Transport Canada Transports Canada

Aviation Safety

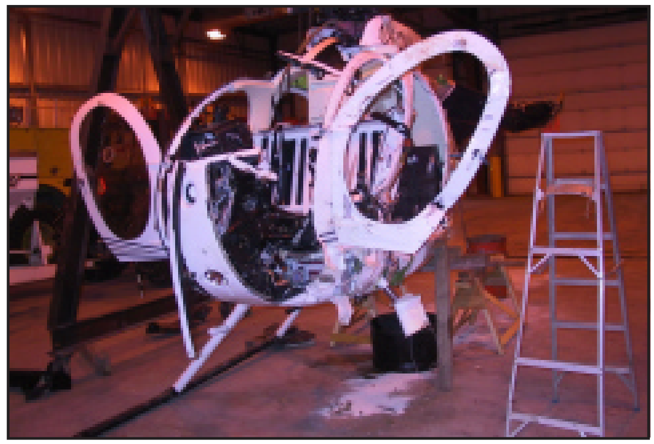
Maintainer

Learn from the mistakes of others and avoid making them yourself . . . **Issue 1/2004**

Risks Associated with a Major Modification

The McDonnell Douglas 369HS with a pilot and a passenger on board had departed a hunting camp and was proceeding to Fort Simpson, Northwest Territories. Approximately 25 nautical miles (NM) from their destination, and considering the time that he had been aloft, the pilot glanced at his fuel gauges and noticed a discrepancy in the reading. The gauge seemed to show a higher fuel load than he should have had. To be on the safe side, he elected to follow roads in case he would be confronted with an emergency situation. As he neared the landing pad at Fort Simpson, he proceeded on a left turn for the final approach. At an altitude of approximately 200 ft, the engine suddenly flamed out. The pilot immediately set up for an autorotation and attempted to land on a secondary road.

Unfortunately the helicopter struck trees and descended to the ground. The pilot was fatally injured and his passenger was seriously hurt. Examination of the wreckage determined that the engine had flamed out because of fuel starvation. Only approximately three cups of fuel was found in the main fuel cell as compared to 132 lbs of fuel in the auxiliary fuel tank. The open/close control for the auxiliary fuel valve was found in the closed position. The helicopter was equipped with a float-type fuel quantity indicator system and with a low-fuel caution light that the pilot had tested twice during the last 15 min of the flight, but it had not illuminated. The fuel quantity indicator and low-fuel caution light are activated by the same sensor arm in the main fuel cell, and if its motion is restricted, neither system will function properly. This MD369HS helicopter had originally been fitted with a single fuel vent tube that exited the bottom of the fuselage. It had not been equipped with the optional additional vent tube and fairing assembly to provide an alternative fuel venting system that is offered by the manufacturer. The owner had recently decided to purchase supplemental type approval (STA) SH78-1, to allow for the carriage of an external load in a cargo pod configuration, but during the major modification process, he changed his mind and the work was halted. Because the modification had been underway, the original single fuel vent fairing assembly had been removed and a vent drain had been permanently installed over the external end of the single vent tube. A drain spigot was added and oriented approximately 80° to the right of the longitudinal axis of the fuselage and the inside diameter of the external end of the vent tube was reduced from $^9/_{16}$ in. to $^5/_{32}$ in. The cargo pod had been fitted to the airframe and then removed when the pilot/owner reconsidered his decision of its usefulness. STA SH78-1 required the installation of an alternate fuel vent in order to meet Hughes Service Information Notice HN-81, but this installation had not been done. The helicopter was returned to service in a partially modified condition and unairworthy as the required alternate air vent had not been installed and the fuel drain spigot and the original air vent line had been reduced in diameter and these components were still in place.



