MU-2 magazine

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what's inside:

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MU-2 magazine

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The Mitsubishi MU-2, one of Japan's most successful aircraft, is a high-wing, twin engine turboprop with a pressurized cabin. Work on the MU-2 began in 1956. Designed as a light twin turboprop transport suitable for a variety of civil and military roles, the MU-2 first flew on September 14, 1963. More than 700 MU-2 aircraft were built before the aircraft went out of production in 1986. Presently, nearly 300 MU-2 aircraft remain in operation with the majority of the fleet registered in the U.S.

Turbine Aircraft Services, Inc. (TAS) is under contract to Mitsubishi Heavy Industries America, Inc. (MHIA) to assist with the support of the MU-2. TAS distributes MHIA-issued publications and serves as liaison between MHIA and MHIA's contracted Service Centers, Vendors and Training Agencies.

COVER PHOTO:

Mike Adams,
Owner/Operator

Photo by Jan Glenn during PROP photo shoot.

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Editorial by Pat Cannon

Wow! PROP is almost here. It seems that every other year, when we wrap up and say goodbye after the final PROP city, the next PROP is way in the future. And so it goes that we are now just a few months away from the beginning of the next event.

In this issue Karin Murphy will give you an update on pertinent facts about PROP 2016 that will help you make the decision on which one to attend. We look forward to seeing you there.

This month we also have an insurance article from CS&A addressing some of the most often asked questions regarding your aircraft insurance. We have also featured the McCredie family and their ownership and use of their second MU-2, a Marquise, and how this family uses the aircraft in their business. You guessed it, the aircraft insurance business.

Once again, you will hear important updates on several of the ongoing certification programs by MHIA Product Support. Many of these great upgrades are now available to you for your aircraft. To that end, Ron Renz has written an update on the AOA system. I've flown behind this system and it is everything it's supposed to be and more. We will have it on both of our aircraft shortly.

Thelma Pence has given an update on the Fly-In in Aiken, SC, sponsored by Mike Laver. What a great and fun event. Lots and lots of aircraft to look at and drool over. Lots of chrome and polish for sure.

I will introduce you to two new members of the Product Support team who are now employed by MHIA. These two new people will be responsible for carrying forward the Product Support programs for the MU-2 well into the future.

Have a great first quarter for the New Year.

Pat Cannon is President of Turbine Aircraft Services.
He is an FAA Designated Pilot Examiner, former MU-2 Demo Pilot, and Safety Expert.

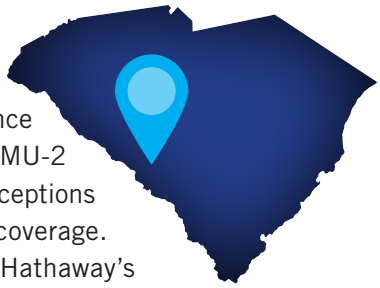
2015 MU-2 FLY IN

Air 1st Aviation, Aiken, SC • October 9-10, 2015

by Thelma Pence

Mike Laver, Owner/Operator of a large fleet of MU-2s in Aiken, SC, hosted the 2015 Fly-In for a social gathering of MU-2 Owner/Operator's, MU-2 enthusiasts and supporters. The event enticed over 125 guests to attend consisting mostly of Owner/Operators to support the biennial event. The Fly-In attendees were privileged to witness about 36 parked MU-2s at the Aiken FBO for this event.

Attendees were warmly welcomed at The Wilcox Hotel, hosted by Air 1st Aviation on Friday night (October 9th) with beverages, hors d'oeurves, and local entertainment. Despite the heavy rain on Saturday morning (October 10th), attendees were welcomed at the Air 1st hangar with a Continental Breakfast. The program started with Zipper Robbins and his introduction and perspective of the MU-2 History. Mike Collins presented an in-depth explanation of his around-the-world trip in 2013 with Mike Laver. Chris Turnbull of CS & A Aviation Insurance presented a discussion of MU-2 Insurance and the misconceptions associated with aviation coverage. Following Chris was Eric Hathaway's presentation of The AuRACLE Engine Management System.



After lunch and a huge break from the heavy rains, the attendees were whisked off to the Aiken FBO for the voting of "Queen of the Fleet". Of the 36 MU-2's on the ramp, 11 MU-2's participated in the competition. Due to the overwhelming votes and the fact that attendees were unable to decide on their favorite, 2 MU-2's were chosen as "Queen of the Fleet". The Saturday evening dinner had been scheduled to be held at the Whitney Field Polo grounds, however, due to the saturated field

Thelma Pence is the liaison between Mitsubishi Heavy Industries America, Inc. and the Authorized Mitsubishi MU-2 Service Centers and is responsible for Service Center audits, parts inventory levels, and other Service Center reports. Thelma is involved in trade show representation, customer seminars and meetings in support of MU-2 Service Centers.

there, dinner was held at the Air 1st hangar. The presentation of the "Queen of the Fleet" was made by Mike Laver. The winners were Ken Sutton S/N 267 and Wayne Haub S/N 791; both airplanes have been extensively upgraded and are currently maintained by two MU-2 Service Centers, Jet Air Group and Carolina Turbine Support respectively.

The event concluded on Sunday morning (October 11th) with presentations given by Mark James from IJSC. He was followed by Pat Cannon with the on-going issue of Short Body Operations and Landings. Ron Renz discussed updates on the AOA system.

The 125 attendees included 87-Owner/Operators with spouses/guests; other attendees were Vendors; Service Center's (IJSC, CTS, and Jet Air); Turbine Aircraft Services, Inc., Mitsubishi Heavy Industries America and other MU-2 friends. An article was written by the Aiken local newspaper on this event. The agenda, pictures, and other information can be found on www.air1st.com. Additionally, Mike Laver announced the Fly-In 2017 will be hosted by Robert Watkins (S/N 409) in Coatesville, PA.

The program started with Zipper Robbins and his introduction and perspective of the MU-2 history.

The "Queen of the Fleet" winners were Ken Sutton S/N 267 and Tim Stanley, pilot of S/N 791; both airplanes have been extensively upgraded and are currently maintained by two MU-2 Service Centers, Jet Air Group and Carolina Turbine Support respectively.

