



Nuts And Bolts

Nuts And Bolts Goes Nationwide

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The purpose of this quarterly newsletter is to provide a means of sharing safety information and items of interest between the FAA SW Region Airworthiness Safety Team and the aviation industry's Maintenance Technicians. Our goal is to provide you with short articles that will help you keep up with the rapidly changing world of aviation maintenance, as well as guidance on where to find additional information when applicable.

The newsletter will contain at least one accident or legal case study in each edition that we hope will make you think "Hey, that could happen to me!"

We hope to provide you with articles that will be informative as well as interesting although, we could never replace the famous Bill O'Brien, who is my hero. As the editor, it's worth noting that Bill O'Brien has always been my favorite FAA writer, and everything you read here is edited with "How would Bill do it" in mind.

In our "Ask The Feds" column, you are invited to ask questions about any issue or subject that might be bothering you or that you really just don't quite understand. We will do the necessary research and share the results with everyone in our column.

Our column titled "Lucky's Corner" will contain an article written by the one and only Lucky Lougue from Air Salvage of Dallas. (ASOD) If you haven't had the pleasure of working with Lucky on an accident investigation, parts location problem, or technical problem, then you're in for a treat. Lucky also conducts IA renewal seminars and is an incredible asset to the FAA and the NTSB here in the Southwest Region.

The "Tech Forum" column will contain little known interesting technical tips, technical refresher articles, and explanations or advice concerning legal matters that we feel you should know. This is where you can contribute information.

We hope to provide you with an interesting read that might answer lighten those gray areas, or provide a tune up on issues you haven't dealt with for a while, and occasionally, a 'heads up' for what might be coming down from the hill.

Until today this newsletter has been a product of the FAA's Southwest Region Airworthiness FAASTeam. As a result of your positive feedback to the editor about the newsletter, the FAASTeam's National Airworthiness committee voted to send our newsletter to national distribution.

The FAASTeam Airworthiness crew in the Southwest Region, Brian Capone-LA, Steve Kessey-OKC, Berry Proctor-DAL, and Mike Jordan-SAT, decided that it would be an honor to share our newsletter with the rest of the nation. In fact, we're hoping that our new group of readers will participate in the newsletter by submitting articles or suggestions for articles provided the new readers follow a few simple rules. Those include little things like it's OK to misspell a word, (we'll try to catch and fix it for you), try the old KISS principal, to the point and useful, and FUN! Remember, we are Mechanics not Journalist. Only articles of interest to maintenance professional will be published. Articles must be legally correct in accordance with Law, Federal Aviation Regulations, and FAA policy. We are Mechanics and this is our newsletter, our motto is "A Newsletter Written By Mechanics For Mechanics". That should say it all.

If your interested in submitting an article, suggestion or request for a topic, or would just like to invite the Editor out to lunch (just kidding of course!), please see page nine for the form and/or e-mail address. Enjoy the newsletter . We are looking forward to hearing from you.

- **If you are interested in safety and would like to help the FAASTeam spread the word in your local aviation community, we need to talk to you. Contact your local FAASTeam Program Manager. See page 8.**

TECH FORUM - AIRCRAFT WIRING PRACTICES - PART 1

By: Fred Gockel

In the wake of the TWA 800, and Swissair 111 incidents', wiring has become an issue requiring a substantial increase of awareness. As a result, several Advisory Circulars have been issued to address airplane wiring and Electrical Wiring Interconnect Systems (EWIS). Here's a summary of some of what these advisory circulars address:

LOAD ANALYSIS

New or additional electrical devices should not be installed without an electrical load analysis.

CIRCUIT PROTECTION

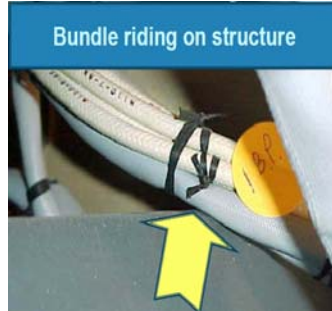
A breaker must always open before any component downstream can overheat and generate smoke or fire. They are designed to protect the wiring and not the components, and are not to be used as switches. Repeated opening and closing of the contacts can cause damage and premature failure of the circuit breaker.