Investigation results suggest that the main fuel cell collapsed as a result of a decrease in air

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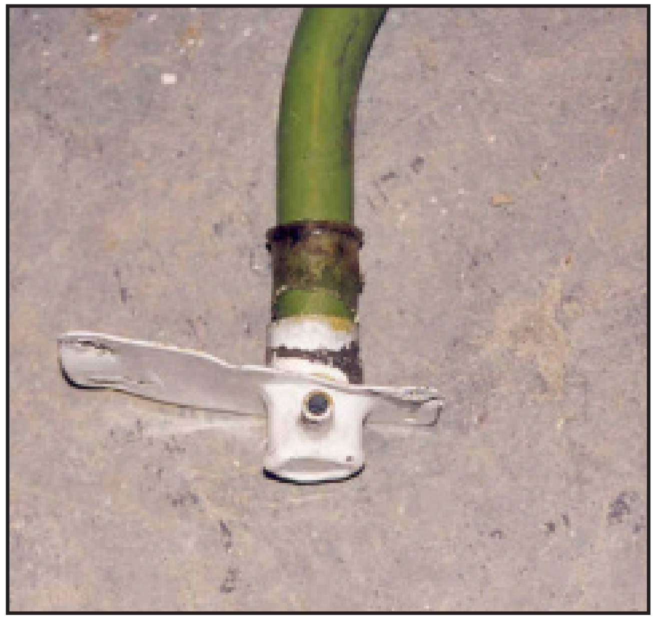
pressure in the tank caused by the drain spigot installed during the STA process. This change in fuel cell configuration acted to immobilize the fuel quantity arm sensor and additionally prevented activation of the low-fuel caution light warning system. The pilot may not have opened the auxiliary fuel valve as he neared the end of the flight, even though he was uncertain of the fuel quantity remaining. Instead, he chose to fly closer to roads in case an emergency should occur. The auxiliary fuel tank emptied in the main fuel cell by gravity when the control valve was opened. As the auxiliary tank still had 132 lbs of fuel remaining at the end of the flight, the pilot may have thought that fuel was flowing to the main fuel cell because of a malfunction in the fuel transfer control valve system. The engine flamed out due to fuel starvation and the altitude was insufficient to ensure a safe autorotation landing.

The incorporation of modifications to an aircraft as instructed by a supplemental type certificate (STC) or STA document consists in a major modification to a type design and before the aircraft is returned to service, it has to be in conformance with these instructions or it has to be returned to its original airworthiness status. In this case, reducing the size of the vent line and altering its position probably led to the collapse of the flexible fuel cell and disruption of the fuel level indicator and warning system. The pilot assumed that he had more fuel available than there really was and an accident ensued.

Always review in its entirety the content of an STC or STA and make a list of the process that you are going to follow in order to ensure that the aircraft is airworthy after completion of the work,



before it is put back on line. If the work is incomplete, only minor modifications to an airframe will allow it to be returned to service. A major modification that is incomplete will have to be approved and certified by Transport Canada or an approved representative before the aircraft is released. Any major change to a type design that is not approved renders a certificate of airworthiness invalid and when such a change is the cause of an accident, it creates a liability issue for the parties involved. When unsure of an airworthiness status of an aircraft following or during a major modification process, consult your nearest Transport Canada Airworthiness office or an approved Transport Canada engineering representative. Consultation is cheap compared to the loss of life.

Safety Is No Accident, It Must Be Planned

This motto can be found on the walls of many large and small organizations that have made it a practice to put safety at the forefront of all of their activities. Whether these companies have learned the hard way the value of encouraging a culture that is safety-minded is secondary because what usually transpires from such an accomplishment is that men and women perform to deliver a product or a service on time and at the requested quality level. Added benefits from maintaining such an environment—where employees are consulted and encouraged to bring forth ideas on how to improve methods of work, all the while improving safety—include the improvement of the quality of the service and/or product, as well as production ratio and employee absenteeism level. These added benefits increase efficiency, which in turn improves the bottom line ratio. “Safety is no accident, it must involve planning.”