Dave McCredie

McCredie Insurance Agency
Flint, Michigan

From Left: Brad, Dave and Todd McCredie

The Family That Flies Together, Stays Together

by Kimberly Fish

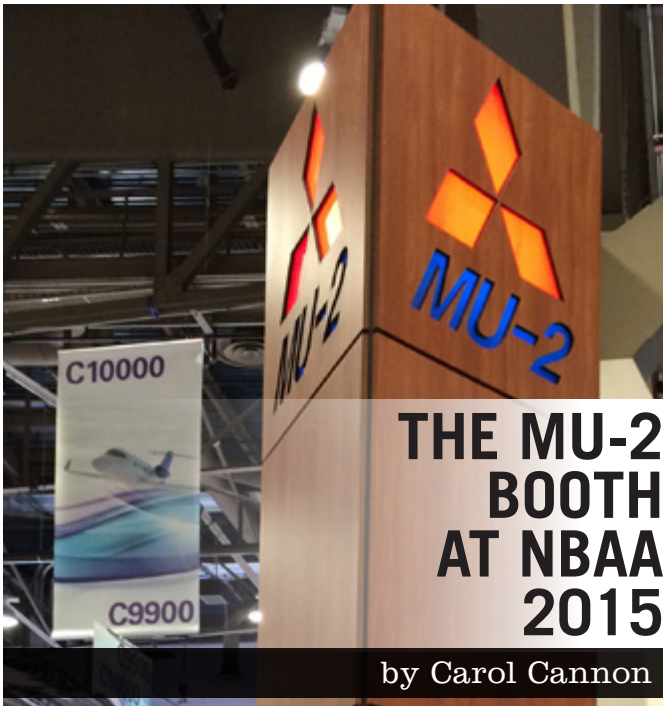
When you speak with Dave McCredie, his enthusiasm for flying MU-2s is contagious. It's not just a factor of his experience as an owner/operator, or the fact that he's logged thousands upon thousands of miles in the air. It's that he's got that love of machinery and precision deep in his blood and almost nothing meets that pinnacle more for him than Mitsubishi's twin-engine turboprop. It's a love of machine that he's passed on to his two sons, Brad and Todd. This is a family that flies together, shares the thrill of flight stories, and then passes along their expertise to a new generation of MU-2 pilots just beginning to understand the power and performance of one of the fastest planes in its category.

Dave's fascination with MU-2s began 26 years ago when he started looking for a faster aircraft that would exceed the piston-driven twin engine he'd been flying. Knowing that the best way to understand whether he would enjoy the MU-2 would be to undergo ground training, Dave attended ground school and then committed more than 20 hours of airtime with an instructor. He also pursued every avenue of safety awareness he could find so that he'd best understand what he was getting his hands on. He said it's not unusual for owners to buy an MU-2 and after 20 hours begin to wonder what they'd bought into, but after 50 hours flight time they're in love with the airplane. He sees himself as a prime example. Brad, a newly licensed pilot at the time of his dad's MU-2 purchase, attended some of the pilot training sessions and watched first hand as Dave began to appreciate the power and precision he'd acquired with the Mitsubishi. Brad then caught the MU-2 bug as well.

While Dave's passion for the flight experience in an MU-2 began to grow, he found himself in a unique position to help other pilots discover the joys of this fast plane, with large haul capacity, and smaller airport capability. As an insurance executive, he knew firsthand the safety requirements and training that would be required of a new pilot to master the plane, and he had the confidence to guide these pilots in making wise choices for their transition. He had to overcome some word-of-mouth stereotypes in the beginning, but with his background in insurance, his and his sons successes with the aircraft, and with the emerging MU-2 culture that featured expertise and safety it wasn't long before he became a leader in the airplane insurance field, and a reliable information source for MU-2 owners and operators. The underwriters put great confidence in the reliability of the operators Dave represents because with the advent of SFAR108 and advanced FAA requirements they find that a well-trained pilot of an MU-2 is one of the lowest risk investments they can make. Dave is one of those rare individuals that can combine his love of flight, his passion for his airplane, and the ability to make a successful career all in one fell swoop. What's compelling about this is that he's been able to transfer these same qualities to his sons. Brad enjoyed an extensive career flying MU-2s for a small freight hauling company before joining the family insurance business. Todd's journey into the air was more for business development and pleasure, but his ability to travel quickly from location to location with the MU-2 has opened doors with clients that he'd not been able to achieve without the airplane (which always commands attention when it pulls up to a hangar.) Brad doesn't see much distinction between flying for work or for pleasure as he says anytime he can log hours in the air it is pure pleasure.

In the insurance business, Dave, Todd and Brad meet hundreds of pilots every year. The camaraderie of those that fly the MU-2 is distinctive. Much like Harley-Davidson enthusiasts have their own culture, the MU-2 community is just as vibrant. Getting a bunch of MU-2ers together at PROP or a Fly-In brings out the bragging stories, the comparison accounts, the one-uppers, and those that know the parts network. Not only is the PROP conference a "must attend" event for the latest training, news, and friendships, but the emerging Fly-In events, like the one in Aiken, SC this fall, have also become meeting grounds for the diehards. The McCredies relish this ability to fly their own aircraft and thoroughly enjoy the hands-on, training-focused, and out for the full-range experience that comes from crisscrossing a region in rare speed. That expertise puts them in a special class.

Dave, Todd and Brad McCredie are experts in the culture of MU-2 enthusiasts, but they're also influential to those considering a new plane, and a sustainable means for enjoying the aircraft after purchase. They delight in helping others find the joy they'd encountered as pilots. Todd, who often flies for business, finds that his guests on the aircraft are often awed by the speed for which they arrive at their destinations, and then discover that the near pristine experience of a good flight is something that can't be replicated on the ground. One of his youngest guests likened the experience of flying through gentle clouds fast as being on a trip through heaven. It's that kind of discovery that the McCredies most enjoy sharing with others as they invite friends, family and business clients into the cockpit of their beloved MU-2. Dave is a little sheepish as he describes what its like in a family where several generations have logged flight time together. He reports his wife has a doormat at their house that advertises "welcome to the home of one normal person and a pilot." It's obvious that the three men value their family, their shared insurance business and MU-2 ownership because it's something they can do every day together. And the family that works and plays together, stays together.



THE MU-2 BOOTH AT NBAA 2015

by Carol Cannon

The 2015 NBAA Convention was held in Las Vegas, Nevada at the Las Vegas Convention Center on Nov. 17, 18, and 19. The NBAA Convention had been held in Las Vegas just 2 years ago, so everyone was pretty familiar with the convention hall. The MU-2 booth was staffed by personnel from Mitsubishi Heavy Industries America, Turbine Aircraft Services, and the five domestic Authorized Mitsubishi MU-2 Service Centers (Carolina Turbine Services, Intercontinental Jet Service Corp., Jet Air Group, Professional Aircraft Maintenance, and Winner Aviation).

