Use the Tape to Avoid Loss of Control Accidents

Background:

It is a documented statistic that *loss of control* (LOC) incidents among general aviation pilots flying "light aircraft" are mostly associated with a stall/spin event during a turning maneuver. Aviation pundits and safety experts frequently address this issue, but cannot seem to agree on the specific cause, much less a solution for reducing the occurrence of LOC accidents. Perhaps the problem has been over analyzed. Facts suggest the cause of LOC can be simply explained; therefore, an effective solution to LOC can be developed:

- Generally these are stable aircraft and they do not stall; *therefore, the airplane is not the problem.*
- All pilots know not to stall an airplane yet they do; *therefore, education is not a major factor in LOC occurrence.*
- Pilots cause airplanes to stall when they apply and/or hold excessive elevator deflection; therefore**, loss of control is a pilot performance issue.**

*Airmanship is a path of pilot performance***. Use the Tape** is an effective way to assist a pilot in developing airmanship, proficiency in controlling an airplane; thereby, avoiding LOC.

Purpose of Lesson:

Teach pilots the skills of airmanship. Specific skills are:

1. How to avoid stalls caused by inadvertent over-controlling inputs.
2. How to use the sight picture for attitude information and to recognize over-control.
3. Properly execute a level turn that recognizes and controls adverse yaw.

Application: Flight review, Emergency Maneuvers Training, Practical "add-on" or enhancement of Private, Light Sport and Commercial Pilot Training and Test Standards.

Goal: Reduce the occurrence of loss of control accidents through a resurgence of airmanship within the pilot community.

Ground School (one hour)

I. Introduction to Airmanship:

Review with the student his concerns:

- Becoming a victim in a loss of control accident?
- To improve pilot skill set and becoming a great stick, a good flyer?
- Apprehension when flying an airplane?

Make the point that the solution to such concerns can be found with airmanship, proficiency in controlling an airplane.

Use the Tape: Airmanship includes the skill of using the sight picture for attitude information. As a training aid for interpreting the sight picture, **Use the Tape** during this course of instruction refers to a piece of tape* or a grease pencil mark on the windscreen, parallel to the horizon in level flight and in line with the horizon and pilot's eye. Watch the tape for focus and to interpret attitude information.

- As the tape moves towards or away from the horizon, the pilot sees pitch attitude information.
- Tape helps the pilot select and use an aiming point.
- The tape shows bank, and provides indications of yaw

*(With side by side seating, use two tapes respectively parallel and aligned with horizon during 30 degree banks left and right. A proper sight picture in level flight places the horizon between the two tapes.)

To the point of airmanship, there are only two fundamentals for a pilot to understand:

- Do not stall
    - Define a stall with reference to angle of attack, and explain that because airplanes are stable, they do not stall.
    - Explain how pilots cause airplanes to stall with excessive deflection of elevator and stall recovery is accomplished by unloading the elevator. Caution student against habit of holding elevator back pressure.
    - **Use the tape**; Talk about the sight picture and describe how to use the sight picture to detect inadvertent pitch.

Key Point: *If you do not stall, you will not spin. Neutral elevator avoids a stall. Always unload the elevator before using the ailerons.*

- Control yaw
    - Review the definition of yaw and its causes.
    - Reinforce the students understanding to control yaw with rudder.
    - Make the point that "you cannot control yaw if you cannot recognize yaw". **Use the tape** to explain how to detect yaw by reference to the sight picture, and that the student must develop the habit to use rudder to control yaw, whatever, the cause.

II. Introduction to Good Habits

- Impress upon the student that *airmanship*, flying an airplane, is not that hard; *yet, m*any good pilots have difficulty directing an airplane through maneuvers.
- Explain that one or more bad habits inhibit a pilot's flying skill, and emphasize that bad habits go to the heart of explaining loss of control accidents.
- Make the point that result bad habits result from a disregard for flying fundamentals (don't stall and control yaw) and the absolutes.

Key Point: Good habits are formed around proper use of the sight picture and avoiding over-control. Those are essential factors that promote airmanship – *they are absolutes.*

Explain that Newton's Laws of motion are absolute. A pilot's adherence to those natural laws of motion is mandatory, there are no exceptions.

- *Do Not Wiggle the Controls.* Newton teaches that when a pilot does stuff, other stuff happens and results in over-control. ***Use the Tape*** *to detect any tendency to over-control*.
- *Be Patient*. When a pilot must adjust or move a control, he should allow time for the airplane to adjust to the control input. He must be patient and allow the airplane to come to him. *After making an adjustment or moving a control,* ***Use the Tape*** *and watch the airplane adjust to newly directed attitude.*

Another absolute is the need for attitude information. A pilot cannot maintain control of an airplane without constant attitude information. When flying VFR, a pilot must **Use the Tape** to maintain constant attitude information by reference and interpretation of the "sight picture".

