Our Personal Gyro Safety Envelope

by Greg Gremminger

PROLOGUE:

I am starting this series of articles in response to the shocking accident rate in the past few years and months. I am also writing these articles in an attempt to help gyro pilots understand and appreciate the safety and aeronautical discussions currently embroiling the gyro community. These articles are intended to raise awareness of all levels of gyro pilots to take into account machine, environment and pilot factors, which combine to increase or decrease the safety margins of your unique personal flying envelope.

In these articles I am not claiming to be the all-knowing guru of gyro aeronautics. I am not speaking as a representative of the PRA or any other entity. I do not suppose to be the last word in the technical issues discussed herein - I expect there may be some of you who might disagree with some points of the technical discussions. I do, however, have many years of gyro building, flying and experimenting with many of the aeronautical principles and theories currently under such heated discussion. Over the last couple of years, through my Rotorcraft magazine involvement, I have been deeply engaged in these technical discussions and arguments.

In this series of articles I hope to convey these concepts in practical and understandable terms. I will not attempt to endorse, condemn or condone specific design configurations or components. Discussion of specific configurations or components are presented only to help the reader understand and appreciate that outright evaluations of good or bad features or components is often an oversimplification of complex interrelated factors. Hopefully, appreciating the complexity of the interactions of these various factors will help us all approach our personal machine and flight envelope with appropriate caution and respect.

First, some terminology for the purpose of this discussion:

✔ **Safety Envelope:** The limits of our ability to safely fly (a gyro). These limits are set or defined by numerous pilot, machine and environmental factors.

✔ **Environment:** The set of conditions in which we are currently flying or intending to fly, including, for example, wind, altitude, turbulence, airspeed, temperature, proximity of obstructions, lighting, surface field conditions, size of audience, etc.

✔**Pilot proficiency:** Pilot proficiency is gained when proper control reactions become permanently committed to automatic or unconscious responses. Automatic and unconscious responses are learned and reinforced through conscious repetition and practice. The brain can handle multiple unconscious responses at the same time (walk and chew gum at the same time!) The conscious brain has limited ability for conscious attention to multiple activities. For this reason, the proficient pilot is one who has practiced the required control responses enough to commit them to unconscious automatic response - leaving room for other conscious activities (such as avoiding obstacles or performing for a crowd!).

✔**Pilot factors:** Our personal set of human factors affecting our pilot proficiency, including for example fatigue, experience, ego, mental attitude, distractions, etc.

✔**Machine factors:** The specific parameters and factors of the gyro we intend to fly, including for example stability, controllability and maneuverability factors, as well as obvious structure and powerplant reliability issues.

It is my concern that the safety of this sport might not be enhanced with the current level of discourse and argument between proponents of differing types of gyro designs and components. The current discourse, sometimes pointed, accusatory, emotional, biased and polarizing, may be creating more questions and confusion, thereby promoting resistance, inaction and inattention by those who are most at risk - the pilots. I certainly hope this series of articles serves to focus attention on each of our individual personal safety envelopes, rather than on continuing heated discussions of whom or what might be to blame!

Is the gyro at fault?

In my opinion, it is an oversimplification to blame a certain gyro configuration, component or lack of a certain component for the rash of accidents we have recently experienced in this sport. These recent tragedies have involved pilots of all levels of mechanical and flight experience. Although some conclusions based on types of machines are tempting to make, in most cases the common denominator is the pilot and his/her skills and decision-making. Through understanding and appreciation of their own personal flight safety envelope in that machine and in that environment, the pilot is ultimately responsible for his/her fate. It is my opinion that what is necessary to break this current safety dilemma is to improve the skills and decision making capabilities of each of us through much improved understanding and ap

preciation of the complex interactions of our personal skills and the many interrelated aerodynamic and control factors in the particular machine we are flying in that particular environment that day.