This year's convention was again a great success. There were over 27,000 people in attendance, 1,100 plus exhibitors and 100 aircraft at the Static Display at Henderson Airport and the small static display in the convention hall. The MU-2 booth had 25 Owners and Operators stop by, and they all received a leather portfolio embossed with the MU-2 aircraft. Many vendors also visited the MU-2 booth, along with several dignitaries.

The show opened on Tuesday, Nov. 17, and there was a steady stream of people through the MU-2 booth. The show continued on Wednesday and Thursday, and the personnel in the MU-2 Booth were excited to see so many old and new faces of Owner/Operators and Vendors. MHIA, Aircraft Product Support Division had a large contingent of personnel on site in the booth. General Manager Ken Takeuchi, Deputy General Manager Ralph Sorrells, Takao Horichi, Yoshi Asako, Manny Okano, Rick Elias and Joel Howells represented MHIA. In addition, two new MHIA employees joined us in the MU-2 Booth: Mr. Joe Megna, recently hired as Product Support Manager and Jenna Herzog, recently hired as Event Coordinator. It was good to have them all there, and especially important for Joe and Jenna to learn how the MU-2 Booth is brought about.

All Owner/Operators who visited the MU-2 Booth were entered into a Door Prize drawing for Owner/Operators only. The prize was a laser-engraved crystal on a lighted base with the double MU-2s engraved in it. The winner was Mr. Mike Laver of Carolina Turbine Services and Air 1st Aviation Companies. Congratulations, Mike!

By 4:00 Thursday afternoon, the convention attendees were pretty much gone and the lights were brought down on another year at the MU-2 booth. We'll see you again next year in Orlando, Florida on November 1 – 3, 2016.

Carol Cannon has worked on Turbine Aircraft Services' projects for over 20 years. She manages the PROP series of seminars, the MU-2 Booth at the NBAA Convention, MHIA's Barrington Irving "Dream and Soar" events, other MHIA/TAS trade shows and appearances, and the MU-2 Magazine.

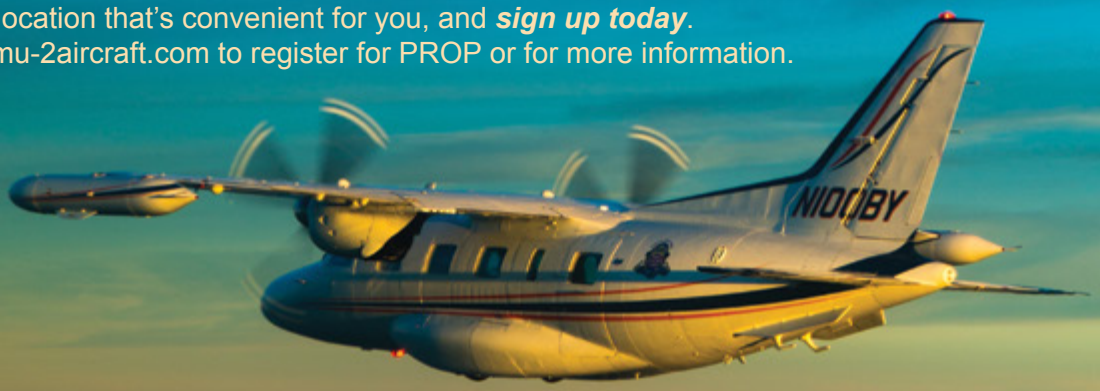
Live the Safety Culture

2016 PROP

The highly acclaimed PROP (Pilot's Review Of Proficiency) is once again coming to a city near you. Consistenly rated best in its field, PROP puts the world's most experienced safety professionals on stage with information and educational material prepared expressly for pilots like you.

PROP supports the leading safety culture for turbine aircraft operators worldwide. In 2016, "Live the Safety Culture" means MU-2 owners and operators everywhere are committed to ensuring the safe operation of their aircraft. Owners, pilots, service personnel, and safety managers alike will want to participate in this event. Best of all, PROP is free to attend.

Select the location that's convenient for you, and ***sign up today***.
Visit www.mu-2aircraft.com to register for PROP or for more information.



MU-2 owner/operators invite and encourage you to attend PROP 2016 and "Live the Safety Culture."

Brought to you by:

MITSUBISHI HEAVY INDUSTRIES AMERICA, INC.

SIMCOM TRAINING CENTERS

DALLAS, TX
April 1–2

TUCSON, AZ
April 15–16

CINCINNATI, OH
April 29–30

SNEAK PEEK PROP2016

by Karin Murphy

Many of you are familiar with the PROP series of seminars, but there are also many new MU-2 owners and/or operators out there who have never heard of or attended PROP. P.R.O.P. (Pilots' Review of Proficiency) is presented every other year (even numbered years) under the sponsorship of Mitsubishi Heavy Industries America, SimCom and Honeywell. Turbine Aircraft Services is the organizer and coordinator of the event. It is a 1-½ day seminar that is geared to the Mitsubishi MU-2 aircraft, however, it is packed full of useful information for non-MU-2 pilots and even for those who aren't pilots but who might fly right seat.

PROP 2016 will be held in the following cities:
Dallas, TX • April 1 – 2, 2016
Tucson, AZ • April 15 – 16, 2016
Cincinnati, OH • April 29 – 30, 2016

Attendee check-in for PROP will open on Friday morning as will the Exhibitor Room, and the opening remarks and introductions will begin at 10:00 AM. Seminar topics for Friday include ADS-B, Single Pilot CRM, NTSB Midair Investigation, NTSB Staff Presentation, Service Center Maintenance Panel, and Cold Weather Ops.

On Saturday, introductions will begin at 8:00 AM. The topics for Saturday's schedule include Advanced Aerodynamics, Accident Analysis, AOA, Engine Adjustment Evaluation, Single Engine Ops, concluding with a Question and Answer period. Advanced Aerodynamics will be presented by Sean Roberts, past PROP 2012 speaker.

PROP 2016 will feature the Friday evening receptions in each city, all of which will be held at the Host FBO hangars. The receptions are always fun – good food, good beverages, good entertainment, good MU-2 talk – and you get to look at all of the MU-2s that flew in to the event. Plus a two-ship fly by. What could be better?

All in all, 2 days full of information that will be invaluable to all who attend. Not to mention the neat gifts that are given to all attendees, the luscious lunches, the enjoyable receptions, and, of course, the door prizes furnished by our wonderful exhibitors and sponsors.

To top it off, the PROP seminars are FREE to all who attend. No other manufacturer offers such a complete package for such a low cost. All you have to do is get there and pay for your room. Not only is this event a bargain, but it is well worth your time!

