



Flight Advisor Corner by Hobie Tomlinson

June 2011

Human Factors, Part VII

June is here and the summer flying season is in full swing. Historically, as the flying level increases during summer, so does the accident level – surprise? So as we continue our series on “human factors,” we now want to take a look at “*Human Behavior*” and “*Risk Management*” as critical components in our accident prevention strategy.

The Study of Human Behavior attempts to explain how and why humans function as they do. Human Behavior is a complex topic and is the product of innate human nature, an individual’s experiences, and the environment within which it occurs. While definitions of Human Behavior abound, depending on the field of study, the scientific world sees Human Behavior as the product of factors that cause people to act in predictable ways.

The Federal Aviation Administration (FAA) studies human behavior in an attempt to reduce human error as an accident causal factor. The term “Pilot Error” has historically been used to describe an accident in which the pilot’s actions and/or decisions (or the failure to take proper actions and/or make correct decisions) were either the cause or a contributing factor in the resulting aircraft accident. The broader term for these type accidents has become “*Human Factors Related*” accidents.

A Single Decision (Error) or event does not typically lead to an aircraft accident. An aircraft accident is usually preceded by a series of events and/or decisions which have become known as the accident “Chain.” If this “Chain-of-Events” can be recognized and broken, no accident occurs. Because this “Chain-of-Events” typically involves the interaction between pilots and/or other aviation personnel, Crew Resource Management (CRM) and Line Orientated Flight Training (LOFT) were implemented. LOFT is simply scenario-based training which occurs during a “real-time” simulator session. This is a “Preflight” to “Secure Cockpit” (gate-to-gate) simulator flight in which any problems which are introduced have to be dealt with by the crew in “real time” and either solved or “lived with” until the flight’s conclusion ~ just like in the real world. Loft Training and CRM have produced a very positive impact on Commercial Aviation safety. The move toward scenario based training in General Aviation is in an effort to extend these proven training techniques to the wider pilot group involved in private aviation.

While Human Error indicates the “What and How” of an aviation system process (i.e. flight operation) breakdown that became the cause of an accident, it provides no guidance as to “Why” the breakdown occurred. The uncovering of why pilots make mistakes – no one gets up in the morning thinking, “I am going to go get my airplane and go out and have good crash today” – definitely involves multiple disciplines. In aviation (particularly with pilots) some of the human factors which have to be considered in examining the human decision-making process involve the design of flight displays and controls, flight deck layouts, communications, software, maps and charts, operating manuals, checklists, and system procedures. Any of the preceding items can become the stressor that triggers a breakdown in human performance that results in a critical human error, which then becomes the cause an aircraft accident.



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Poor Decision-Making by pilots (i.e. Human Error) has been consistently identified as a major factor in many (estimated at 70 to 80%) aviation accidents. The field of Human Behavior research attempts to determine an individual's predisposition to risk taking and the level of an individual's involvement in the accident chain. Multiple scientists have spent countless hours trying to figure out how to improve pilot performance by drawing upon decades of scientific research on the subject of Human Behavior.

Human Behavior is a good place to start when looking at risk. The obvious question being, are there certain pilot who are just "accident prone?" The answer will probably not come as any surprise to anyone who has spent much time in the industry. It is an unqualified "Yes" and the industry has even come up with an "official title" for pilots who are at a high risk of having an accident ~ "Rogue Pilots."

A Research Study overseen by the Federal Aviation Administration (FAA) which surveyed over 4,000 pilots (One-half with "clean" records and the other half who had been involved in an accident) came up with the following five traits of **Rogue Pilots**:

1. Rogue Pilots show a **Distain toward Rules.**
2. Rogue Pilots usually have **Numerous Violations in their Driving Records.**
3. Rouge Pilots typically fall into the personality category of **Thrill and Adventure Seeking.**
4. Rogue Pilots are **Impulsive rather than Methodical and Disciplined** in the following areas:
 - a. Information Gathering
 - b. Speed and Selection of Actions Taken
5. Rogue Pilots show a **Disregard for and/or Underutilization** of the following sources of outside information:
 - a. Flight Instructors
 - b. Other "Safety Counselors," including pilot friends
 - c. Industry accepted "Best Practices."
 - d. Organizational Standard Operating Procedures (SOPs)
 - e. Copilots and/or Flight Attendants
 - f. Air Traffic Controllers
 - g. Flight Service Personnel

Successful Pilots, on the other hand, typically display the following characteristics:

- The **Ability to Concentrate**
- The **Ability to Manage Workloads**
- The **Ability to Monitor and Preform several Simultaneous Tasks**



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Research also demonstrates significant links between a pilot's personality and his (or her) performance, especially in the areas of crew coordination and resource management. Borrowing from the title of a famous book about American Astronauts, the FAA categorized the three pilot groups as follows:

- The “**Right Stuff**” Group displays the following characteristics:
 - Has the **Right Stuff**
 - Positive **Achievements**
 - Positive **Motivation**
 - Positive **Interpersonal Behavior**

- The “**Wrong Stuff**” Group displays the following characteristics:
 - Has the **Wrong Stuff**
 - High Level of **Negative Traits**
 - **Autocratic Traits**
 - **Dictatorial Tendencies**

- The “**No Stuff**” Group displays the following characteristics:
 - Has **No Stuff**
 - Lack of **Goal Seeking**
 - Poor **Interpersonal Behaviors**

These Groups surfaced in a 1991 study by Robert L. Helmreich and John A. Wilhelm titled “Outcomes of Crew Resource Management Training.” During this study a subset of the participants reacted negatively to the training. These were the individuals who had been previously identified as most in-need of the training being provided! This confirmed to the study's authors that personality traits played a factor in the likelihood of having an aircraft accident, because the individuals who resisted the training lacked adequate interpersonal skills and had previously not been placed in the **Right Stuff** group. The conclusion was drawn that this group felt threatened by an emphasis on the importance of communications and human relations skills.

A 2005 Study by the FAA determined that human error which is associated with General Aviation accidents is multifaceted. Specifically, the analysis revealed that the following four causal items (which are listed in largest cause order) were involved in General Aviation accidents:

- a. **Skill-Based Errors**
- b. **Decision Errors**
- c. **Violations of Rules and Regulations**
- d. **Perceptual Errors**



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The Final Step is identifying a variety of intervention strategies which are targeted at all four leading error groups. Because humans are error-prone, errors are a normal part of Human Behavior. *Trying to eliminate Human Error is a very unrealistic goal.* The parallel thought is that many aviation accidents are preventable. This fact leads us to seek ways to reduce the adverse consequences of typical Human Behavior. These courses of action lead to the development of training to help better understand Human Behavior. This training is also designed to help pilots isolate the characteristics and behaviors which lead to poor pilot decision-making.

Risk Management is an aviation discipline which evolved in an attempt to better train pilots in the process of learning to identify dangerous situations before they actually develop. Living life involves risk, and activities which involve height (defying gravity) and speed (defying inertia) increase that risk. Fortunately, whatever the activities we chose to participate in, we usually have the option to manage (or control) the level of risk which we are willing to accept. (I have noticed that as I have aged, the “Skull and Crossbones” type of ski trails have lost their appeal ~ as the saying goes “The older I get, the older I want to get.”) Accidents occur when we fail to control risk, accept risks which are extremely hazardous, or fail to even recognize the level of risk to which we are exposing ourselves.

In Years Gone by, risk management was “tribal knowledge” which was transferred to new airmen by the long periods of apprenticeship which the then existing aviation culture required. These apprenticeship years were usually spent under the watchful eye and mentorship of more seasoned (i.e. WW II) senior aviators. They were also the years before the “kinder, gentler, touchy-feelie brand of CRM was developed. When an inspiring, junior aviator was unfortunate enough to transgress the existing aviation protocols, *the requisite knowledge and performance standards expected were immediate transferred to the errant aviator in no uncertain terms!* Usually the resident senior aviator provided this knowledge at an audio level slightly above the threshold of pain, clearly bringing into question the errant aviator’s intelligence level, and typically spicing the information very liberally with multiple strings of profanity. Lessons so taught were not soon forgotten!

The Intervening Years have brought about the loss of most of the small FBOs and their associated senior aviators, especially at the smaller airports, thus leading to the elimination of the safety controls that they provided. The rapid rise in the sophistication levels, acquisition costs, and capabilities of light aircraft has also led to a major change in the way light aircraft are operated. This change from primarily local recreational flying to serious business-related, cross country flying has dramatically changed the landscape for providing light aircraft flight training. In the current aviation environment, relatively inexperienced pilots routinely operate high tech aircraft in cross country operations, including weather flying. This change of venue has required the development of a means to teach the processes by which risks can be detected, evaluated, and mitigated – as necessary – to enable flight operations to occur safely.



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Risks have been segmented into the following categories:

- **Identified Risks** are those risks that have been identified through various analytical techniques. The very first (i.e. primary) task in ensuring the safety of any flight operation is to identify – within practical limitations – all the possible risks to which the pilot(s) will be exposed during the upcoming mission (flight operation).
- **Unidentified Risks** are those risks which have not yet been identified (i.e. such as unknown and impending equipment – or system – failures). Some unidentified risks are subsequently identified after an accident (or hopefully – only an incident) has occurred. Some risks will never be known.
- **Total Risk** is the sum of both Identified Risks and Unidentified Risks before any safety efforts have been employed to eliminate or mitigate those risks.
- **Unacceptable Risks** are those risks which cannot be tolerated by the entity managing the flight activity. In the commercial aviation world, these risks are clearly identified as unacceptable in published Standard Operating Procedures (SOPs). The function of Company SOPs is to take all the worst decisions “off the table,” so to speak. SOPs are the “guardrails” of safe flight operations. Because the single pilot, private operator does not have the benefit (protection) of SOPs, they are strongly encouraged to develop a set of well thought out “Personal Minimums.” These Personal Minimums can then serve as their SOPs and provide much of the same protection.

Personal Minimums provide a rational basis for avoiding “*Continuation Bias*” and help in creating the ability to resist any “External Pressures” to continue a flight operation when all the indicators are turning negative. *The ability to say “NO” is the best aviation safety device there is!* Just as a good businessman never falls in love with his business, a safe pilot never become overcommitted to a flight operation! Unacceptable Risks require that actions (flight modifications) be taken to either eliminate the risk or mitigate it to an acceptable level. In the absence of the ability to modify the flight operation so that unacceptable risks are eliminated, or mitigated to an acceptable level, the flight operation must be cancelled and other plans (back-up options) implemented.

- **Acceptable Risk** is the part of identified risks that are allowed to remain without further mitigation or flight modifications. Making this decision is a difficult yet necessary responsibility of the person managing the flight activity. While the pilot in command (PIC) is the ultimate authority for this decision in all flight operations, in the private aviation type of flight operations he (or she) has to make this determination without the organizational support (back-up) which is available in commercial aviation. *This is why having a predetermined and well-defined set of personal minimums is such an important safety factor!* The Acceptable Risk



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decision must be made with the full understanding and knowledge that it is the end user (pilot *and all passengers*) who are ultimately exposed to this risk.

- **Residual Risk** is the risk remaining after system safety efforts have been fully employed to eliminate or mitigate risks. Residual Risks are not necessarily the same as acceptable risks. Residual Risk is also the sum of both Acceptable Risk and Unidentified Risk, but only after all system safety efforts have been fully implemented. Residual Risk is the total risk which is ultimately passed on to the user.

This is a good breaking point for this month. Next month we will continue with our discussion of “*Risk Management.*” The thought for this month is as follows: “*Never be afraid to sit awhile and think.*” ~ *Lorraine Hansbury, American Playwright.* So until next month, be sure to **Think Right to FliRite!**



Montair Flight Service ~ Summer of 1983 at Burlington, VT ~ (KBTV)

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