INTRODUCTION OF PILOT DECISION MAKING TO THE GLIDER PILOT

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INTRODUCTION

This paper addresses the history, formulation, and execution of a decision making program presently being presented to glider pilots in the United States by the Soaring Safety Foundation and the Soaring Society of America.

The teaching of judgment training and decision making has, since flying began, been passed over lightly in favor of teaching the mechanical aspects of flying, with some instructors believing that judgment could not be taught, but was inborn.

The SSF and SSA believe that the application of this course to all glider pilots will cause a significant reduction in accidents. This reduction will not be obvious for several years, but it is anticipated that with proper indoctrination, we will see a steady decrease in judgmental-related accidents by as much as 30% over the 5 year test period.

The introduction of the concepts, followed by practice during training, should provide the new pilot (and those receiving this training during recurrent training) a solid foundation for recognition of hazardous situations, whether mental or physical, and more thoroughly complete the training cycle.

HISTORY

The history of flying is peppered with advice on how to avoid having an accident. You may have seen the wall poster describing the twenty five "Regulations for Operation of Aircraft," which supposedly dates back to January, 1920. We are still talking about the same problems today.

1. Don't take the machine into the air unless you are satisfied it will fly.
2. If you see another machine near you, get out of the way.
3. If flying against the wind and you wish to fly with the wind, don't make a sharp turn near the ground. You may crash.
4. Never take a machine into the air until you are familiar with its controls and instruments.

During the years that have elapsed since those regulations

were cardinal, some of the more perceptive instructors recognized that pilots proven to be quite adequate at the mechanical operation of aircraft continued to have accidents for unexplainable reasons. Accidents were classified as "pilot error" when no other logical cause could be ascertained. With more than half of the accidents having such a conclusion, it would have been logical to assume someone would attack the accident problem from the psychological area.

But there was no real attack on "pilot error" problems until recent years. Some instructors even believed that judgment couldn't be taught, but was "inborn," and only those so blessed would ever be outstanding pilots. Today, there are still instructors who believe this.

In 1974, the Federal Aviation Administration (FAA), the pilot licensing agency in the United States, supplied a grant to the University of Illinois to study the general aviation accident cases occurring between 1971 and 1974, and attempt to discover a common thread among them. They were to examine causes, skill and experience levels, pilot's occupation, etc.

The results, though inconclusive as to causes, etc., did discover that 35% of the non-fatal and 52% of the fatal accidents were directly traceable to pilot-judgmental factors; commonly called "pilot error."

While the University of Illinois group continued to study their findings and formulate a plan, the U.S. military pilot training programs introduced judgment training, replacing many of the formerly memorized procedures with situational training where the pilot could make a decision as to what was really needed, then observe the results, rather than react strictly by rote. The increased versatility of simulators made such training possible without exposing student and instructor to hazardous situations. Today, with such things as "terrain flying" at unbelievable speeds, the military is teaching an extension of decision making, "task shedding," where the pilot chooses what is important to the flight and what can be put off until some later time; in effect, prioritizing tasks to lower the overall stress level and work load at critical times.

Do glider pilots face the necessity to make similar selections while circling at low altitudes and during competition flights?

In 1978, United Air Lines, a commercial Air Carrier, introduced a Command, Leadership, Resources/Management course to all of the pilots flying for the company. This was an intensive four day course in decision making emphasizing crew coordination and management of all available resources within the cockpit to solve problems and provide a safer, more efficient operation. The course called for the "manager" (the Captain) to gather all available information from each crew member, then formulate the plan of action, discuss alternate plans with the rest of the crew, and then initiate the best plan available.

Since that time, almost all carriers have initiated a similar program, and have the programs for sale.

Meanwhile, in 1982, Embry-Riddle University of the Air, a leading flight training school for general aviation pilots, was given a grant by the FAA to test a program which evolved from the University of Illinois study to see if judgment and decision making could be taught. This study brought us to where we are today, with our own vocabulary; "Hazardous Thoughts," "Antidotes," "Action Ways," etc.

In case you're wondering about the results of the study at ERUA: Students trained in judgment committed 36% fewer errors over a list of tested tasks, including traffic pattern and landings, stall recognition and recoveries, and unusual activities (such as flying low along a beach crowded with people). A similar study conducted in 1984 in the FAA Eastern Region of the United States found a 16% reduction in judgmental errors during "check flights."

