



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: July 21, 1998

In reply refer to: A-98-59 through -61

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Since 1983, the National Transportation Safety Board has investigated 145 accidents involving aerial advertising/banner towing. Forty-five of the accidents (31 percent) resulted in 37 fatalities and 11 serious injuries. A recent review of the accidents by the Safety Board indicated that a majority of the accidents were associated with one or more of the following critical flight phases, circumstances, or events: the banner pickup maneuver, entangled or snarled banner tow lines, and loss of engine power.

Banner Pickup Maneuver (63 accidents)

The banner pickup maneuver is a critical low-level maneuver performed about 20 feet above the ground in which, while trailing a grapple hook, the pilot flies above and between two upright poles about 15 to 20 feet apart. The pilot's objective is to engage the banner tow loop (suspended between the poles) by applying full power and abruptly pitching the airplane upward just before arriving at the pickup poles. The banner, laid out on the ground, is connected to a tow line about 250 feet long. To lift the banner into the air and to avoid dragging it along the ground, the pilot exchanges speed energy for altitude, attempting to gain as much altitude as possible before moving the banner. The airspeed decreases rapidly during the maneuver because of the airplane's nose-high pitch attitude. As the airspeed approaches the best angle-of-climb airspeed, the pilot must begin lowering the nose of the airplane to avoid a stall. However, for a variety of reasons, including inadequate pickup airspeed, excessive pitch attitude, and delay in reducing pitch attitude, about 50 percent of the accidents involving this maneuver result in a stall or a stall/spin and a subsequent collision with the ground. The fundamental problem is largely operational, involving banner pilot training, experience, and competence issues.

Entangled or Snarled Banner Tow Lines (32 accidents)

A grapple hook and cable assembly, the device used to engage the tow line during the banner pickup, is about 30 feet long. One end of the cable is attached to the tow release mechanism on the tail of the airplane adjacent to the rudder control horns. Typically, the grapple

hook and cable are brought forward along the side of the fuselage and through the cockpit window; they are stowed in the cockpit until the airplane is airborne and the pilot is ready to pick up the banner. The pilot then drops the hook and cable, allowing it to trail into position below and behind the airplane. However, if the hook and cable pass too closely to the side of the fuselage, the assembly sometimes becomes entangled or wrapped around the rudder control horns and disables the tow release mechanism. If the banner is picked up with the cable entangled in this manner, it causes significant loading and deflection of the rudder control horns and rudder, which leads the airplane to yaw severely. About 80 percent of the accidents involving entangled banner tow lines result in an in-flight loss of control and a subsequent collision with the ground or a loss of airplane performance and control during landing.

Loss of Engine Power (31 accidents)

A partial or total loss of engine power can occur because of fuel exhaustion, fuel starvation, fuel contamination, inadequate maintenance, or mechanical failure. Because typical banner towing operations are performed at relatively low altitudes, the loss of engine power usually allows the pilot little time to initiate emergency procedures, release the banner tow line, or position the airplane for a successful forced landing. About 40 percent of the accidents precipitated by loss of engine power involved in-flight collisions with objects/terrain; 20 percent involved an in-flight loss of control. The airplane was ditched (landed in the water) in 13 of the accidents.

Banner towing operations are conducted under a certificate of waiver or authorization issued by the Federal Aviation Administration (FAA) in accordance with Title 14 Code of Federal Regulations (CFR) 91.311, "Towing-Other Than Gliders." The respective FAA flight standards district office (FSDO) issuing the banner towing certificate may append special provisions to the certificate in the interest of safety if the operator uses nonstandard equipment or for other reasons such as geographical considerations, pilot limitations, air traffic control limitations, or weather conditions. The Safety Board is aware of one FSDO that appends special provisions concerning banner pilot minimal training and safety equipment to all banner towing certificates.

Operators who hold a certificate of waiver or authorization have the responsibility to train each new pilot in banner tow operations and in the special provisions of the waiver. However, there are no specific regulatory requirements or other guidelines, such as an FAA advisory circular (AC), that uniquely address banner tow training or operations. The amount of training given and the training syllabus used, if any, is largely at the discretion of the individual operators. The FAA requires that the new banner tow pilots demonstrate proficiency by performing one banner pickup and drop with the maximum number of letters (panels) to be used by the certificate holder. However, repeated accidents involving inadequate pilot performance (failure to maintain airspeed, misjudgment of clearance, etc.) during the banner pickup maneuver indicate a lack of adequate training and proficiency in performing the maneuver under both normal and abnormal (entangled banner) circumstances.

