Flight Advisor Corner by Hobie Tomlinson

October 2011 Transition to Experimental or Unfamiliar Airplanes ~ Part I

This month we will begin to take a look at Advisory Circular (AC) Number 90-109, *Airman Transition to Experimental or Unfamiliar Airplanes* which was published by the FAA's Flight Standards Division (AFS-800) on 03/30/11.

The Purpose of this particular advisory circular is to provide information and guidance to the owners and operators of experimental airplanes, as well as to flight instructors who may teach in these same types of airplanes. This information and guidance provides recommendations for providing training experience for the pilots of experimental aircraft based on one of seven groupings. These aircraft groupings are identified by the group's performance and handling characteristics.

AC 90-109 does not address the flight testing of newly built experimental aircraft. Information addressing the flight testing of newly built experimental aircraft is contained in the current edition of AC 90-89, *Amateur-Built Aircraft and Ultralight Flight Testing Handbook*, and it has been covered in a previous series of articles. However, if a pilot is planning on performing a flight test program in an unfamiliar experimental airplane, then both AC 90-109 and AC 90-89 would apply. AC 90-109 should be consulted to plan the necessary transition training required to safely accomplish a flight test program in an unfamiliar airplane, while AC 90-89 would provide the necessary information to implement the flight test program. AC 90-109 is also useful in planning the transition to any unfamiliar fixed-wing airplane, including type-certificated (TC) airplanes.

The Experimental Airplane Community is an important part of the civil aviation industry in the United States. Some of aviation's greatest technological achievements have occurred in that segment of the aviation industry. Although the amateur builder community is foundational to General Aviation in the United States, the recent trends in experimental airplane accidents have indicated the need for increasing our efforts to ensure the proper preparations of pilots for the challenges of their experimental airplanes. Even though experimental airplanes only fly a small component of General Aviation's total flight hours, they incur a significant percentage of General Aviation's accidents.

The Issue – based on 2009 accident data – is that while experimental airplanes fly only 3.4 percent of the total General Aviation (GA) fleet hours, these same airplanes are involved in approximately 27 percent of all fatal accidents in the United States! This is – in fact – nearly 8 times the fatal accident rate per flight hour that the mainstream GA community incurs while flying Type Certificated (TC'd) airplanes. The predominant causal factor in these experimental airplane fatal accidents is the pilot's performance, especially in the transition phase with an unfamiliar airplane. While some increased risk with experimental airplane operations might be acceptable to the General Aviation community and the general public at large, both the FAA and the industry agree on the need for improved safety. This increase in the level of safety is necessary for the recreational, educational, and experimental benefits of amateur-built airplanes to flourish. The recommendations developed in the AC are designed to mitigate some of the risks found in experimental airplane operations and were developed by collaboration between the FAA, GA and the EAA.

The Development of AC 90-109 used an existing risk management (RM) model for airplane operations. During the certification of large turbojet-powered airplanes, the FAA establishes a Flight Standardization Board (FSB) which evaluates the airplane as it is completing its certification process. The FSB determines the specific requirements for training, for checking, and for operating the airplane in revenue service. The FSB operations group first studies the airplane's systems, its performance and limitations, and its recommended operating procedures. The FSB operations group will then fly the airplane to determine what requirements need to be established. Meanwhile, the FSB Maintenance Group simultaneously reviews the airplane's systems, its structures, and its powerplants to determine what specific maintenance procedures, training events, tools, and processes will be required to maintain the airplane in revenue service. The final FSB report will establish what baseline training events and operating procedures will be required by the Original Equipment Manufacturer (OEM) and/or the FAA for an operator to safely maintain and operate that particular airplane type.

A Tabletop Group consisting of personnel from the FAA's Flight Standards (AFS), Aircraft Certification (AIR), and Accident Investigation and Prevention (AVP) groups, as well as representatives from the Experimental Aircraft Association (EAA), the Aircraft Owners and Pilots Association (AOPA), and the National Association of Flight Instructors (NAFI) was formed under the authority of the General Aviation Joint Steering Committee (GA JSC) to examine these issues. Using the "tabletop" methodology, this group established seven categories of airplanes. Each category of airplanes consists of airplanes having similar handling characteristics, performance levels, configuration and/or complexity. The group then proceeded to identify the knowledge and skill levels required to safely fly an airplane in each category.

The Airplane Categories which were established are as follows:

1. **Light Control Forces and/or Rapid Airplane Response**
2. **Low-Inertia and/or High-Drag**
3. **High-Inertial and/or Low-Drag**
4. **Nontraditional Configuration and/or Controls**
5. **Nontraditional and/or Unfamiliar Airplane System Operations**
6. **Nontraditional and/or Unfamiliar System Component Maintenance Requirements**
7. **Specialty Airplanes**

<u>Since Pilots</u> of these airplanes come from a variety of backgrounds, the tabletop group determined that the best course of action would be to identify the specific hazards presented by each category of airplane. Once the hazards were developed for each airplane category, the risks (likelihood of an event actually occurring plus the severity of its resulting consequences) associated with each identified hazard could be assessed. As the risks for each category of airplane were identified, risk mitigation strategies were established for those identified hazards in order to either reduce the likelihood of their occurrence or to reduce the severity of their consequences, should they occur.

<u>Accident Data</u> has shown *<u>that there is as much risk involved in 'moving down" in airplane performance as there is in "moving-up" in aircraft performance</u>!* As an example, consider the pilot who has considerable experience in high performance corporate, airline, or military airplanes. The knowledge and skills used to safely operate long distance flights at high speeds and high altitudes will, by themselves, not adequately prepare a pilot for the challenges of a low-inertia, high-drag airplane. Likewise, pilots with considerable experience in light, low-powered airplanes will need specific training to successfully transition to a high performance experimental airplane.

<u>Prior to Flying</u> an unfamiliar airplane, all pilots should review the hazards and risks of the applicable airplane category as listed in AC 90-109. It is of utmost importance that pilots successfully complete the training recommended by AC 90-109 before attempting to operate their new airplane by themselves.

<u>The Choice</u> of the type airplane and individual flight instructor used for experimental airplane flight training is very important. To accomplish the best training possible, use your specific airplane with a well-qualified flight instructor who has adequate experience in that specific make and model of airplane. If that is not possible, the next choice would be to obtain training in the same model of airplane as the one you are planning to fly. The last choice would be to obtain training in an airplane with similar characteristics (same category grouping) as the one you intend to operate. This may even include a Type Certificated (TC'd) airplane. *<u>It is important to note that non-TC'd airplanes of the same model may have quite different handling and performance characteristics, due to construction and/or rigging differences</u>*. **All pilots should consider their first flight, in any particular experimental airplane, a test flight and specifically review the recommendations located in both AC 90-89 and AC 90-109 prior to the flight!**

<u>Additional Assistance</u> related to the training and operation of a particular type airplane may be obtained from any and/or all of the following sources:

- **Kit Vendors**
- **Aircraft Owners**
- **Type Clubs**
- **EAA ~ http://www.eaa.org/**
- **AOPA ~ http://www.aopa.org/**
- **FAA Safety Team ~ http://faasafety.gov/**
- **Flight Advisors**

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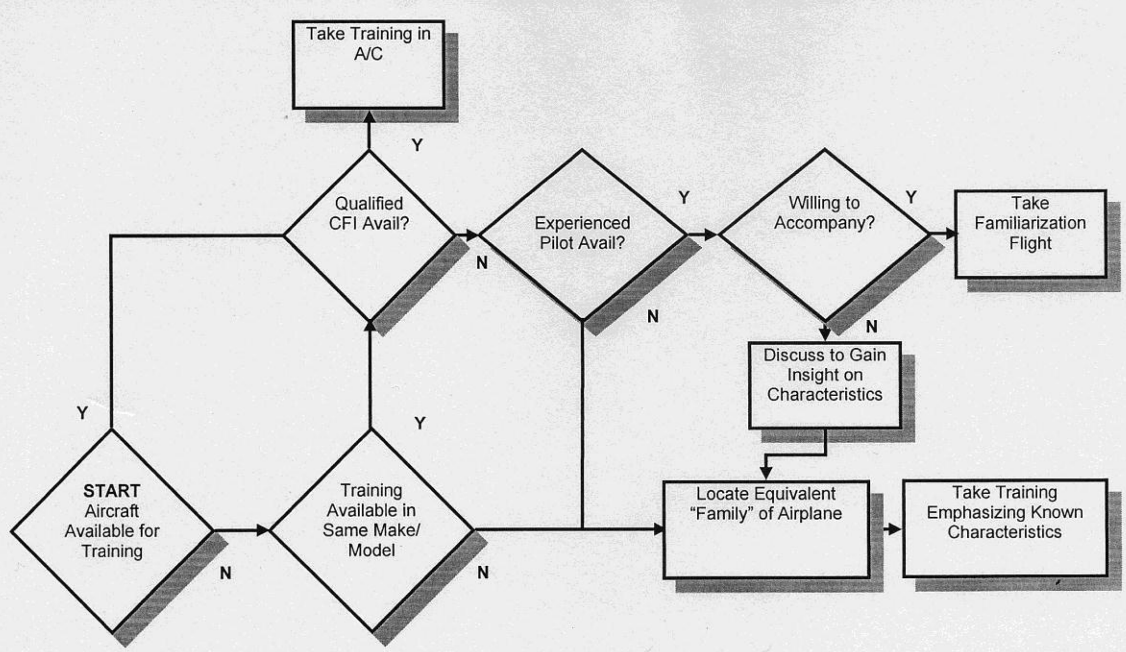
Current Accident Analysis indicates that the subsequent owners and/or pilots of experimental airplanes have a higher accident rate during their initial flight time than that of the original owner/pilot. It is therefore recommended that the subsequent owners/pilots of experimental airplanes receive airplane-specific training with an appropriately experienced flight instructor before operating their airplane by themselves.

Analysis Indicates that when pilots attempt to conduct operations during challenging conditions – especially before they accumulate a significant level of experience in their particular type airplane – they are exposed to a much greater risk of having a fatal accident. Several type clubs – such as the Lancair Owners and Builders Organization (LOBO) and the Cirrus Owners and Pilots Association (COPA) – recommend that pilots acquire a significant amount of day-visual meteorological conditions (VMC) operating experience prior to flying during the more challenging operating environment of night time or instrument meteorological conditions (IMC).

A New Buyer of an experimental airplane may not fully understand the challenges of transitioning to their new airplane. This is especially true if the new airplane has characteristics which are outside of their previous aviation experience. The FAA recommends that owners who are engaged in selling their experimental airplane ensure that the prospective buyer has obtained a copy of AC 90-109. (AC 90-109 may be downloaded without charge from the FAA web site.) In addition, any owner contemplating allowing another pilot to fly their experimental airplane should consult AC 90-109 in conjunction with the prospective pilot to prepare them to safely fly the airplane. The EAA also provides a checklist for prospective buyers of experimental airplanes to consult.

FIGURE 1. RECOMMENDED EXPERIMENTAL AIRPLANE TRAINING APPROACH



AC 90-109

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Pilots Transitioning to experimental or other unfamiliar airplanes need to develop a training strategy for mitigating the risks of operation of their new airplane. Some of these risks are inherent with the operation of any airplane with which you are unfamiliar, while others are specific to the handling characteristics, performance and configuration, systems operation, and maintenance considerations of a different type of airplane.

Transition Considerations, which we will discuss, and that are common to all airplanes are as follows:

- **Recommended Flight Training**
- **Performance and Limitations**
- **Risk Assessment and Risk Mitigation (RM)**
- **Stability and Controllability**
- **Stall Characteristics**
- **Procedures**
- **Transition Training**

Recommended Flight Training must include knowing your airplane's systems, its limits, the expected performance, and all recommended procedures before you actually begin flying it.

You should consult your kit vendor for advice on developing a *Quick Reference Handbook* (QRH) for your specific aircraft which will contain the above listed vital information. QRHs have long been in use on transport airplanes and their great advantage is that they take the critical information, which is embedded in the more voluminous Airplane Flight Manual (AFM) or Pilot Operating Handbook (POH), and make it readily accessible in the cockpit.

Other Good Sources of information about your airplane's systems, limits, expected performance, and recommended operating procedures are Type Club members, other owner/builders of your specific aircraft model, and internet forum/chat rooms. You should keep in mind; however, that other participants may or may not have the technical expertise that you require. For example, *it is especially important to remember that the airplanes of other owners and/or builders may exhibit a quite different stall behavior than the one exhibited by your airplane*.

A Thorough Airplane Check-Out by an adequately qualified flight instructor with experience in your airplane model is an excellent idea. If you built your airplane yourself, consider obtaining this flight training from the kit vendor or owner's group. It is always preferable to obtain the training in your individual airplane, whenever possible. If you purchased your airplane from a previous owner, learn all you can from them. You should periodically practice stall recognition and stall recovery – at a safe altitude – after you have received enough instruction to feel comfortable. Stall recognition ability and confidence in your stall recovery technique are the critical assets needed for unintentional stall avoidance. Stall recognition and recovery should never be self-taught! Your first experience with stalls in your new airplane must not come from an inadvertent stall that catches you by surprise.

Additional References for flight training in experimental aircraft are as follows:

- *The Advanced Pilot's Flight Manual* by Kershner, Iowa state University Press
- *AC 23-8*, Flight Test Guide for Certification of FAR Part 23 Airplanes

Performance and Limitations are also very important to observe with experimental airplanes, even though there may not be any official performance and/or regulatory limitations specified. Pilots must be able to readily identify the acceptable, safe flight envelope for their airplanes and to consistently operate within it. This flight envelope and the accompanying flight limitations, which allow you to stay safely within it, must be based on the original designer's data combined with the experience gained in both your flight test program and your post-test phase of operations.

Flight Test Data for your individual airplane must be incorporated in the development of the operations data for your aircraft. (i.e. If the actual, demonstrated stall speed for your airplane turns out to be greater than the speed indicated in the original designer's data, adjust any takeoff, approach and landing data derived from the standard airplane accordingly.) Actual flight experience, coupled with the close observance of density altitude, can validate that adjusted data. This will give you a high level of knowledge about your specific airplane's performance. Until you achieve this high level of knowledge about your specific airplane, avoid operations into smaller airfields, especially at higher weights and/or under higher density altitude conditions.

This looks like a good point to break for this month. Next month we will look at the subject of **Risk Assessment** and **Risk Mitigation**, as well as start to delve into the weighty issues of **Stability and Controllability**.

The thought for this month is**: "A man should look for what is, and not for what he thinks should be." ~ *Albert Einstein, Physicist.*** So until next month, be sure to **Think Right to FliRite!**

TC'd Aircraft in *"Light Control Forces and/or Rapid Airplane Response"* Category

Picking Up a Grumman American AA-1C at KSAV ~ 1977 **Hobie Tomlinson Image**