The Soaring Society of America added Judgment Training to its CFI-G (Certificated Flight Instructor-Glider) Revalidation Clinics in 1985, and continues to emphasize that training during clinics, seminars and magazine articles. These clinics provide CFI-G's an opportunity to revalidate their certificates (a requirement every two years) as well as get recurrent and new training in areas necessary to flying and instructing. The seminar programs present similar information to the "grass roots" pilots.

During the period of 1974 to 1986, similar and parallel studies and courses have been conducted in Canada (transport Canada sponsored), Australia and France.

Michel Bouet, a glider pilot and professor of sports psychology in France, has compared the ability of "non-expert" and "expert" pilots to make good decisions based on available information, and has written a cogent piece disclosing his findings. In layman's terms, he found that the ability to predict the results of a particular decision is strong in expert pilots, while almost non-existent in non-experts. This is not hard to believe, when one considers that each experience we encounter as pilots can be stored for future reference, and the non-expert has a much smaller repertoire of past experiences to call upon to make such projections. The conclusion we may draw is that if it were possible to expose the non-expert pilot to many experiences in a short period of time, he would have the facility to make better decisions in the future. While it may not be possible to enlarge his background significantly, it is possible to increase his awareness of the method for making a good selection from the available choices, and hence effectively train him to avoid situations that may call for superior decisional skills beyond his experience level.

That is the purpose of Pilot Decision Making training as we are now using it in the United States.

Since the program is being initiated in a poorly controlled atmosphere, the cockpit of a glider and the pre-flight briefing and critique portion of training, it may be impossible to prove, scientifically, that the PDM program is effective. However, using the logic that up to 52% of previous accidents have been judgmental-related, and in light of the stated decrease in judgmental errors in the two test programs, the Society Society of America and the Soaring Safety Foundation encourage the use of the PDM program.

HOW IS JUDGMENT LEARNED AND TAUGHT?

Several learning and teaching methods have been recognized. Passive learning, negative learning, peer pressure, self-commitment, structured learning, and behavioral modification present methods explored over the years.

Mere presentation of the facts or using the fear factor (passive learning) have not shown much advantage. Accident statistics seem to have no (or very little) effect on the accident rate. The same can be said about fear, Cancer data, heart attack information, or accident pictures do not seem to leave a lasting enough impression to warrant their use. In the U.S. today, however, publicity campaigns against drunk drivers are making some headway, and the methods being used may be pertinent in the future.

Negative learning—the "don't do's," fail to substitute a positive cure in many instances, and therefore are not overly effective.

Peer pressure is somewhat effective, but only while flying with a particular group, since different flying clubs have different rules and methods. "Hangar flying" sessions are help-

ful, if one considers that there is always a person who thinks the more dangerous his acts, the greater his piloting skill, and that discussions may bring out a better way to do something.

Self-commitment is probably the choice we would all like to see made by the student pilot. (The use of student pilot applies to all pilots receiving any kind of instruction, regardless of method, experience, etc.). The motivation from within to better one's self in flying can be far stronger than any outside teaching device, and can be readily enhanced by other teaching methods.

Structured learning presents to the student a program he can follow with or without assistance, and is as effective as the student (and assistant) make it. While there is some fine structured texts available, there are also some not-so-good ones, making the selection difficult for the uninitiated.

The Pilot Decision Making course presently recommended by the SSF and SSA is a behavioral modification type program, attempting to enlighten the student to hazardous conditions and thoughts and presenting him with solutions (through antidotes to those thoughts) and practice to ingrain proper action at the proper time, with positive reinforcement for proper responses, and discussion to discourage improper responses.

This presents the student with a pleasant experience each flight (unlike negative learning where the experience may be unpleasant as the instructor screams "don't do that!" or strikes the student with a clip board whenever an error is committed), and an opportunity to openly discuss the reasoning that went into a decision without feeling overwhelmed by the complexity of the man/machine interface.

Behavior can be modified by several methods; hypnosis, yoga, voodoo, and maybe even faith healing. It can also be modified by substitution; i.e. since the mind is just like a computer, only able to process one bit of information at a time, should an unsafe thought occur, if the student had an immediate replacement for that thought, his response could be guided toward more temperate actions. That defines judgment/decision making: performing the proper act at the proper time and proper place, considering the equipment and information at hand.

