelope and to know what can happen when we do not. My hope is when you read this paper, you will open your flight manual and compare the limitations of your particular ship with what I have written.

I want to thank Carl Herold and other experienced Open Class pilots and designers who have reviewed this paper.

Stanley F. Nelson
February 24, 2003

About the Author

Stan soled in gliders in 1982. He soloed in military jets in 1954 as a distinguished graduate of USAF Jet pilot training at Williams AFB, Arizona. Stan has acquired 17,000 hours in fighters, transports. helicopters and gliders. His last assignment was Chief, Aircraft Operations Office, NASA Kennedy Space Center. He first owned a Ventus B, Libelle, ASW-24 and VentusCM before moving to the ASH25e. He presently serves as Chairman, Contest and Records Board, National Aeronautic Association.