WIRE SIZE

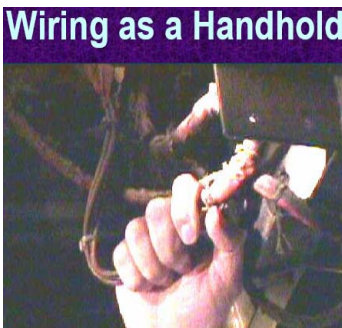
Size wires so they have sufficient mechanical strength, do not exceed voltage drop levels, are protected by circuit protection devices, and meet circuit current-carrying requirements.

ROUTING/CLAMPING

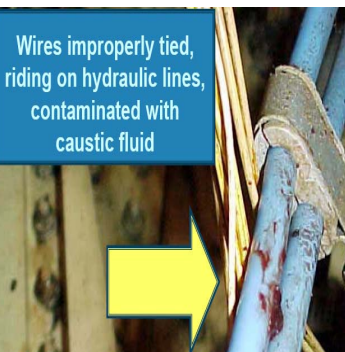
Eliminate potential for chafing against structure or other components.



Position wiring to eliminate/minimize use as handhold or support.



Minimize exposure to damage by maintenance crews or shifting cargo. Avoid battery electrolytes and other corrosive fluids. Protect wires in wheel wells and other exposed areas. Route wires above fluid lines, if practical.



Use drip loops to control fluids and condensed moisture. Keep slack to allow maintenance and prevent mechanical strain.

STAND-OFFS

Use stand-offs to maintain clearance between wire and structure



CLAMPING

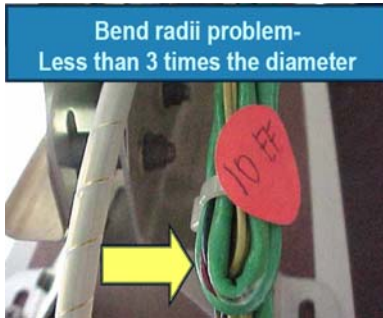
Support wires by suitable clamps, grommets, or other devices at the proper intervals. Supporting devices should be of a suitable size and type with wire and/or cables held securely in place without damage to the wire or insulation. Wire bundles should be snug in the clamp (no movement). Do not crush RF cables. Mount clamps with attachment hardware on top. Tying is not to be used as an alternative to clamping.



TECH FORUM - AIRCRAFT WIRING PRACTICES - PART 1 Cont.

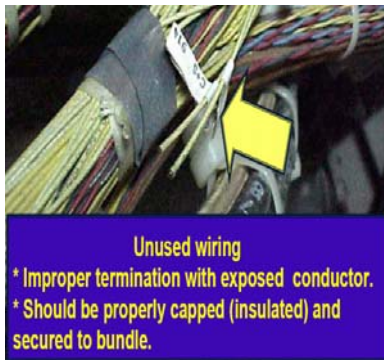
LOOP BEND RADII

As a general rule, minimum bend radius should be three times the outside diameter of the largest wire in the group unsupported.



UNUSED WIRES

Unused wires should be tied into a bundle or secured to a permanent structure. They should be individually cut with strands even with the insulation and properly capped and stowed.



WIRE REPLACEMENT

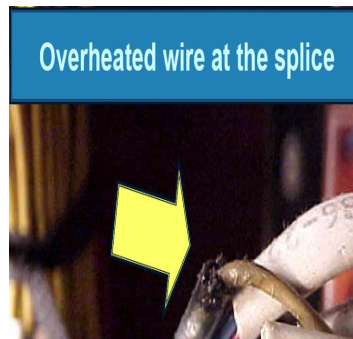
Wires should be replaced for any of these conditions:

- Chafed or Frayed
- Insulation Damage
- Damage by Contamination
- Damage by Overheating
- Crushed or Kinked
- Shielding Frayed
- Breaks, Cracks, Dirt, or
- Moisture in Sleeving

Replacement wires should have the same shielding characteristics as the original wire, and the replacement wire should not be outside the shielded bundle.

WIRE SPLICING

Wire splicing should be kept to a minimum and high vibration areas avoided. The splices should be staggered in bundles at the correct intervals, and use a self-insulated splice connector if possible.



TERMINALS

Terminal strength should be the same equivalent strength as the wire and resistance should be negligible relative to the normal resistance of the wire.

TERMINAL STRIPS

Terminal strips should have barriers to prevent adjacent studs from contacting each other. Current should be carried by the terminal contact and not the stud. Replace a defective stud with an equivalent of the original. Mount strips so loose metallic objects cannot fall across the terminal. Inspect periodically for loose connections and contamination.