PILOT DECISION MAKING COURSE

The course consists of seven judgment concepts; Subject Area, Judgment Chains, Actions Ways, Mental Processes, Hazardous Thoughts, Antidotes, and Stress management.

SUBJECT AREA

All decisions must be made considering three things:

The Pilot
The Aircraft
The Environment

I have added two more because I feel glider pilots are so influenced by it that it requires special mention:

Time
Situation

The Pilot: the pilot must always consider his physical condition, mental condition, skill, experience, and knowledge in all decisions. Some are long-term (such as knowledge) and some are short-term (such as a broken leg). If there is any impairment in any area, he must be aware of it, to say the least, and may even decide that a flight today is a bad decision simply because he isn't up to it.

The Aircraft: consideration must be given to the applicability of the aircraft to the mission, it's condition, and whether the pilot is familiar enough with the aircraft to accomplish the task chosen.

The Environment: recognition of weather conditions, changes, airport conditions, off-airport field conditions (time of year, crop, etc.) and awareness of the effects of these on the planned flight.

Time: the failure to recognize that there is not enough time to complete a task (or to start one, for that matter) has led to unnecessary outlandings and probably to several accidents. Time is rarely a friend to the glider pilot, and he must always be aware of it.

Situation: the pilot must always consider the situation when making a decision (or series of decisions). What may be right for one situation may be absolutely wrong for another. For instance, decisions made while on a competitive flight must consider several factors not normally considered while on a local flight.

JUDGMENT CHAINS

The course addresses the integration of decisions, and calls that a Judgment Chain. While the purpose of the course is to show the student that a poor decision may lead to a faulted judgment chain (since those decisions following are based on the anticipated results of a faulty one), one must realize that there are Good Judgment Chains also, but the potential for flying toward an accident or incident is greatly enhanced when a poor judgment chain (PJ chain) is allowed to continue. The number of alternatives become smaller as the PJ chain length increases until there are no viable options remaining. Several people have stated that as few as five poor decisions in a row will lead to an accident.

The emphasis, then is to present the student with a method of determining when he has made a PJ, and how to break the chain.

ACTION WAYS

The use of action ways demonstrates to the student a vocabulary that will quickly explain why the problem was not noticed, or why it was not solved. They describe the ways we choose to do things.

1. Do: the pilot did something he should not have done
2. No do: the pilot did not do something which should have been done
3. Under do: the pilot did not do enough when something more should have been done
4. Over do: the pilot did too much when less should have been done
5. Early do: the pilot acted too early when action should have been delayed
6. Late do: the pilot acted too late when something should have been done earlier

Since most problems have several solutions and the success of the decision is based on these things, the action ways become a critiquing tool as well, to be used not only in the air, but on the ground, followed by a discussion of the proper course of action for the problem involved.

MENTAL PROCESSES

Structuring the mind to react in an orderly fashion requires realizing when the student can adequately manipulate the aircraft, teaching him to think all situations through thoroughly, and teaching him to constantly review his decisions.

AUTOMATIC REACTION

When you sign your name, you are performing something by automatic reaction. When you make no conscious effort to hold the wings level during straight flight, you are doing so by

automatic reaction. The student should be able to manipulate the glider almost automatically before introducing the course to him, or the importance of decision making will be dimmed by the necessity of concentrating on flying the aircraft.

PROBLEM RESOLVING

Discovering several solutions to a problem and choosing the proper one is the basis of all decision making. The course emphasizes thinking through each potential solution, trying to visualize what the flight will be like should that course of action be followed, and then picking the solution that most closely follows where the flight is supposed to be going.

1. Recognize and analyze a problem.
2. Consider the solutions and outcomes.
3. Apply the chosen solution to the best of the pilot's ability.

REPEATED REVIEWING

Recognizing the results (feedback) of a decision, and continued search for other situations that may require a decision is the principle of repeated reviewing.

Unless the student is made aware (by one way or another) of a problem or situation, he may not recognize it until he is quite far along the situational path. However, when once made aware of a problem, the student seems to say "Why didn't I recognize that earlier?"

It is quite possible for subtle changes to take place without recognition, and only by repeatedly reviewing the present situation, can one recognize those changes. Once recognized, however, their solution becomes quite simple (usually).

HAZARDOUS THOUGHTS

From this point forward, the application of all that went before is focused on solution of problems or when one recognizes that a hazardous thought has occurred. Here are the hazardous thoughts and a brief description, verbalized, of what may be in the mind at that moment.

1. Anti-authority: "Don't tell me what to do"
2. Impulsiveness: "Do something quickly"
3. Invulnerability: "It won't happen to me"
4. Macho: "I can do it"
5. Resignation: "What's the use"

Anti-Authority: a rebellion against any kind of authority. whether it be from parent, flight instructor, controller, or whatever. The rebellion can be partial or total, with the state of mind dictating how far one pushes the authority image.

I quickly point out that a reluctance on the part of the student to follow instructions to do something that appears hazardous to the student is not an anti-authority thought, but merely a questioning of the request. For instance, questioning a request by a traffic controller to turn away from the airport while low in the traffic pattern is not an anti-authority thought, but a genuine good decision based on the environmental perspective of the moment.

Impulsiveness: in early students, there seems to be a desire, if not a need, to do things quickly. If not tempered by positive instruction, this can carry over to the decisions made throughout a pilot's career. As we know, there are only a few things that happen while flying that require an impulsive (automatic) reaction, such as avoiding a mid-air, or a rope break at very low altitude. At most other times, we have adequate time to survey the situation (Problem Resolving) and select a viable solution (Repeatedly reviewing) and follow through without incident.

Invulnerability: the feeling that things happen to others, because they are stupid or poorly prepared blocks our awareness that we too are sometimes ill prepared for what is coming, and leads us to believe that we are invulnerable, that nothing will happen to us.

Macho: the Macho thought leads one to "show off," to take a chance where not necessary, or to try to prove superiority over others. Though normally thought of as a male characteristic, women are equally susceptible.

Resignation: when you feel you have done everything possible and nothing is working out right, you are feeling resignation. There seems to be nothing left to do but ride it out and hope for the best.

ANTIDOTES

As said earlier, the mind is like a computer, in that it can only process one thing at a time. If we could only replace the hazardous thoughts with a more constructive thought, the mind would be forced, due to its limitations, to process the antidote.

1. Anti-authority: Follow the rules, they are usually right.
2. Impulsiveness: Not so fast, think first.
3. Invulnerability: It could happen to me.
4. Macho: Taking chances is foolish.
5. Resignation: I'm not helpless, I can make a difference.

There are the replacement thoughts, the Antidotes, for each of the hazardous thoughts. They must be memorized by student and instructor alike. By memorizing the thought and the antidote, the student has an automatic reaction to replace a hazardous thought (when recognized) with the antidote. The instructional problem is to raise the consciousness of the student to recognize when he is indeed having a hazardous thought.

Anti authority: "Don't tell me what to do": Follow the rules, they are usually right.

By simply replacing the dislike of authority with the antidote one can then quickly decide whether the action requested by the authoritative figure is logical and possible, lessening the dislike for authority we all possess.

Impulsiveness: "Do something—quickly": Take it easy, slow down.

The instructor should encourage the student to take a deep breath, slow down, and think through the problem before reacting. Those cases where immediate action are required can be handled separately.

Invulnerability: "It won't happen to me": It could happen to me.

"There but for the grace of God go I" should serve as a reminder that it can happen to anyone, and we must always be aware of it.

Macho: "I can do it": Taking chances is foolish.

With all of the things one sees at a glider contest, it may be difficult to convince a student that low finishes and low thermaling are unsafe. It is still imperative that the instructor positively reinforce any tendency on the student's part to avoid taking a chance.

Resignation: "What's the use": I'm not helpless, I can make a difference.

A recent study by United Air Lines training cadre identified the two most common hazardous thoughts of airline pilots to be invulnerability, followed by resignation. As inconsistent as that seems, further thought shows that after following all of the rules (a common airline pilot habit) the only thing left to do is ride it out. Awareness of the ability to interrupt a situation (PD Chain) must be integral in the instructor's teaching.

STRESS

Though we normally think of stress as being debilitating, a certain amount of stress improves performance. The thrill we feel from the challenge of a new task is positive stress, and is healthy.