Prior to the official start of PROP 2016, we are offering two different optional courses. In Dallas and Tucson, the TPE-331 Pilot's Familiarization Course will be presented by Don Ross, well-known and respected former Honeywell employee, on the Wednesday and Thursday before PROP begins. The TPE-331 Course has been given very high marks by all who have attended in the past. The TPE course fee is $300. Also, the Comprehensive Airborne

Radar Course will be offered at the Cincinnati location and will be presented again by Erik Eliel, successor to Archie Trammel and owner of Radar Training International. The Airborne Radar Course will be presented on Thursday before PROP in Cincinnati and the fee for this course is $250. Both of the optional courses are being offered only to PROP attendees and are subsidized by MHIA in an effort to give PROP attendees a well-rounded "safety culture" learning event.

A breakout session that has proven to be very popular is the Non-Pilot Demonstration Course. This 2 hour course will teach the students what to do if the pilot becomes incapacitated. It will be offered on Saturday at 10:00 AM in each city and will be presented by Tom Goonen, SimCom instructor.

There will be a host of Exhibitors showing their wares in the Exhibitor Room, and Sponsorship packages have been made available for PROP 2016. You will see new companies as either Exhibitors or Sponsors (or both), along with some of the Exhibitors who have been represented at PROP for many years.

PROP is an event that you can't afford to miss. Here are a few of the comments that were written on some of the PROP 2014 critiques:

"The best safety/human error information I have ever heard. Way better than what we got at the airlines."

"The Dallas PROP was Fantastic!!!!!!!"

"This was my first PROP and I can say, it exceeded my expectations!"

"Let me congratulate the entire team with regards to the fantastic PROP events. As you know it was my first PROP and wow was I blown away."

"The culture that you create is one of professionalism and safety! I for one, and know that I speak for most of the pilots, are sincerely in your debt for providing this valuable venue."

"Thanks for putting on another great PROP in Phoenix."

Please join us at one (or more) of the PROP 2016 cities.
Register today at www.mu-2aircraft.com or www.turbineair.com.
For further information call Carol Cannon at (972) 248-3108, Ext. 211.

The Uniqueness of the Aviation Insurance Marketplace

by Thomas H. Chappell,
CS&A Insurance

What should you expect from your aviation insurance agent at renewal time? First, let me point out that the aviation insurance world marches to an entirely different drummer than any other segment of the insurance industry. Many aviation insurance consumers gauge their expectations of aviation insurance agents, underwriting companies, and policies by what they have experienced when buying general property and casualty policies. They usually try to equate the coverage in an aircraft hull and liability policy to that found in an automobile policy.

So, let's discuss what you should expect from the agents and insurance underwriters in this tiny segment of the insurance industry called aviation insurance.

How big is the aviation insurance marketplace?

Over the past few years the aviation insurance marketplace has grown from a tidy eight underwriting facilities in 2006 to a lumbering overcapacity of 19 markets in 2015. Obviously, all underwriters will not have an appetite for every risk type. Some will prefer turbines and jets and others will be more comfortable with piston aircraft. In days of old, the marketplace for the MU-2 was quite small. If you could find any enthusiasm at all from the underwriter, the agent had done a great job. Today, since the impact of SFAR training and the resulting improved MU-2 loss experience, we can often find as many as six willing underwriters for an experienced MU-2 pilot flying a well maintained aircraft.

Not all aviation insurance agents are created equal.

We all recognize that the MU-2 is a special aircraft. Like aircraft owners and pilots, there are insurance agents who love the MU-2 and those who are unfamiliar with the aircraft. This applies to the underwriting community as well. Obviously, when purchasing your

Tom Chappell is the chairman and CEO of Chappell, Smith & Associates, Inc., parent company of CS&A Insurance. He is a graduate of Middle Tennessee State University, and his articles have been published in insurance and aviation trade publications for more than three decades. He has distinguished himself in the area of aviation risk and safety management and is recognized as an authority on business development. He is requested as a guest speaker in the area of aviation insurance and risk management throughout the country.

aviation insurance, you will be best represented if your agent is experienced in insuring the Mitsubishi. He will know which underwriters understand the aircraft, know its history and admire its strengths.

When I speak of underwriter, I am not just referring to the company but the particular underwriter at that company. In short, your agent must know his way around the MU-2 community including which underwriters appreciate the aircraft.

Too many agents can spoil the renewal.

Unlike the property and casualty world, aviation insurance companies are few in number. They tend to be less structured than other sectors of the insurance world, although there remains a basic industry protocol that they will rigidly follow. Like the general property and casualty (P & C) industry, most aviation companies will offer to quote insurance to a prospective client through only one agent. Aviation insurance companies are often accused of being very restrictive with their "one agent, one quote" policy. The fact is that this is no different than any other P & C insurance company.

So don't block your own market. If you offer your renewal to too many agents, they will be falling over each other trying to get you a quotation. Pick your agent based upon skill and experience with the MU-2 and trust him to negotiate your insurance program.

How far in advance of your renewal should your agent begin the quoting process?

Your current aviation insurance agent should contact you for renewal information between thirty and sixty days prior to the expiration of your policy. I know, I know. Your P&C agent begins the underwriting process between 60 and 120 days prior to expiration. The differences are many. Many property underwriters want a company engineer to inspect a large property risk before quoting. That is a legitimate requirement. Pure property and casualty risks must go through the rating department so the underwriter has a starting point to work with. Of course, the P&C underwriter needs the necessary procrastination time. That is the two to four weeks to let the file sit on the corner of his desk and mildew. The industry culture dictates much about momentum and protocol.

To the contrary, most aviation underwriters will not accept an account to quote more than 60 days prior to the policy anniversary date. Unlike general property and casualty underwriting, there is little engineering of the risk, and the calculation of rates is simple. Candidly, aviation underwriters tend to do a better job getting the quotes back to the agent once they begin the process. Some procrastination is a standard among all underwriters but certainly much less of an obstacle with aviation than in the general property and casualty world. In addition, each aviation insurance company has more flexibility in pricing and risk acceptance.

Most agents begin the process in a timely fashion, but often are delayed by the client. People travel, procrastinate, misplace log books, and a variety of issues that delay the quotation process. The moral to this dialogue is that you, the consumer, may be the cause for what may be perceived as a late quote.

Your agent's success may depend upon you.

Timeliness is important. The quicker you respond to your agent with your pilot information and any changes in your aircraft, its value, and your desired liability limits, the more time he will have to negotiate your renewal.

In addition, thoroughness is most important. Any information regarding training or upgrades to your aircraft will give your agent that much more to use in his negotiations.