- A pilot cannot maintain control of an airplane without constant attitude information.
- Consider flying in the clouds without instrument skills.
- When flying VFR, a pilot must maintain constant attitude information by reference and interpretation of the "sight picture".

Key point: Moving your head and shoulders as you turn and look about is a common cause of over-control. You cannot focus on your sight picture when you are looking about and you will not see your over-controlling inputs.

Caution: Do you focus your attention on the runway as you turn base to final? Without focus on your sight picture, you will not see the nose move if you inadvertently apply back pressure; you will not see the stall coming; you will be too slow and too low to recover the spin.

III. Teach the Turn:

Make the point that a turn is a factor in most fatal LOC accidents.

Review with the student how the fundamental skills of airmanship are essential to executing a proper turn:

- A turn, like any other maneuver, should take advantage of an airplane's natural stability. Power and trim should be pre-requisite to executing a turn.
- Banking into and out of turn requires coordinated use of rudder and aileron together to control adverse yaw. **Use the Tape** to set bank angle and detect adverse yaw.
- Elevator is critical to proper turn; neutral when using ailerons, and "as needed" when established in the turn. **Use the Tape** to detect inadvertent pitch changes.

Give special attention to the technique of rolling out of the turn:

- The stick and rudder control inputs that direct an airplane to roll out of a proper turn in the traffic pattern are the same “top rudder” control inputs used for upset recovery and early spin recovery.
- The control inputs, rudder and aileron together with neutral elevator,

Dual Flight Lesson (two hours)

Purpose: Demonstrate and teach the student airmanship. Specific skills are:

1. Recognition and recovery from accelerated stalls from level turn.
2. Installing **the Tape** and using sight picture for attitude information, recognizing adverse yaw and over-control.
3. Using proper power and trim:
    a. demonstrate airplane’s stability
    b. demonstrate over-control
4. Properly execute a level turn

Goals: Teach good habits and pilot skills that will reduce the risk of loss of control.

Flight Syllabus:

I. Demonstrate and then allow student to cause and recover from accelerated stalls:
    a. Initiate stall from level turn at Vy airspeed. (feet off the rudder peddles)
    b. Emphasize that pilot causes stall with back pressure
    c. Stall recovery technique must be “releasing back pressure”
    d. Emphasize that attitude recovery, after stall recovery, is not stall recovery.

II. Demonstrate how to **Use the Tape** to interpret sight picture and what adverse yaw looks like:
   a. Set trim and power to establish straight and level flight at Vy.
   b. **Use the Tape** to review the sight picture and identify the indication of pitch, bank and yaw. Note that interpreting a sight picture is like using an attitude indicator, *aka* an artificial horizon.
   c. Demonstrate adverse yaw. Do not apply elevator pressure, and using aileron alone with at least 50% deflection, **Use the Tape** to roll into a 30 degree bank to the left. The nose will appear to pitch up. That is not pitch, but adverse yaw. The nose moved right, but because the airplane has rolled, the nose appears above the horizon.

III. Demonstrate and teach level turns. Follow these principles:
   a. Use rudder and aileron together when rolling into and out of a turn. **Use the Tape** and practice using a fast roll rate (perhaps 50% aileron deflection) to 30 degree angle of bank. Teach this coordination skill with the spoken cadence “on it – off it”. Say “on it” and apply rudder and aileron pressure; at the proper bank angle, release the pressure saying “off it”. **Using the Tape**, intently watch the sight picture to detect yaw during rolling moments, and provide guidance to adjust pressures and timing to control yaw.
   b. *Elevator must be neutral when rolling into and out of a turn*. **Not optional** – always unload elevator before rolling. It is helpful to unload, release yoke, before executing the roll. **Use the Tape** to watch the sight picture as you unload. If the nose moves, you where over-controlling.
   c. When established in a level turn, rudder and aileron are neutral and the elevator is used only “as required”. Become aware of over-control by releasing elevator pressure (remove hands from yoke) when established in a turn. **Use the Tape** and watch the sight picture as you let go. If the nose moves, you where over-controlling with elevator and/or pressure.

Flight Debrief: Emphasize with the student, the following:

- **Practice recovering accelerated stalls**. Becoming comfortable with stall recovery is important in relieving a pilot's anxieties about flying.
- **Do not over-control**.
  - **Do not look about**. It is unnecessary and induces over-control. instead,
  - **Use the Tape** to focus on the sight picture for attitude information and to develop awareness of over-control.
  - Work to develop a habit of allowing the airplane to fly the maneuver by **"letting go**" of controls.
- **Mastering a turn will make a pilot an airman**.
  - Proper control inputs at critical times become instinctive, a habit;
  - The skills of airmanship avoids loss of control incidents,
  - Possessing airmanship will encourage a pilot to be confident in his skills and ability to avoid and recover from unusual attitudes.