
ROTOR GAZETTE

St. Louis Rotorcraft Club ~ PRA Chapter 35 ~ November 2005

CLUB MEETING - 3:00 PM Saturday, December 3, 2005

NOTE the TIME - 3:00 PM

Gyro accident prompts 'precession stall' discussion

by Greg Gremminger

A well-known gyro pilot from Texas, Ken Rehler, died as a result of a gyro accident on November 11, 2005. This latest fatality has prompted a lot of discussion on the internet rotorcraft forum.

Here's the description of the accident based on an experienced helicopter pilot's eyewitness account:

Ken, attempting a landing, nearly stopped mid-air about 20-30 ft high - off the side of the runway. It appeared that he then tried to rudder side slip over to the runway. At that time, the gyro rapidly yawed 90 degrees and then did a back flip over the top to impact the ground inverted. The gyro then rolled upright. Ken's gyro had two rudders to the sides of the propwash stream. Wind was reported at 12 knots and gusty. Temperature 81 degrees Fahrenheit.

The discussions are focussing on a possible cause of the accident, namely "precession stall" due to rapid yaw with spindle tilted aft. This is also probably the cause of a KB3 fatality at El Mirage a few years ago. "Precession stall" results from too rapid and large of cyclic stick input that causes one or both blades to stall enough blade area to cause a rapid severe flap. This can be done by rapid full throw of the cyclic from one stop to another, by the initial rapid pitching of the airframe during a buntover, or by airframe yaw or spinning while the spindle is tilted off the axis of airframe spin.

A specific example is when the stick is held aft to hold the nose up to hold zero or low airspeed in a vertical descent - especially with the engine running significantly - the spindle is tilted significantly aft. In this condition, if the gyro yaws or spins, a constant and severe cyclic input is provided to the rotor. This can either immediately stall a blade enough to flap it beyond the teeter and rotorhead limits, or slow the rotor down enough for it to flap and cone extremely. In the El Mirage case, the pilot attempting to do a vertical spin with some power for the rudder to spin it and a full aft cyclic to hold the nose up to low airspeed in the spin. The rotor precess stalled in 1/2 turn - bent up and flapped severely enough to break off a rotor blade!

Since the Rehler accident was a landing attempt, there was

probably little prop wash to enhance rudder authority. In such a twin rudder arrangement (similar to a Twinstarr that has also encountered severe "yaw flip") in a yaw, one rudder becomes "shaded" by the engine fuselage, and the large yaw moment from the forward empanage initiates a sudden yaw or "yaw flip" to the reverse direction. With just one rudder still effective, but with no prop wash to enhance it, side airflow on the large enclosure forward can yaw flip the airframe around! This may be what Ken's gyro did! In the landing flare, the spindle would have been tilted aft. When the airframe yawed far enough to cause a precession stall, rotor precession jerked the gyro onto its back from the severe imbalance of lift on the two rotor blades - like a tumbling gyroscope.

How does this affect us? With a single centerline rudder, there is probably no big issue with "shading" of the rudder in a yaw. But, with the rudder "fully immersed", rudder (and HS) effectiveness is a function of power setting, so some less rudder effectiveness should be expected at idle or no power - especially if there is a large enclosure or engine to block the airflow to the rudder. Keep speed up! In any gyro, when doing a vertical descent, use low power and do not hold the nose above level attitude - the CG higher than the rotor lift vector can "yaw flip" the gyro to the 180 degree position rapidly. Also, trying to hold altitude at low or zero airspeed with power and with the nose held high with aft stick, the spindle is tilted strongly aft presenting the precession stall possibility if a severe rapid yaw is initiated.

The moral of the story is avoid a yaw or spin at low or zero airspeed speed with the stick held aft. If doing a vertical spin, always allow the nose down a little with low power and a near neutral stick - the spindle will then be vertical and the gyro will be spinning around the vertical spindle - no cyclic input to the rotor! Never perform a vertical spin with significant power and/or with the nose held up with strong aft stick.

This Rehler accident was a bit freakish. I doubt anyone would have anticipated this scenario. But, it does show these are experimental aircraft, not always fully understood with normal airplane intuition. Airplanes don't fly at near zero airspeed and with a big gyroscope spinning above them.



St. Louis Rotorcraft Club
 c/o Greg Gremminger
 1725 Pleasant View Drive
 Ste. Genevieve, MO 63670

Election of Officers at December Meeting

At our November meeting, a slate of candidates was nominated for the club's officers and board of director opening. They are as follows:

President:

Gerry Loeser
 Bill Finnigan
 Mark Green

Treasurer:

John Wohaska

Board of Director:

Ken Bricker
 Bill Finnegan

Vice President:

Dave Herrmann

Secretary:

Mark Green
 Darren Twellman

As you might guess, with new officers our club will likely take on a new direction. The candidates expressed an extreme desire to revitalize our club.

Important, please show your support of these candidates and our club voting at the December meeting.

2005/2006 Meeting/Fly-in Dates

Dec 3, 2005, **3:00 PM** County Library, Lindberg Ave.
 Jan 7, 2006, **11:00 AM** ... County Library, Lindberg Ave.
 Feb 4, 2006, **11:00 AM** ... County Library, Lindberg Ave.
 March, 2006 Social gathering somewhere??

T-shirts, caps, sweatshirts available at
www.cafepress.com/pr35

Check out the Website
 (Webmaster - Dave Herrmann)
<http://www.stlrotorcraft.com>

Classifieds

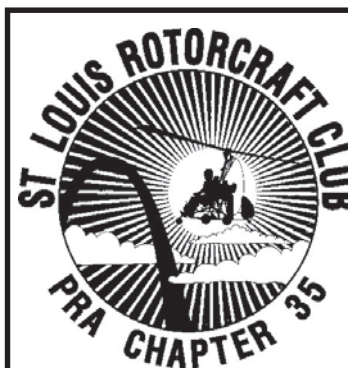
For Sale: Set of Benson plans, & engine manuals. 25-year collection of 90 & 72 hp Mac spare parts.
 James R. Smith 573-779-3535,

For Sale: Bensen drop-keel, Rotax 503 dual carb point ignition, 23' Dragon Wings, 5 Gal seat tank, main wheel brakes, trailer included. Featured on front cover Aug 04 Rotorcraft. Sale due to purchase of Parsons 2-place, 80 hrs TT, \$4500, John Wohaska, 636-296-7188. jswoh@yahoo.com

For Sale: Subaru EA-81, Hirth gearbox 2.03:1, MAC adapter, - Ken Bricker
 - 217-899-0175



2006 Dues are due.
Send to John Wohaska



2005 Officers:

President: Greg Gremminger
 (573) 883-3541
 VP: Dave Herrmann
 (618) 585-3871
 Treasurer: John Wohaska
 (636) 296-7188
 Secretary: Steph Gremminger
 (573) 883-3541
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 Steph Gremminger
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NEW: <http://www.stlrotorcraft.com>