Your agent is not a mind reader.

You should have a general discussion with your agent periodically just to chat about your flying, the aircraft, contracts you may plan on signing and your plans for the future. You will be surprised at how much information your agent will glean from such a conversation. An agent, if he is good at his job, thinks about risk management and looks for areas where coverage is missing.

Don't make a surprise phone call. With a little notice, the agent will have time to review your file and refresh his memory about you and your situation. Believe me when I tell you this is time well spent.

Your aviation insurance agent may become your "new best friend."

You deserve to know.

If your agent shopped one or more insurance companies for your renewal quotes, how did the quotes compare? You deserve to know. We have seen many agents make a placement submission to all available aviation

(continued on page 17)

Why Fly Angle of Attack (AOA)?

by Ron Renz

Angle of Attack (AOA) systems increase safety by indicating and alerting the pilot when entering a critical phase of flight which might result in LOSS OF CONTROL due to a stall or spin unless immediate and appropriate action is taken. An AOA system does this by increasing pilot awareness of the MARGIN FROM STALL.

How does AOA accomplish that? Perhaps a short engineering lesson will help.

The ability of an airplane to fly depends on the lift produced. As the AOA increases approaching stall, airflow begins to detach from the top surface of the wing, losing efficiency, until at some point airflow separates with a corresponding large decrease in lift. This is the critical AOA where the aerodynamic stall occurs (see Figure 1).

Figure 1: Wing Flow Separation at Stall

Aircraft stall speed varies with weight, load factor (i.e. G's), bank angle, power and density altitude. There are other factors that affect stall speed but these are the big ones. Angle of attack is defined as the angle between the relative wind acting on the wing and the wing chord line. This is depicted in Figure 2. During testing,

Figure 2: Define Angle of Attack

engineers measure lift and convert it into a dimensionless term called Lift Coefficient (C_L). Generally we represent the lift characteristics of the airplane using a graph of Lift Coefficient (C_L) vs Angle of Attack (for AOA, we typically use the term Alpha or use the Greek symbol α).

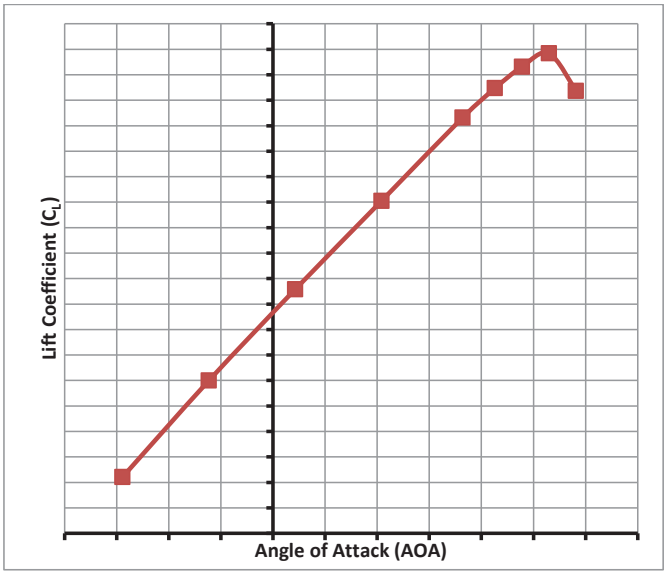


Figure 3: Typical Lift Curve Slope

Figure 3 presents a typical C_L vs α curve. Note the slope of the curve is approximately 0.1 C_L per degree of AOA. The beauty of this depiction is that C_L is a dimensionless quantity that includes lift (i.e. weight or G's) and airspeed in its calculation and allows engineers to analyze the airplane lift in any situation regardless of weight, wing loading (i.e. as it changes due to bank angle), etc. The stall of the wing is well defined by this curve as it occurs at the peak that is shown at the highest C_L. This is where the flow separates from the top of the wing, and the wing stalls aerodynamically. **THE WING WILL ALWAYS STALL AT THE SAME ANGLE OF ATTACK**, regardless of the airspeed, wing loading etc. All pilots should be familiar with the stall Speed vs Bank angle chart that appears in all Airplane Flight Manuals. Figure 4 presents the chart for the MU-2B-60 (Marquise). What this graph shows is how the airspeed changes as the load factor increases (i.e. increasing C_L) in level flight due to bank angle. Note that load factor can be increased not only by turning in level flight, but

Ron Renz is a member of the MHIA engineering support team for the MU-2B, with degrees in both Aerospace and Mechanical Engineering. Ron carries an ATP certificate, is an A&P with Inspection Authorization, and has served as both a flight test engineer and a flight test pilot. Ron has worked on STC programs, new aircraft programs and has developed specialized techniques for simulator data gathering during flight test programs.

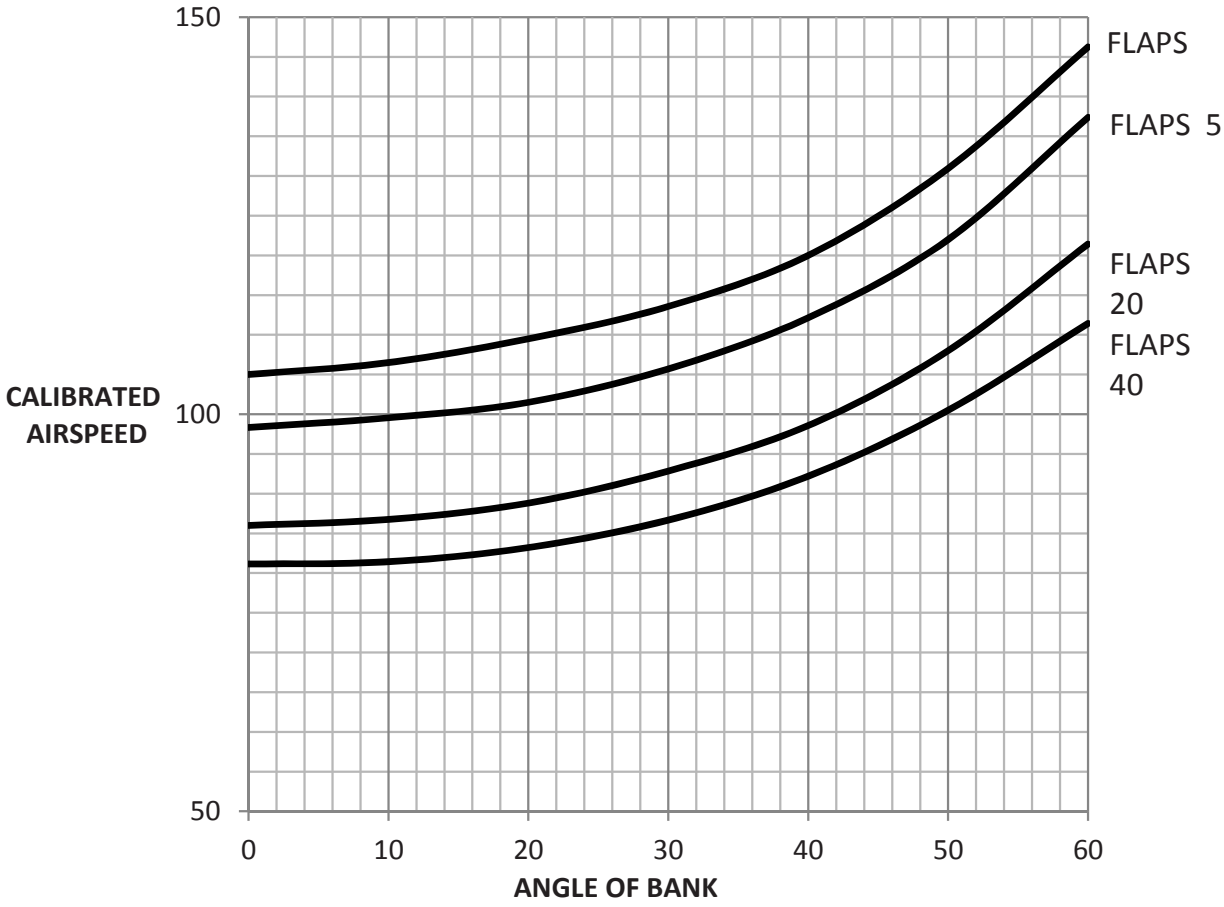


Figure 4: Stall Speed vs Angle of Bank MU-2B-60

also by pulling back on the yoke in any attitude, including wings level, so long as the airfoil has not reached the critical AOA. Incidentally, aerobatic pilots know they can fly an airplane at very low speeds, even zero airspeed, as long as there is no wing loading, and use that knowledge to perform various very slow speed maneuvers under full control.

Why have we not had Angle of Attack Systems before?

Actually, all certified airplanes have some means to measure angle of attack. These have traditionally been used to trigger the stall warning system. On the MU-2B airplane this Angle of Attack Sensor is a stall vane located on the leading edge of the right wing, and it triggers the stick shaker. So even though you may not have been aware of it, pilots have been flying with an angle of attack warning system since they started flying airplanes. For many decades, Navy pilots have been using angle of attack as the primary indicator to fly approaches to aircraft carriers. Many commercial airplanes have had angle of attack indication systems installed to aid the pilot, although some of these earlier AOA systems were quite costly.

Recent technology advances have allowed production of Angle of Attack Systems that accurately measure and display angle of attack information to the pilot at a low cost. An example of the system in the final approval process for the MU-2B is shown in Figure 5. A probe

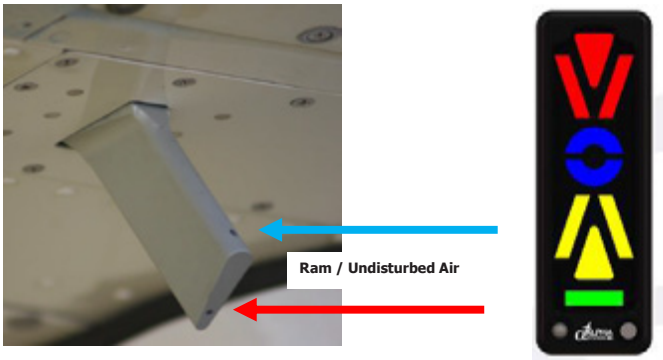


Figure 5: Alpha Systems Angle of Attack Indicator and Under Wing Probe

with no moving parts is used to sense the angle of attack. Pressure differential between the 2 ports on the probe is directly proportional to the angle of the air flowing across the probe, and thus AOA across the wing. This pressure difference is measured and the angle of the air flow is presented on a cockpit display that shows the AOA as 14 unique steps. How these relate to the

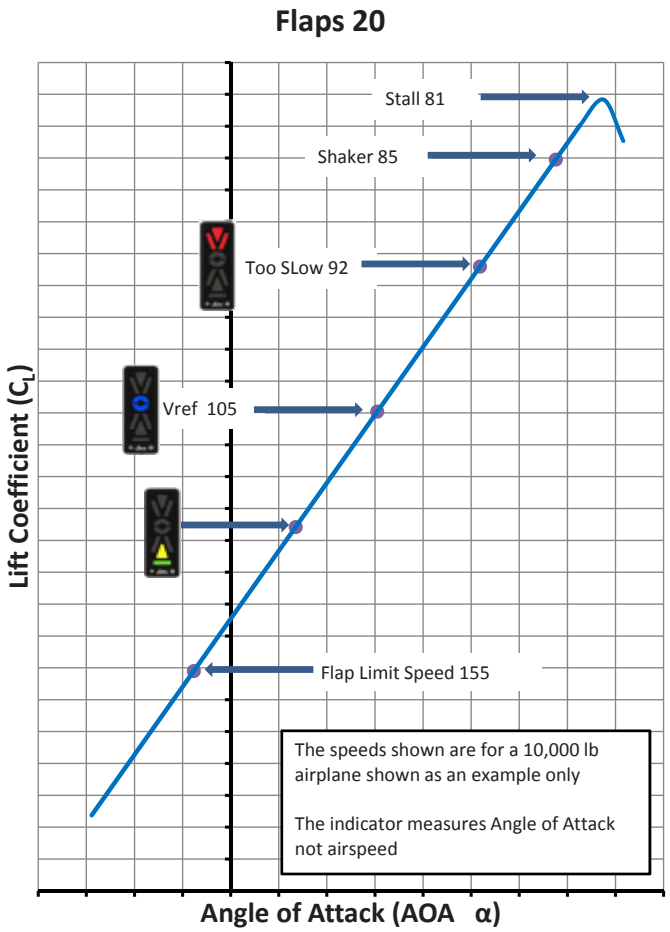


Figure 6: Lift Curve Slope and Angle of Attack Indication

lift curve slope is shown in Figure 6. The important understanding from this Figure 6 is that; **AS YOUR ANGLE OF ATTACK INCREASES, YOUR MARGIN OF AVAILABLE LIFT PRIOR TO STALL DECREASES**, which is displayed to the pilot in an easy to understand method.