Addendum to Maintainer 3/2003

Mechanical Happenings: Aerospatiale AS350 B2—A fire broke out in the right-hand cargo compartment and the helicopter was substantially damaged. Initial investigation revealed that a damaged or shorted fuse holder for the essential bus Ng indication may have been at the source of the problem.

DeHavilland Beaver and Otter: Potential for Premature Magneto Failure—The float-equipped DHC-2 had an engine failure at 1 500 ft but was able to land safely. Investigation showed that the “P” lead connector SKL3-21-3-8AN had failed internally.

The Transportation Safety Board of Canada (TSB), Transport Canada and the type certificate holder are investigating both matters. We will publish additional information on these incidents later this year. —Ed.

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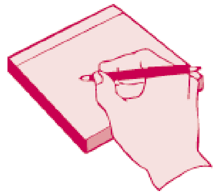
Letter from the editor



Ref: *Article "Heaven Can Wait," Maintainer 3/2003*

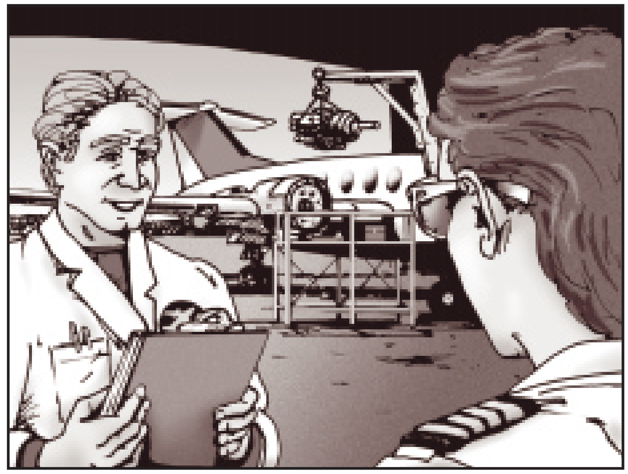
I received quite a disturbing call from a reader who complained that in the above-mentioned article, complacency may not have played a role in the accident, as the inspection of the trim assembly is extremely difficult, if not impossible, to perform due to the location of the assembly. Here is a rule that we all should try to abide by all of the time. If you cannot confirm that an installation is 100% secure, you cannot rightfully sign it off as done. Even if it seems to perform, such as in this case, as per the specifications for rate and for travel. I pointed out to this individual the fact that any good engineer will have at their disposal several types and sizes of mirrors on extension handles that will allow for a clear view of any work before signing it out as secure. Aircraft maintenance engineers (AME) have the responsibility to take all of the appropriate measures to ensure that the performance of the work is equal to or better than what is required. It is a question of life and death, such as in the above-mentioned article; it is a question of ethics and it is a question of liability. As an AME, you, the immediate supervisor overseeing your job, as well as the company that employs you, are all responsible for the continued airworthiness of the aircraft and of the flights. Any mishap that occurs for which you may be directly, indirectly, or partly responsible, will cause you damages beyond your wildest expectations. People put their trust in you and most airplanes fly safely millions of miles every year without mishaps, thanks to your professionalism, your wits and abilities to perform work often beyond the call of duty. Guard against becoming complacent.

My apologies for the picture of a Beech C90 instead of a Beech A100 mentioned in the article. It is always difficult to obtain the right picture, and the authorization to use such, within the allotted time. Keep up the good work.

In This Issue

Pilots vs. Engineers or Us vs. Them: A Question of Safety

by Wade Pelly, Pilot Instructor Helicopter, Conception Harbour, Newfoundland



There's a state of mind that can ruin your base. It can crush morale, interfere with getting the job done and make you want to be elsewhere. I've seen it where I'm working now and I've seen it on other bases. It can be divisive of any two groups of people, but for now I will focus on how it divides engineers and pilots. It's hard to put a label on it. Instead I'll try to describe it. If any of this seems all too familiar, I hope some of the ideas which follow will help fix the problem.

How it divides engineers and pilots. The successful operation of any base requires cooperation between engineering and pilot staff. A friendly rivalry may exist between us but, at times, rivalry can combine with individual conflict and develop into open warfare. The problem is not specific to any one type of operation. I've observed it in emergency medical services (EMS), in the bush, overseas, in flight training and in the military. It just as easily divides captains and co-pilots, line-staff and management, or field workers and office staff, and it is usually centered on those few people who refuse to cooperate. When battle lines get drawn, they bump everyone into two groups—Them or Us.

I've wondered why it continues to be an issue. The people I work with are professionals striving to conduct business safely and reliably. It's bad enough when a rift develops between individuals, but when it divides whole crews, it can become difficult to keep the operation working at all—let alone smoothly. When morale heads south, mistakes increase and though we get the job done, not one of us is happy. I will discuss some of the factors that I believe contribute to these conflicts getting out of hand. They may or may not apply to your situation but they do apply to many I've seen. I'm not a psychologist by any stretch of the imagination, but I'm willing to offer some opinions based on what I've witnessed. If you think I'm way out in left field with no business being there, please let me know.

Human nature. Common sense says, we don't get along with all the people all of the time. We cope, recognizing the problem or problems we have with any one person, putting distance between ourselves or working it out with others as professionals, if not necessarily as friends. In the kind of operations in which we work, distance is not always an option. We may have limited space in which to work and few places to go in off-hours. It is necessary for us to keep our eyes open for anyone losing their sense of humour and help them keep their perspective. If the simplest things are making someone crazy, either back off or find out what the real problem is. It is important, as we get on each other's nerve, to make allowance for personality quirks. It is also important not to apply a problem we have with one person to the whole group. Just because I keep adding 2 and 2 to get 5, doesn't mean all pilots are out to botch up the journey log for the engineers.

Duty day differences. Hours worked and the *Canadian Aviation Regulations* (CARs) strictly control minimum crewing for pilots. As a result, we tend to get a reasonable work schedule even in 24-hour operations. The exceptions are seasonal high intensity jobs. Customers usually prefer to fly daylight hours during the workweek, which sets the pilot's schedule nicely. This leaves the maintenance department with limited time to complete inspection and repairs. They end up getting time during less desirable hours of the day. But we aren't going to change the schedule. We need to deal with it—ensuring that each operation has the people, pilots and engineers it needs. No more single machine, 24 hour, and seven days a week operations being staffed by six pilots and one engineer.

One common reason why training fails. Why is it then, I hear pilots complain about engineers not working hard enough and vice versa? Consider the size of the operation. A single pilot and engineer working together on one machine in the bushes have rarely complained about the other. They see and understand each other's role and either get along or understand the problems are personal, not a function of somebody's trade. They have mutual respect. When we are assigned to a base with a large number of crews, we loose touch with the nitty gritty details of each other's work and tend to look at things from our own perspective. It is easy to get irritated watching someone else kick back in the sun or complain about not having enough ice in his drink at lunch, while I'm sweating bullets trying to keep up with the job at hand. I need to remember, he will be feeling the same about me when I'm sitting down to a steak dinner and a cold one, while he's swatting malaria-laced mosquitoes trying to finish a 25-hour inspection after dark. As I said, it's all about perspective.

Lack of education. To clarify, a lack of education is what I mean. All too often, new entrants to the business of flying or maintaining helicopters are told next to nothing about whom they will be working with. In early training, the only information I was given about engineers and technicians was how to make sure I wasn't caught by their mistakes, and how to deal with engineers who didn't like pilots. Great stuff upon which to build a working relationship—no! Almost nothing was said about how I could learn from the experience of others; how closely we would be working together; or how often he would save my bacon. I've found from working with engineers, their experiences were similar. The solution is simple. From day one, educate and mentor student pilots and apprentice engineers. We need to teach them about their own jobs and about the importance of the people with whom they will be working. If we can instil an understanding and respect for each other's importance in getting the job done, then working together should be easier and we will help clear up the next point.