If we were to plot stress versus performance on a curve, we would find that at the low end of the stress curve, performance is low (in fact, the task might be considered boring), while at the other end, a high stress situation, panic might more aptly describe the feelings. Somewhere in between these two extremes we achieve maximum performance and the thrill of a job well done.

If a pilot becomes aware that the requirements to perform a certain task are approaching his piloting capabilities, the increase in stress may be sufficient to cause him to react unfavorably. The disproportionate number of accidents during the landing phase can be correlated to the task being difficult and the pilot is near the end of his flight, which may mean he is tired, thus has suffered a decrease in capability. At some point, these two issues expose the pilot to the potential for an accident. It is difficult to say how many times a pilot has landed beyond his capability, but it is reasonable to assume that it is a frequent event, just from the number of problems encountered during that phase.

The relationships between stress and decision making are well documented in several studies, and the instructor's job in this program is to point this relationship out to the student.

COURSE ADMINISTRATION

The instructor must realize his role in training. is he a coach or an evaluator? There is room for both, but generally, he is a coach, i.e. he is there to help the student progress by providing encouragement and instruction through demonstration and personalized instruction.

The use of sound educational principles is essential to successfully using the PDM program. Positive and generous reinforcement, clear statement of learning objectives, and shaping of behaviour are the goals. The generous reinforcement is slowly reduced to occasional rewards to offset the student performing solely for the reward.

The instructor must realize that this is not a psychoanalysis program, nor are the hazardous thoughts to be considered personality traits. Each thought is a momentary thing that occurs in all pilots' flying, and should be treated as such. There should be no attempt to classify the pilot into a psychological group (even though it might be tempting) and no attempt should be made to determine why a hazardous thought occurred, but an attempt to make the student more aware that a thought did occur and that he must be more alert to such thoughts in the future. Behavioral modification must only involve the action, not the overall behaviour of the pilot.

As the student becomes more capable of handling the aircraft, the instructor may choose to begin exposing the student to several practice problems in decision making, stress recognition and management, and judgment.

The method used is to select a particular Mental Process exercise and a particular Judgment Scenario for each lesson, then allow the student to work through the problems, whether in flight or on the ground. The instructor is monitoring the student to see if the observed behaviour indicates success in using the mental process being developed. It will require at least three exercises for each mental process taught, with each lesson taking about five minutes, a total of nine lessons and 45 minutes.

The Judgment Training scenarios are divided into phases of flight, and are chosen to coincide with the student's level of experience. The first time such exercises are administered, the instructor informs the student that he will, from time to time, introduce these problems in the training. The student is to recognize and solve the problems, and a complete critique will take place after each flight. Emphasis that the instructor will not put the student (or himself) in danger, that the problem will be terminated (and by what method) once solved or if the situation is not progressing, but getting worse. Obviously, if there is no progress, there is no sense continuing into a worsening condition. This is the instructor's decision, but the student will be notified of the termination. Discussion then will be on the ground following the flight.

The instructor must know what behaviour is being sought, and be ready to positively reinforce correct behaviour immediately. Any unsatisfactory behaviour should be described in relation to the action ways, the subject area, and relation to poor judgment chain development, then discussed on the ground to establish proper behaviour.

Several post-check scenarios are provided for additional work and it is recommended that these be used to further reinforce the need for continual awareness of decisional factors on each and every flight.

COURSE MANAGEMENT

Material is included for the instructor to keep track of the progress of each student and to plan his future activities with each.

A master plan for scheduling training activities gives the instructor guidance as to when and how to administer the program, a student progress record for both ground and in-flight activities provides additional guidance, a complete record for sequencing of lessons, and blank lesson plans encourage the instructors to invent their own scenarios.

CONCLUSIONS AND RECOMMENDATION

The SSA and SSF have concluded from the findings at Embry Riddle that the decision making program herein described is a major contribution toward reducing accidents and incidents, and are recommending that all glider instructors and all glider schools include the material in the training curriculum.

Several schools have done so, but the program has not been in use long enough to make absolute positive statements as to its effectiveness.

Introducing the course to the flight instructors was done intentionally, since without their assistance, there will be no major changes in training, and without their awareness of the program, there can be no hope for use, regardless of how vital it might be. The fact that the program adds no appreciable time to the training program has surprised schools and instructors, and made them more willing to try it.

For copies of the booklets, contact:

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