TERMINAL LUGS

There should be no more than 4 lugs, or 3 lugs and a bus bar per stud. Lug hole size should match stud size with the greatest diameter on the bottom. Do not over tighten connections or a deformed lug will result.



Remember to **ALWAYS** consult the Standard Wiring Practices Manual for your particular aircraft.

Author: Fred Gockel - FAAS Team Representative - Houston, TX.

Everyone should review Chapter 11 of AD 43.13-1B periodically to freshen up on these practices!

LOOK FOR PART 2 IN THE NEXT EDITION.

ASK THE FEDS - Do I Really Want To Be The DOM For A Small 135 Operator ?

This question came into the Dallas FSDO from one of the local IA's. The phone call went something like this: Hi Barry, this is Phil, I met you at the IA renewal symposium this year and thought I would give you a call and see if you could answer a question for me. I was approached by Tom Flyboy with XYZ Aviation the other day and Tom asked if I would consider being his Director of Maintenance for his FAR Part 135 Charter operation. Tom said he operates a couple of Cessna 402's for freight and he hauls people in a Baron, and a couple of Bonanzas. He said I wouldn't have to do anything except let him use my name and give him a resume and a copy of my mechanic certificate. Tom offered to pay me for my trouble on a monthly basis. Is this something that I want to get involved with, it sure sounds like easy money to me?

This scenario happens a lot in the world of small Part 135, on demand charter operators. What Tom is asking Phil to do is illegal. If Tom had left out the part about "you wouldn't have to do anything except let me use your name", then the arrangement could work legally even if Phil did it only part time. That is provided Phil meets all regulatory requirements for the required Director of Maintenance position as outlined in 14 CFR part 119.71(e) and, he is readily available to fulfill all responsibilities of the position that are consistent with the certificate holder's operations as outlined in their manual.

Lets look at the rule: Part 119.71(e) says: [To serve as the Director of Maintenance under Sec. 119.69\(a\) a person must hold a mechanic certificate with airframe and powerplant ratings and either: \(1\) Have 3 years of experience within the past 6 years maintaining aircraft as a certificated mechanic, including at the time of appointment as Director of Maintenance, experience in maintaining the same category and class of aircraft as the certificate holder uses; or \(2\) Have 3 years of experience within the past 6 years repairing aircraft in a certificated airframe repair station, including 1 year in the capacity of approving aircraft for return to service.](#)

The rule is clear on the qualifications for the DOM and the 135 operator must be able to prove to the FAA Inspector that his DOM meets all of the requirements. This is usually done by reviewing personnel files which should contain a resume of past experience and copies of the individuals mechanic certificate and IA if applicable. It's also worth noting that the DOM position is required to be filled even if the operator contracts out

all of his maintenance and inspections. Now lets look at the duties of the DOM as spelled out in Part 119.69(d):

[The individuals who serve in the positions required or approved under paragraph \(a\) or \(b\) of this section and anyone in a position to exercise control over operations conducted under the operating certificate must--](#)

- [\(1\) Be qualified through training, experience, and expertise;](#)
- [\(2\) To the extent of their responsibilities, have a full understanding of the following material with respect to the certificate holder's operation--](#)
 - [\(i\) Aviation safety standards and safe operating practices;](#)
 - [\(ii\) 14 CFR Chapter I \(Federal Aviation Regulations\);](#)
 - [\(iii\) The certificate holders operations specifications;](#)
 - [\(IV\) All appropriate maintenance and airworthiness requirements of this chapter \(e.g. parts 1, 21, 23, 25, 43, 45, 47, 65, 91, and 135 of this chapter\); and \(v\) The manual required by Sec. 135.21 of this chapter; and](#)
- [\(3\) Discharge their duties to meet applicable legal requirements and to maintain safe operations.](#)

Although the rule (part 135) primarily holds the certificate holder responsible for the airworthiness of it's aircraft, you better believe that if it is warranted, we (the FAA) will hold the Director of Maintenance responsible if something happens that is contrary to the FAR's. The following quote came from the FAA Inspectors Order 8900.1. It was found in a chapter that deals with certification of a new operator: [The Director of Maintenance \(parts 121 and 135\) is responsible and accountable for administering the operator/applicant's maintenance program.](#)

Now that you are familiar with the applicable regulations how would you answer Phil's question? I would tell him that he should run away as fast as he can from that easy money.