Displaying Angle of Attack to the Pilot

This AOA system for the MU-2B uses an intuitive design to indicate to the pilot the relative angle of attack of the airplane and assist in establishing the appropriate approach speed. As the pilot slows the airplane, the angle of attack increases, the display steps thru the various segments as shown in Figure 7, where green is high speed, yellow is slowing toward approach speed, blue indicates normal approach speed, and red indicates **TOO SLOW** (or too high a G load). The red indications are coupled with a voice alert through the headset stating "TOO SLOW" prior to stick shaker. The basic premise used in the display logic is that the RED chevrons intuitively point down advising the pilot to lower the nose. BLUE is the appropriate approach speed, a circle, and yellow is GOOD, with the chevrons pointing up advising the pilot to raise the nose to achieve the appropriate approach speed.

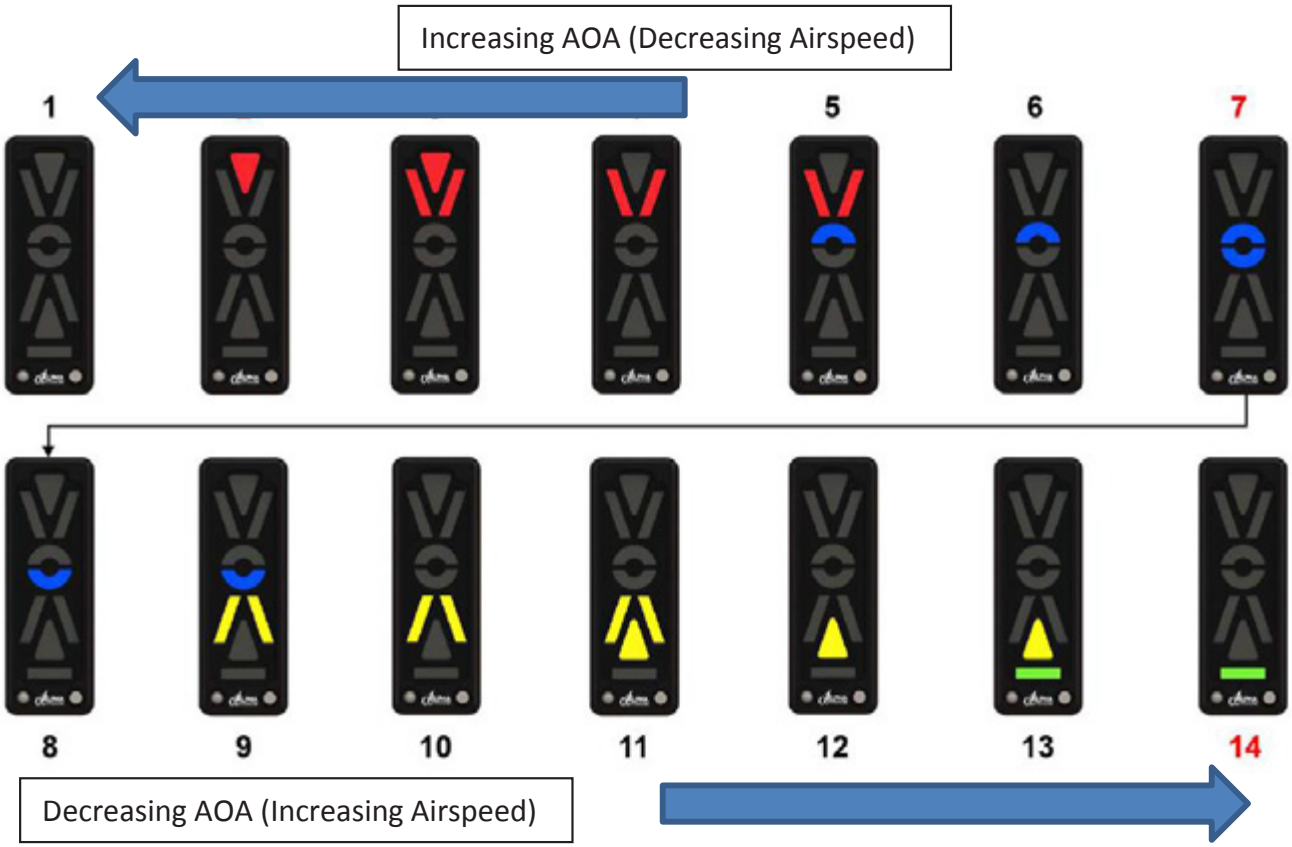


Figure 7: AOA Display Progression

How AOA improves safety.

When the military began installing angle of attack indicting systems in their airplanes, they reduced fatalities significantly. The FAA has determined that a very large portion of approach accident fatalities in general aviation airplanes occur on the base to final turn, in slow flight, or in accelerated stalls. The MU-2B AOA system provides visual and aural warnings as these flight conditions deteriorate. To be most effective, AOA indicators must at a minimum always be in the pilot's peripheral vision, so that when the pilot's focus is outside of the cockpit an indexer or display is **INSTANTANIOUSLY RECOGNIZABLE**. An ideal location is on the windshield center post of the MU-2B. With an AOA indicator in his peripheral vision as it changes from yellow to blue to red and then a "TOO SLOW" voice sounds in his ear, it will draw attention back into the airplane to the instruments, making the pilot aware of the deteriorating flight condition. The AOA system directly provides the pilot **AN INCREASED AWARENESS OF THE MARGIN FROM STALL** and intuitively indicates the action to take by pointing in the direction towards which the nose should be moved.

Angle of Attack is not just about identifying STALL.

AOA can be used to help pilots fly consistent and stabilized approaches. On the system developed for the MU-2B the AOA indicator blue donut is set to match the MU-2B V_{Ref} speeds at all flap settings (0, 5, 20 and 40). Flying the blue donut will automatically place the aircraft at the proper weight-adjusted AFM threshold speeds, providing a safe margin above stall. Other benefits of flying precise approaches are reduced tire and brake wear, and less float on flare and landing.

In a follow on article I plan to discuss how pilots can use an AOA system to help fly more precisely and get the most out of the airplane and the AOA system.

(continued from page 13)

insurance companies every renewal. Sometimes this effort is truly to provide you with the most competitive premium and coverage available. Other times the agent's motive is to block the market. Once an insurance company is approached with a submission to quote, no other agent can approach the company without the client appointing his new agent in writing. This letter is known as an agent or broker of record letter (AOR or BOR). When this reassignment occurs, industry protocol dictates that the insurance company extends the original quote to the reassigned agent. If that is a declination, the declination must be extended. If the underwriter has not yet extended terms to the old agent, the new agent is free to negotiate on the client's behalf.

If the agent shops or over-shops the market every year, regardless of his motive, the underwriters will eventually lose interest in repetitive quoting and never writing the account. They see the submission, match it to the computer, and see that the agent has submitted it on numerous occasions. If the underwriter believes he is just being used to block the market and has no real chance to write the business, you will receive a declination and back in the computer you go for another year. The agent has blocked the market and retains the business because no one else can obtain a quote. And you, the aircraft owner, will never really see the competitive side of general aviation insurance.

How do you know the agent's true motive? You don't, but you can have a better feel for the situation if your agent offers a copy or a spreadsheet of each company's response.

Get to know your agent and discuss your renewal marketing strategy with him. You will get a feel for his talent with just a short conversation.

Your agent should council with you as to the advisability of shopping the risk every year.

Don't shop every year, and don't allow your agent to just tie up the market every year to block the competition. If the market is stable and you have confidence that your agent has shopped your risk in good faith, plan your next "shopping spree" with caution.

How much liability insurance is enough?

This is a question we are often asked. In days of old (pre-SFAR) the question was not how much do you need or want, it was how much could you get. An MU-2 owner was lucky to find an underwriter that would issue a policy with more than $1M liability including passengers. The more experienced pilots occasionally could qualify for $2M. Today, the reputation of the MU-2 has improved (although there are still plenty of naysayers out there) and higher limits of liability are now available and at reasonable prices.

IF YOU ARE STILL FLYING WITH LOW LIMITS OF LIABILITY, GIVE US A CALL. You may be pleasantly surprised at the affordable premium.

The Future of MU-2 Product Support

by Pat Cannon

I think many of you are aware that MHI has been planning to take the MU-2 Product Support program well into the future. In order to maintain the integrity of that program, MHIA will be required to bring some new blood into the fold in order to foster new perspective to the program and to bring some younger, newer energy to help us old guys as we get closer to retirement.

Many of you already know the man who will take a newly created position as the Product Support Manager. Mr. Joe Megna has been around MU-2s as long as, or longer than, most of you. His previous employment with Jet Air in Green Bay, Wisconsin spanned many years. This, of course, makes him an expert on both the history of the MU-2 and all things maintenance, which will serve him well in his new position with MHIA here in Addison, Texas. As Product Support Manager, he will head the team that will take the MU-2 and its support into the next decade. He will use many of the talents and all of the knowledge that he has gained over the last 30 years at MHIA's oldest Service Center, to set the tone for a stable product support environment for a very long time to come.

One of the large concerns of the current support organization is the continued support of the many programs currently run under MHIA's guidance. Among them will be PROP, NBAA and the many other programs that add meaning and enthusiasm to our ownership of the MU-2. As owners and operators, we are all concerned that we maintain the same positive group atmosphere that exists today. To that end, MHIA has hired Ms. Jenna Herzog as their Event Coordinator. Jenna has an extensive 15 year background in media and trade show events and has hosted very large trade shows and conferences in the entertainment industry. Jenna joined the product support team in November, 2015 and is focused on continuing the tradition of providing a common forum for owner/operator participation through PROP and NBAA. These great programs are important to all of us and for so long have been the glue that holds us together in our quest to keep the MU-2 community moving forward toward our common goal of safety and an excellent reputation for the MU-2.

Please join with me in welcoming these two professionals to the MU-2 Product Support organization and make sure that you introduce yourself to them both at PROP 2016.

Joe Megna

Jenna Herzog

Pat Cannon is President of Turbine Aircraft Services.
He is an FAA Designated Pilot Examiner, former MU-2 Demo Pilot, and Safety Expert.

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- In-depth pre-purchase knowledge and support
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ENGINEERING PROGRAMS
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As previously promised MHIA is continuing to support the MU-2 fleet in the interest of safety and maintainability by certifying new systems and improved parts.

ANGLE OF ATTACK SYSTEM SOON TO BE AVAILABLE FOR THE MU-2

I'm pleased to report that the Angle of Attack (AOA) System has been approved and should soon be available through the Authorized Mitsubishi MU-2 Service Centers. Of note is that AOA Installation cost is reduced for those MU-2s that are already equipped with the Voice Box since they already have the wiring associated with the AOA. If you have been considering having the voice box installed in your aircraft, now might be the time to do it. Certain safety modifications and additions are in the works for the MU-2 Voice Box that I'll be able to announce later.

Although the AOA system is basically an off-the-shelf unit manufactured by Alpha Systems, the version for the MU-2 features angle of attack guidance for all MU-2 flap positions including fully retracted flaps (zero degrees). Flying the landing approach at the published Vref speed will be "a piece of cake" or in this case a "donut" since the proper angle of attack will be flown when a blue donut is displayed on the AOA unit. In the event the airplane gets too slow and a stall is imminent, a voice advisory will annunciate "Too Slow" through the headset. Some of you have already seen the AOA displayed at the MU-2 Fly-In recently hosted at the Air 1st Aviation Companies, Inc. in Aiken, South Carolina.

Ralph Sorrells is Deputy General Manager of Mitsubishi Heavy Industries America.

STRETCHED ACRYLIC COCKPIT SIDE WINDOWS

Stretched acrylic cockpit side windows have been FAA approved for future spares replacements. MHIA teamed with Perkins Windows of Fort Worth to fabricate the cockpit side windows. Damage tolerance is improved and crack growth reduced with the new windows. It is the same material that is being used in the replacement cabin windows.

U.S. SOURCE FOR RUBBER DUCTS AND TUBING

MHIA secured a United States vendor, Industrial Tube, for future air ducts and tubing. By having a U.S. vendor, MHIA expects to offer improved spares availability. Ten year replacement kits for both Air Research and Hamilton Standard air cycle machines are available for all MU-2 models through the Authorized Mitsubishi MU-2 Service Centers.

SNIFFLE VALVES

Another U.S vendor, Helimec, located in San Francisco, is now producing our MU-2 tip tank sniffle valve spares. Reports from the field indicate that the leaking sniffle valve problem has been resolved. The Helimec Sniffle Valves are currently available through the MU-2 Authorized Service Centers.

MAINTENANCE ALERT

While attending the recent Fly-In, we noticed that a few short body MU-2s main landing gear doors were loose, indicative of a worn bracket or pin. While this condition should not be a safety concern, a loose door could vibrate or "buzz" and, if left unchecked, could create an expensive repair/replacement. Proper lubrication of the pins and hinges will go a long way toward reducing wear and extra maintenance in this area. (Refer to the door bracket P/N 010A-32649, MLG door hinges P/N 010A-32427 and P/N 010A-32426)

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