That is not to say that gyro configurations and components do not play a part in any accident - they certainly do! But the ultimate root cause may be that pilot's lack of awareness, understanding and appreciation that those factors influenced his/her flight safety margin in that flight environment. These articles are my attempt to cut through the confusions and misunderstandings of the technical theories and debates, without pointing fingers or picking favorites. I will attempt to help all of us, gyro pilots and aspirants alike, appreciate that and why even the high time pilots have limitations in his/her own personal safety envelope that should be recognized and considered on each flight.

Every flight, every gyro is different:

Every gyro is different and requires different automatic control reactions by the pilot. Every gyro requires different control reactions in different environments of wind, temperatures, airspeeds, power settings, etc. Some gyros may have uniform control requirements throughout their flight envelope, but others may control quite differently from low speed to high speed, for instance. It is my belief that (almost) anyone can learn to fly any gyro in almost any reasonable environment. That is often the argument that any gyro can be safe - as demonstrated by certain long-time pilots. However, in the same way that a human being (or even a monkey) can learn to ride a bicycle or a unicycle, the important element enabling proficiency in any machine is the developing of automatic control reactions which can be learned only with practice and repetition in that machine.

Proficiency is a learned response:

In flying a gyro or an airplane, in riding a bicycle or a unicycle, or in any learned physical accomplishment, there are two levels of human control activity - conscious, and unconscious (or automatic). Conscious repetition of a control activity is the only way to develop the automatic, unconscious control. This is accomplished by burning a pathway of synapses in the brain, which will allow the brain to automatically control that function. That is how human beings learn to walk tightropes, ride unicycles or fly aircraft. The positive fact that gyros are so maneuverable and are capable of such a wide envelope of flight conditions makes their control requirements quite different and often unique in different machines and different flight environments. Each one of these unique requirements must be learned by the brain before safe, automatic control of that machine in that environment is accomplished. Before automatic control of that machine is learned in that environment, the conscience brain must dedicate attention to that control function - limiting attention to other activities and responses. That is why proficient flight in any type of aircraft, but especially as we shall see in rotary wing aircraft, in different environments or configurations, must be learned carefully and slowly so as to commit each control requirement to automatic brain reaction. Once each reaction is committed thoroughly to automatic control (synapse paths burned in), the brain can free up some conscious attention for a new challenge.

In the articles that will follow in the next several issues, we will explore the numerous factors that may effect your flight proficiency and help you better identify your own personal flight safety envelope. I hope I might influence each of us to more fully respect and approach every flight, in every machine, in every environment with a fuller appreciation of our specific situation. That we may recognize that we might not have adequately developed our automatic reactions, for this flight, this day, in this machine, in this environment. By recognizing on each flight when any one of the familiar factors are different, we may think to approach that limit of our personal safety envelope with appropriate conscious attention; that we may avoid the surprise when our automatic systems are not adequate for that flight situation. Or we might better recognize when the machine or environment for that flight is beyond our learned capabilities, our personal safety envelope, our proficiency level, and so may decide to not even fly that machine that day.

*Next month we will explore the differences between **Controllability**, **Maneuverability** and **Stability**. These are the sources of some misunderstanding. They are not the same things and they are not necessarily directly related or mutually exclusive. The differences are both interesting and important.*

Tips To Live By

The following are several brief guidelines critical to your safety. The reasoning behind these will be covered in future installments of this article. These are presented - short and sweet - at this time, because these are factors that are leading to fatalities, and some of us may not be able to afford to wait for more details. Please consider and heed!

✔ If your gyro's nose flies lower at high speed or high power, do not fly like that without abundant experience, and never in turbulence - you may be setting yourself up for PIO or PPO!

✔ If your gyro wobbles or bobbles around in turbulence, do not fly in turbulence!

✔ Do not ZOOM in a gyro - the reduced loads and steep angles may easily cause PPO in MANY GYROS!

✔ If you have not flown in a while - get training and have someone experienced help you solo!

✔ If you are tired or lacking normal mental or physical faculties, do not fly!