In this case, I'm sure that Tom is not trying to circumvent good maintenance, he is probably contracting out to a certified repair facility. What Tom does not understand is that there is a reason the FAA requires a DOM. We hold air operators to a higher level of safety. That's why the DOM must be qualified and experienced, even if the operator is not performing his own maintenance. If your going to do it, do it right. What is your A&P certificate worth?

Author: Mike Jordan - FAASTeam Program Manager

Accident Case Study - Robinson R-44

The local instructional flight was scheduled for an east departure from the airport and south along the coastline. Several witnesses observed the helicopter approximately 200-500 feet above ground level (agl) in cruise flight along the coastline on a south heading. One witness, a former pilot and mechanic, reported he observed the helicopter in straight and level flight, then heard a change in "rotor noise, followed by a bang/pop/twang sound." The helicopter then "snap-rolled" to the left and descended into the terrain in a nose low attitude. There was a post accident fire.

The Pilot in command, a 39 year old female Flight Instructor and the 29 year old male Student Pilot both received fatal injuries.

Examination of the helicopter's flight control system revealed that the right forward servo to swashplate push-pull tube joint was disconnected and the attach hardware (bolt, lock nut, two washers, pal nut) was missing. The left forward servo to swashplate push-pull joint was connected; however, the nut was found partially engaged on the bolt threads, and the torque was "finger tight"; no pal nut was noted. Material analysis of the components revealed that only one of the two nuts for the left and right connections were installed, and then only finger tight. The nut on the right servo connection rotated off during flight which allowed the bolt to extract itself and disconnect the servo from

the push-pull tube. Prior to the accident flight, an inspection, which required the push-pull tubes to servo connections to be disassembled, was performed on the helicopter, and a 0.5-hour maintenance test flight. The mechanic who performed the inspection, stated he forgot to properly secure the hardware for the left and right servo connections. The mechanic stated the reasons for the error were the following: 1. He was pulled, "in all directions" by company personnel since his arrival at that facility; 2. The "reassembly was not opposite of the disassembly," which was a personal maintenance practice he used to eliminate errors; 3. Two nights prior to the completion of the inspection and the maintenance test flight, the apprentice providing assistance, wanted to stay late to finish with the mechanic a certain section of the inspection. As a result, the mechanic forgot to go back and secure the hardware connecting the two push-pull tube to servo joints; 4. The company was understaffed with maintenance personnel. According to the company's maintenance quality control program, any maintenance completed on a helicopter was to be inspected by another mechanic. A review of the program revealed that the mechanics were not following the program, and the company was not providing oversight and enforcing the pro-

gram.

The National Transportation Safety Board determines the probable cause (s) of this accident as follows:

the mechanic's improper installation of the attachment hardware for the servo to swashplate push-pull tube joint which resulted in a disconnection, subsequent loss of control, and impact with terrain. Contributing factors were the company management's inadequate surveillance and enforcement of maintenance procedures, the excessive maintenance workload due to inadequate staffing of maintenance personnel, and the insufficient management of maintenance tasks.

It's disturbing to think that this is a situation that many of us have been in before. The sad part is that this overworked overstressed mechanic made a mistake that could have been prevented if he had followed the company approved procedures. Perhaps a checklist or a second set of eyes might have broken the chain of events that led to the accident.

Think about the consequences of our profession and what we do daily. This individual lost his mechanic certificate with airframe and powerplant ratings for 120 days and the worse part is that he will have to live with his mistake for the rest of his life.

A smart man or woman learns from the mistakes of others, after all we are not going to live long enough to make all of the possible mistakes ourselves.

Human Factors issues are not just FAA hype created by bureaucrats in Headquarters. It's a real issue that can get people hurt and destroy your career.

Get a copy of the Maintenance Personal Minimums Checklist from you FAASTeam Representative or Manager and use it.

Author: Mike Jordan , FAASTeam Program Manager, SAT-FSDO



Tech Forum - Capacitance Fuel Quantity Systems

Accurately measuring the fuel remaining in aircraft tanks has been one of the many challenges facing aircraft designers. After all, aircraft operate in a three dimensional realm and fuel is a fluid with tendencies to migrate based on applied forces. Over the years a wide array of methods have been employed to provide flight crews with a reference displaying remaining fuel. In some cases mechanical floats and dipsticks were used when the fuel tanks were visible from the flight deck. But with the need to store more and more fuel it became clear a method was needed to give the crew an accurate display.