Although very few formal or structured banner towing training courses are available, the Safety Board is aware of one course¹ that has been approved by the FAA under 14 CFR Part 141, "Pilot Schools." The curriculum, which contains comprehensive ground and flight training designed to enable pilots to safely tow commercial banners, is described as follows:

Complete ground school on all related subjects, including FARs, waiver requirements, banner assembly, pre-and-post-flight of aircraft, banner tow equipment and banners, repair to banners and equipment, communications, emergency procedures, ground crew coordination and marketing. Flight training includes pick-up and drop procedures, in-flight emergencies involving banner towing, normal procedures, and abnormal procedures. Includes actual banner towing missions and ample practice banner pick-ups and drops.

The lesson syllabus includes repeated low passes (over the banner pickup zone) with emphasis on altitude and airspeed control, maximum performance maneuvers, failure of the tow release mechanism, loss of rudder control, repeated pickup and drop of the banner tow line (with and without the banner attached), and loss of engine power with the banner attached. Because of the history of accidents involving banner towing, which indicates that current training procedures are inadequate, the Safety Board believes that the FAA should require banner tow operators to train new banner tow pilots using an FAA-approved banner tow training syllabus, similar to the one above.

The Safety Board also believes that the FAA should issue a comprehensive aerial advertising/banner towing AC containing detailed information concerning FAA regulations and requirements; banner towing equipment and flight operations, including tow hitch and release mechanisms; banner assembly size and weight considerations, layout, and banner aircraft performance limitations; flight training guidelines/criteria for safe and efficient performance of the banner pickup maneuver and other phases of banner towing operations; fuel management; in-flight emergencies, including entangled/snarled banner tow lines and loss of engine power; and aircraft, engine, and banner equipment maintenance requirements.

The hazards caused by banner tow lines becoming entangled with the rudder control horns and/or tow release mechanism can be avoided through use of simple mechanical devices.² For example, for tail wheel airplanes with horizontal stabilizer support wires, a spring-action clip can be fastened to the lower stabilizer wire near the point where it joins the outboard bottom surface of the stabilizer. The tow cable may then be routed from the tow release mechanism outboard to the spring clip and then forward to the cockpit, ensuring that the cable is held away from the fuselage when the grapple hook and cable assembly are dropped. The weight of the hook and cable then pulls the cable away from the spring clip, and the cable trails normally behind and below the airplane.

A second device consists of a guard attached to the bottom of the fuselage projecting outward and aft from either side of the fuselage. This can be fabricated from a steel rod 1/4 to 3/8 inch in diameter bent at the center to form a "V." A small plate welded to the rod at the bend

¹ *Banner Tow Training*, Kaimana Aviation, Inc., Ponca City, Oklahoma 74601.

² Refer to *Instruction Booklet for Gasser Banner Equipment*, Gasser Banner, Inc., Nashville, Tennessee 37217.

serves as a base for attachment to the fuselage. The length and spread of the "V" is designed so that a tow cable sliding along the side of the fuselage toward the rear would be deflected outward around the rudder control horns and clear of the steering arms and springs.

Because these devices can prevent banner tow lines from becoming entangled with the rudder control horns and/or tow release mechanisms, the Safety Board believes that the FAA should require the installation of a mechanical safety device on the tails of tow airplanes such as a V-bar guard or stabilizer wire spring clip, designed to prevent entanglement of the banner grapple hook/cable assembly with the airplane's rudder control horns and/or tow release mechanism.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require banner tow operators to train new banner tow pilots using an FAA-approved banner tow training syllabus. The training syllabus should include repeated low passes (over the banner pickup zone) with emphasis on altitude and airspeed control, maximum performance maneuvers, failure of the tow release mechanism, loss of rudder control, repeated pickup and drop of the banner tow line (with and without the banner attached), and loss of engine power with the banner attached. (A-98-59)

Issue a comprehensive aerial advertising/banner towing advisory circular containing detailed information about FAA regulations and requirements; banner towing equipment and flight operations, including tow hitch and release mechanism, banner assembly size and weight considerations layout, and banner aircraft performance limitations; flight training guidelines/criteria for safe and efficient performance of the banner pickup maneuver and other critical phases of banner towing operations; fuel management; in-flight emergencies, including entangled/snarled banner tow lines and loss of engine power; and aircraft, engine, and banner equipment maintenance requirements. (A-98-60)

Require the installation of a mechanical safety device on the tails of tow airplanes such as a V-bar guard or stabilizer wire spring clip, designed to prevent entanglement of the banner grapple hook/cable assembly with the airplane's rudder control horns and/or tow release mechanism. (A-98-61)

Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations. Vice Chairman FRANCIS concurred with recommendation A-98-60, but disapproved recommendations A-98-59 and -61.

By:


Jim Hall
Chairman