Communication is the key. Pilots talk about engineers, what they're like, what they do. Usually it's just good-natured ribbing, but for some it gets way too serious. These are the people who forget how closely we need to work together and how similar our situations are. Unfortunately, our attitudes are shaped, as any teacher or instructor will tell you, by our earliest experiences. They become very inflexible and difficult to change. The later in our career or life we try to make a change, the harder it is. Again, this is why early education and mentoring is so important when we bring new blood into our organizations.

The heart of this article is about respect and professionalism. We may not become best friends and chum around together or change the structure of the world, but we need to have a level of professionalism and personal respect for each other in what we contribute to the operation. One group can't function without the other. Communication is the key to developing and maintaining respect. The earlier we teach this to the apprentice or newly licensed pilot, the better the situation will become and the fewer problems we will have to deal with or correct down the road. Maybe, one day, we will get ambitious enough to try to take the same approach with management…?

Vacuum Pump Gasket Failure Leads to Forced Landing

During the past few years, there has been a series of forced landings attributed to engine failure from oil starvation. In many cases, rupture of the vacuum pump gasket was the cause. Here is a case in point.

A Cessna 206H was about 4 min into a flight when the pilot noticed a low oil pressure warning. As he monitored the pressure, he saw it quickly reach the 0 mark. The engine ceased very shortly thereafter. The pilot tried a restart several times, but without success. He set up a glide to a nearby cultivated field where the forced landing was made. The aircraft was substantially damaged but the pilot walked away unharmed. Investigation revealed that the vacuum pump gasket had failed because it could not continue to hold the high oil pressure to which it was subjected. A review of the engine manufacturer's maintenance and parts manual indicated that the wrong gasket had been used. When a new vacuum pump had been installed, the aircraft maintenance engineer (AME) had used the gasket supplied in the kit. The manufacturer of the pump, Parker Hannefin/Airborne, supplies a cork gasket, but responsibility is left with the AME to determine if the installation requires that type or a different one. The aircraft manufacturer's parts manual is the best reference for this information and should be consulted. In the above case, the problem with using a cork gasket between the vacuum pump drive pad and dry vacuum pump, in the Lycoming IO-540-AC1A5 engine, is that the oil pressure galley port that ends at the pad surface can generate up to 130 psi. That oil galley was formerly used to supply oil to the old wet type vacuum pump lubricated with engine oil. Since this is a pressure feed port, high oil pressure can overcome the gasket material's resistance to tearing, and a leak can occur. In time, it will empty the oil sump.

When Lycoming shifted the oil pressure pick up point from the port off the accessory section to the front of the engine, most of the engines saw an increase of up to 115 psi for the oil limit red line and either 50-90 psi or 60-90 psi for cruise, depending on the engine model. Since oil pressure is flowing to the vacuum pump drive but is not used, there is no drop in oil pressure at the pad location. When the engine is started on a cold day, the pressure may reach 130 psi; a cork gasket is not designed to hold such pressure. For that reason, it should not be use at that location.

Cessna issued SNL00-8 dated June 5, 2000, and advised about a possible oil leak condition when a cork gasket was used. The service letter specifies the use of gasket part No. S3346-1 or equivalent and details torque procedures for the pump retaining nuts. It also shows a picture of a wrench that can be fabricated to remove and install the nuts. Aircraft have been known to operate for several hundred hours after the installation of the gasket before problems arise. The torque on the fastener may decrease over time as the material shrinks and degrades. Review aircraft maintenance records to determine if a vacuum pump has been replaced in the past and if a cork gasket was used. When installing a vacuum pump, ensure that the proper gasket is used every time by consulting the aircraft manufacturer's parts manual. If unsure of an installation, it is safer to investigate. A forced landing is usually more costly than an inspection.

Aircraft Air Conditioning System Concerns

by Jim Watson, DAR and pilot, Orillia, Ontario

Air conditioning (A/C) systems in older general aviation aircraft commonly use R12 as a refrigerant. Environmental concerns have caused the imminent prohibition of the use of R12. Newer A/C systems are designed to use R134, which is environmentally accepted. Older systems do not function correctly if R12 is replaced with R134. As the aviation use of refrigerant is a very small portion of the overall market, it is obvious that with R12 becoming unavailable, other products will be developed to fill the need for a replacement.

Effective refrigerants can be developed in a number of different ways. Some producers have developed refrigerants with a careful blending of specialized chemicals that perform similarly to R12. Other companies use a blend of primarily Propane and Butane as a refrigerant. This creates an opportunity for the sale of these hydrocarbon blends as cheap, unregulated, and potentially dangerous refrigerant replacements. Some suppliers go so far as to label these products as "R12 replacements," or use part numbers like R12a. If a replacement product doesn't have a 400 series number it may be one of these flammable products.

It is important to be aware of these products, and the possible effects of their use in an aircraft system. Firstly, hydrocarbons are very flammable (they are also used as fuel). R12 and other refrigerants are not flammable; some were actually used as propellants for fire extinguishers. So if a flammable refrigerant is installed in an aircraft, it creates a fire hazard where none previously existed. This hazard would exist both in the cabin of the aircraft, where the use of oxygen could make a fire much worse, and elsewhere in the structure of the aircraft where the leak of a flammable gas would be a hazard. Consider the effect of a fire in the leading edge of the wing where hoses carry refrigerant from the nacelle to the fuselage.

Another less obvious hazard also exists for those persons servicing these systems. Most A/C servicing equipment is not designed to handle flammable products. This introduces the risk of a fire or explosion of such equipment while servicing the aircraft. This *has* happened in the automotive industry. Special equipment is available to safely detect and remove hydrocarbon refrigerants from A/C systems.

The servicing of aircraft A/C systems is often subcontracted to people who do most of their work outside the aviation industry, and may not be familiar with aircraft. Aircraft maintenance engineers (AME) and approved maintenance organizations (AMO) supervising the maintenance of A/C systems may not be aware of the use of an R12 substitute, particularly if the packaging of the product says R12a, or "R12 drop in replacement."

We, in the aviation industry, are well aware of the requirement for design approval of products to be installed in an aircraft. This approval ensures that all of the safety and performance requirements of the aircraft have been met. This approval also ensures that the aircraft can be safely maintained, having no unexpected hazards.

Records of previous maintenance for an aircraft should indicate what refrigerant was last installed in the aircraft. It is possible, however, that the record of servicing with R12 could accidentally misrepresent a hydrocarbon actually being present, and maintainers should be aware of the possible hazard. A well-equipped A/C servicing facility should be able to detect and safely handle these products.

How would you spot the hydrocarbon product? The container will bear a flammable or explosive warning label (a red symbol). Approved refrigerants will bear warnings only as compressed gasses (a green symbol).

For everyone's safety, it is important that maintenance done to A/C systems employs only approved products. A Canadian supplemental type certificate (STC) has recently been issued for a non-flammable R12 replacement refrigerant, which requires no aircraft system changes. The availability of this approval, and the safe product economically make the use of unapproved substitutes not worth the risk to the aircraft crews, passengers and maintainers.

Exhaust System Failures: A Severe Flight Hazard

All aircraft systems deserve respect—especially the exhaust assembly. It is crucial to your engine's performance as it assists the intake stroke in admitting the proper air-fuel mixture by creating a partial vacuum in the combustion chamber when the burned gases exit. In addition, the exhaust system supplies the carburetor and cabin heat necessary for the comfort of passengers as well as preventing the formation of carburetor ice. Many two-stroke light aircraft engines depend on the specifically-designed, tuned exhaust system in order to ensure that it will give the rated power. As soon as any modification to the system occurs, the pilot will notice that the engine is not performing adequately. On four-stroke engines, a small exhaust crack will most likely fail to show a decrease in power but can wreak havoc in the engine compartment. What often gets the least attention during inspection? What is the last engine accessory reviewed during the aircraft inspection? You guessed it, the exhaust system. They are often taken for granted. Here are two tragedies that could have been prevented and you, AMEs, probably know of quite a few more.

A young instructor and a pilot friend had set out to practice touch and go on an early July evening. Both were in their mid-twenties and had a wonderful future ahead of them. They had performed two landings and had taken off again to perform another circuit when the flight service station (FSS) specialist called them on the radio to tell them that they were trailing smoke. At the same time they acknowledged the radio transmission, smoke started pouring into the Taylorcraft BC-12D cabin. They proceeded immediately to return for landing, but the cabin was quickly engulfed in flames. Control of the aircraft was lost, and soon after it fell to the ground. The investigation revealed that both pilots had suffocated and likely had died before reaching the ground. The cause was a failure of the exhaust system. The aircraft had been put through its annual inspection just a few hours before the crash but the engineer had failed to see the well-hidden crack that started at the exhaust pipe flange. Had the exhaust system been removed from the engine for inspection, it is very likely that the crack would have been seen and the soot marks around its opening would have been noticed.

In another case, two friends set out for their annual trout fishing trip in early summer. The aircraft was the revered Piper Super Cub and had received its annual inspection just days before. It was late Friday afternoon when they loaded all of their gear aboard the plane, filed the required flight notification (FLNOT) with the pilot's wife and took off for camping at their favorite fishing spot. Monday, when they failed to return, search and rescue (SAR) was notified and found the aircraft along its intended track in the woods. The aircraft seemed to simply have flown into the trees, as it had left a trail of broken branches on the forest rooftops before impact. The investigation revealed that both passengers had lost consciousness in flight and the aircraft continued until it gradually lost altitude and made contact with the top of the trees which slowed it down and it crashed. Unknowingly, both passengers had become intoxicated from carbon monoxide fumes expelled by a broken exhaust pipe. It had entered silently and surreptitiously contaminated the cabin. In both cases, the engineers who performed the annual inspections were very familiar with these specific aircraft and it is possible that some complacency may have allowed for the events to occur.

Aircraft and engine manufacturers, as well as Transport Canada and other Civil Aviation Authorities, insist that the exhaust system receive a very thorough inspection at least once a year. There are airworthiness directives (AD) such as CF-90-03R2 that give specific instructions on how to proceed in the inspection. This information is available on the Transport Canada Web site at www.tc.gc.ca/CivilAviation/certification/continuing/ad.htm. The Federal Aviation Administration (FAA) has numerous documents available online for inspecting exhaust systems. Take a look at www.faa.gov/fsdo/orl/files/advcir/AC91-59.TXT.

Exhaust system parts fail because of metal fatigue, corrosive environments, continuous stress at flange mating areas, vibrations, repeated cycles of heating and cooling, looseness of components and other factors such as material thickness, material compatibility, fabrication methods, etc. Tests performed on aircraft have shown that cracks may appear after between 100 and 200 hours of operation. One half of the failures noted were on the heat exchanger surfaces used for carburetor and cabin heat. Apart from cabin contamination, failure of the heat exchanger surfaces may allow for gases to be drawn into the induction system, causing overheating and power loss. Erosion and carbonizing of the surfaces are the primary causes of internal failure. Any lead pencil mark left on exhaust pipes or any exhaust system part is likely to lead to a premature crack, as the lead causes a heat concentration that degrades the base metal and weakens it through carbonizing. The efficiency of the engine and exhaust system depends on you; always give it your best.

17th Annual FAA/CAA/Transport Canada Symposium on the Safety Management in Aircraft Maintenance: The Integration of Human Factors Principles

Why attend a safety management symposium?

In 2003, the annual Federal Aviation Administration/Civil Aviation Authority/Transport Canada Safety Management in Aviation Maintenance Symposium focused on integrating Human Factors principles.

Everyone likes to feel that they have gotten their money's worth when they commit to the purchase of a new product. We get accustomed to purchasing things that we can handle with our hands and we find it difficult sometimes to see the benefits of a product that is of an intellectual nature, as it seems at first quite intangible, that is, hard to grasp with your hands. Safety Management System (SMS) conferences fall into this category, but from observing the smiles and gratitude of those who attended the last symposium in Toronto, the investment is very worthwhile.

A safety management symposium is a meeting place for people concerned about creating a safe working environment, saving money by increasing efficiency, retaining their well-trained employees, and assuring the highest benefits in the short and long term. It's also a place where you can meet experts on safety and get consultant information at a very cheap rate—and it's tax deductible. Such a symposium offers you the opportunity to get information on most up-to-date safety related programs and at the cheapest cost possible considering that world-renowned experts share with you the results of their research. These safety specialists are most happy to come as they can meet other researchers and get confirmation of the value of their work. They also come to get new ideas on safety systems, as aviation is a complex world in constant evolution. The participants and lecturers came from as far as Australia, Japan, China, Europe, the U.S. and Canada.

Here are some of the topics that were discussed: "The Role of Company Culture in Organizational Accidents and Incidents," Ronald Westrum Ph.D., Professor, East Michigan University; "Non-Punitive Discipline Policies: Building a "Just" Culture," David Max, Engineer; "Changing the Corporate Culture: Lessons Learned at Air Transat," Mike De Lollo; "Progressive Development of Safety Cultures: The Dupont Company Experience," Wayne Wilkes, Dupont Co.; "Establishing Effective Reporting Programs: A Cross-Cultural Comparison of Lessons Learned," Kevin Baines; "Assessing Safety Within Your Organization: Building a Safety Case Through Safety Auditing," Steve Smith; "Investigating Aviation Maintenance Incidents and Accidents: The Role of Aviation Safety Action Committees (ASAPs)," Alison Freyre; "Hazard Management in the Medical Profession: An Alternative Organization Model," Dr. Jan Davies; "Applying Data Driven Decision Making in Regulatory and Company Environment," Captain C. Drew, NASA; "Human Error Risk in Maintenance: Lessons from Confidential Incident Reports," A. Hobbs, Ph.D.; "Integrating Safety Management Principles into Manufacturing," John Holding, Bombardier; "Effective Documentation Techniques," Colin Drury, Ph.D.; "Enhancing Safety Through Quality Improvements: Air Canada's Six Sigma Experience," Ron Elvidge, V.P. Eng. Air Canada; "Data Sharing with Maintenance Error Decision Aid (MEDA)© Data in the United Kingdom," Mick Skinner, British Airways; "Implementing a Safety Management System in a High Risk Industry: Challenges and Triumphs," Jean Tierney, Sr. Advr. Via Rail; and last but not least, "Safety Management System: The Changing Role of the Regulator," Merlin Preuss, Director General, Civil Aviation, Transport Canada.

Each speaker graciously offered the fruit of their research and exchanged their views on numerous topics that affect the progress and the safety of the aviation industry today. Everyone present, at the lectures and discussion forums, was given the opportunity to take an active part in the debates and share their experience for the benefit of all. Various consultant firms were also on hand to share their commitment to safety. Airlines and aircraft manufacturers were present as sponsors to discuss aviation and business opportunities.

Plan to attend the next one, as you will find it to be very valuable, both economically and intellectually.

CASS 2004—The Future of Aviation Safety

The 16th annual Canadian Aviation Safety Seminar (CASS) will be held in the beautiful Sheraton Centre Toronto Hotel in Toronto, Ontario, April 19 to 21, 2004. CASS is an international event organized annually by Transport Canada for all sectors of the aviation community. The theme for CASS 2004 is "The Future of Aviation Safety" which calls for nothing less than gazing into the crystal ball to get a sense of the safety issues the industry and regulatory authorities will face between now and the end of the decade. For information on how to register, visit www.tc.gc.ca/CASS. Time for a little T.O.!