Capacitance fuel gauging systems employ no moving parts (other than perhaps the flight deck indicator) and provide a fuel remaining reference as a unit of weight. Most systems in use today require three entities that include the display, processor unit (sometimes located within the display) and the tank units or probes. It is decided during the aircraft design phase how many probes are required to provide optimum accuracy.

Capacitance is best described as the ability to store and that is exactly what the tank units accomplish. They store or alter an electrical charge that is proportional to the amount of fuel. Several types of system are currently in use and include Alternating Current (AC), Direct Current (DC) and AC / DC systems.

A capacitor by definition consists of two conductors separated by an insulator. In aircraft, fuel probes frequently take on the appearance of two (or three) concentric cylindrical tubes with provisions to install two or three different groups of wires and the insulator is either fuel or air. The tubes are made of metal or have a conductive material applied to the sensing areas and insulated stand offs are used to insure a specific distance is maintained between them. The amount of capacitance is based on the length of the probe and the distance between the plates. Any dents or damage that could alter the relationship between the tubes will probably impact the integrity of the probe. Contamination is one of the most frequent causes of anomalies with capacitance fuel quantity indicating systems. Water is often a culprit and can frequently be eliminated by regularly sumping fuel tanks and using products such as Prist in turbine fuel that will help keep the water in suspension. In some cases probe cleaning may be necessary. Different airframe manufacturers have specific recommendations for decontaminating tank units. Some recommend using

nothing more than clean fuel while others may use dry cleaning solvents such as Xylene. Some chemicals tend to vaporize quickly and if the cleaning process is accomplished on a hot and humid summer afternoon the cleaning agent will rapidly evaporate from the probe resulting in condensation. It is possible to end up with more water in the probe after cleaning than before. It is advisable to refer to the Manufacturer's Safety Data Sheet (MSDS) to insure adequate measures are taken to reduce exposure risks prior to undertaking any cleaning actions.

Many capacitance indicating systems will use shielded wires to connect the probes to the processor. Shielded wires consist of a center conductor surrounded by an insulator and is then encased in a wire mesh. By definition a shielded wire is a capacitor. The capacitance of the wire is factored into the overall tank assessment and may be a contributor to any problem. A break in the shield or a deterioration of the insulating material and even a severe bend can alter the overall capacitance value. These defects may lead to a deviation in the displayed fuel quantity. Technicians may be inclined to make minor gauge adjustments to compensate for the error so a good practice is to verify the proper operation of all the tank components prior to making any adjustment. After all tank problems rarely fix themselves and most frequently the gauging error will reappear.

Most processors incorporate protective circuitry which will detect abnormally high current flows that are indicative of an electrical short. When this occurs the processor will shut down the tank excitation signal and may make the flight deck indicator either display a fault or not come to life when power is applied. Considering the volatility of the operating environment, a failed system should be closely scrutinized prior to replacing any component.

It is always beneficial to have a thorough understanding of the specific system along with any test equipment being used for troubleshooting or calibration.

Author: Jim Sparks, Ft Worth, TX.

Co - Author : Dianne Martindale, Ft Worth, TX

LUCKY'S CORNER - DODGING THE BULLET

DODGING THE BULLET

Imagine flying your 1968 Piper PA-28-180 with a Lycoming O-360-A3A and Sensenich Prop 76EMMS-0-60 on a cross country flight. Then imagine during that flight you lose part of the propeller blade and have to make an emergency off-airport landing which resulted in damaging the aircraft substantially. Luckily there were no injuries or fatalities. This is where I come in. The aircraft was transported to our facility, Air Salvage of Dallas in Lancaster, Texas where the NTSB and I completed the investigation.

Upon looking at what was left of the propeller, we documented that approximately 17 ½" of one blade was missing. That is a lot of blade when you are talking "Separation in Flight". Losing that much blade at cruise RPM almost separated the engine from the airframe. One of the two top engine mount tubes had been pulled into two pieces on the left side and the right side had been pulled and had separated the retaining support structure from behind the firewall. The alternator, exhaust system, baffling and carb air box were all shaken loose and severely damaged. The engine was merely seconds from departing the aircraft. Needless to say, if separation had occurred, it would have been catastrophic.

What made this prop fail? Was this just an isolated occurrence or had this been coming on for some time? Guess what? This failure had been coming for some time. You'll **NEVER GUESS WHAT WE DISCOVERED NEXT!** An Airworthiness Directive, (AD) from 1969 had not been done! Sensenich AD 69-09-03, Para. B, requires a placard or warning near the engine tachometer that warns the pilot of "Avoid Continuous Operation between 2150 RPM and 2350 RPM", and Para. C requires an Inspection, Rework and/ or Replacement of the propeller in accordance with Sensenich Service Bulletin R-14A and must be completed within 50 hours of the effective date of the AD. Once these were complied with, the propeller would then need to be Re-identified by Stamping the Prefix K in

front of the prop Serial number. Guess what?! This propeller showed no "K" prefix in front of the serial number.

How could an AD that was over 38 years old with 3 revisions, have been missed that many times? This means that this aircraft underwent a possible of 38 annual inspections and was never caught! At the IA Refresher Seminar that I instruct every year, I always say, "Don't take anything for granted and assume that the people before you probably checked and took care of things like this!" If you do the annual inspection and there is an AD that can be checked for compliance by a simple visual inspection (In this case checking the prop hub for the "K" prefix on the serial number and visually inspecting to see that the RPM Warning placard was installed on the instrument panel), you had better do it! This accident could have just as easily been a four fatal, smoking hole type of situation where everyone in the last 38 years that had worked on this aircraft was involved and named in a high dollar nasty lawsuit.

To all mechanics, we dodged the bullet on this one! The whole purpose of these articles is to make you aware of and to learn from other people's mistakes. Safety is a learned behavior! Let's **ALL** learn something from this one!

Author: Lucky League - Air Salvage of Dallas

Failure To Follow Procedures Is The Number One Factor In Maintenance Related Aviation Accidents



Do You Need Contact Information For Your FAASTeam Program Manager or FAASTeam Representative

1. Go to faasafety.gov and sign in.
2. Click on FAASTeam Directory, left side of the page.
3. Click on View All Directory Information.
4. Click on Region, click on your FSDO or region from the drop down box.
5. Click on GO.

The system will display all of the FAASTeam folks sponsored by the office you selected.

6. Select the Program Manager or Representative that you need to contact. Click on his/her name and that persons information will be displayed.

Hope you had a Happy Independence Day!



FREE - FREE - FREE - FREE - FREE - FREE

ONE WEEK ALL EXPENSES PAID, AIR VENTURE 2009, OSHKOSH, WI., FOR THE WINNER AND ONE GUEST.

We are looking for candidates for the General Aviation Awards Program for AMT, Avionics Tech., CFI, and/or FAASTeam Rep of the year.

Everyone knows someone that may be deserving of recognition for the great work they do. If so please contact your local FAASTeam Program Manager.

Total prize package value, \$5,000.00 +

WHAT IS IT?

If you know, be the first to send me an e-mail to "nutsandbolts@faasafety.gov" and we will publish it in the next issue and give you credit for your aviation savvy.



The first correct response to the 08- 01 edition photo came from Mr. Joe Christian from Eldorado, Texas. Joe said "It's a Transavia PC-12 Airtruk." The Airtruk was developed from the Bennett Airtruk designed in New Zealand by Luigi



Pellarini. It has a 1 ton capacity hopper. It can be used as a cargo, ambulance or aerial survey aircraft, and carry one passenger in the top deck and four in the lower deck. This aircraft was featured in 1985 movie "Mad Max Beyond Thunderdome."

Do you need to find or get information about any FAA office?

http://www.faa.gov/about/office_org

FAASTeam “Nuts and Bolts” Newsletter Submissions

If you are interested in submitting an article please type your article using 10 point Times New Roman font in a word document. Articles should not exceed 800 words maximum. If pictures are submitted, please title by number to match required caption. Best would be to paste into word document with the captions printed. Limit pictures to reasonable quantity and size for article.

Your submission may be slightly modified to ensure correctness and due to space considerations. No major content change will be made without your notification. You are responsible for content and FAA assumes no liability and/or implied endorsements. Upon completion, please submit to Mike Jordan at

nutsandbolts@faasafety.gov

If you are interested in offering a suggestion for an article or if you have a question or issue that you would like clarification on in our “Ask The Feds” column, simply send us an e-mail with your suggestion or request at the address above, and include the form below.

Please submit the following information with your article, suggestion or request.

Your Name:		Phone #:	
Title:			
Company:		email:	
City/State:		Phone #:	

	YES	NO
Do you wish to have your email address published?		
Do you wish to have your title and/or company name published?		
Are you a FAASTeam Representative		
I agree and attest to information provided		
Signature:		

Article Attached: Yes ___ No___

Pictures Attached: Yes ___ No___

Suggestion: