July 17, 2007

THRUSH AIRCRAFT INC.

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WING SPAR STATUS UPDATE

In light of the lack of action by the FAA in revising the wing spar Airworthiness Directive, most Thrush operators feel Thrush Aircraft, Inc. has been crying "wolf". Operators are confused about what they will really be required to do once the AD is issued. As a result, most have taken a "wait and see" attitude and are doing nothing.

The prevailing feeling seems to be that if there really was any danger, the FAA would have already issued the new AD. We are concerned that this idea that "all is well" is going to result in additional wing separations, with probable loss of life. All operators should read this letter immediately and make up their own minds about the reality of the danger.

At the very least, operators should modify their airplanes per the **attached** Service Letter:

SL-AG-110: IMMEDIATE WING SPAR IMPROVEMENT.

Please note that this Service Letter is applicable to Thrushes built by Rockwell and Ayres Corp., not Thrushes built by Thrush Aircraft, Inc. (2003 or later).

HISTORY OF THE WING SPAR PROBLEM

Metal fatigue is not a new phenomenon, but it wasn't an obvious problem for aircraft until the DeHaveland Comet disasters of the 1950s. Since then aircraft designers, manufacturers and the FAA have taken steps to address the problem. Today critical structural components of airplanes must be either fail safe, damage tolerant, or have an established safe life (life limit).

This wasn't the case when the Thrush was designed, to the old CAR 3 standards. They had to be designed to "resist" fatigue, but no proof was required. The original Thrush spar caps were similar in shape to the present ones, but were made of aluminum. This material was changed to steel in 1965 as a result of field problems, and at least one accident, due to lower spar cap fatigue.

Service Letter SL-AG-97 was issued in 1982, calling for inspection of the wing center section structure for fatigue cracks, as a result of field experience. Service Bulletin SB-AG-23 was issued in 1989 as follow-on to SL-AG-97, calling for inspection of the inboard main spar webs for fatigue cracks, to be repaired with a steel doubler if a crack extended between the spar cap flange and aft doublers. In 1992 Service Bulleting SB-AG-29 called for inspection of lower spar caps for corrosion, as corrosion pitting makes them more susceptible to fatigue cracking.

The Ayres Corporation analyzed the Thrush wing spars for fatigue life as early as 1982, and again in 1984 and 1986, but was evidently satisfied with the results, as no life limits were published. Of course none were required either.

In retrospect, we now know that fatigue really didn't become an issue until Ayres Corp. equipped the Thrush with a turboprop engine, giving it enough power to fly with loads it wasn't designed for. That opened the way for operators of R1340 powered Thrushes to install 750 hp turboprops in place of the 600 hp radial engines. Fatigue damage was then only a matter of time.

The first fatigue failure of a steel lower spar cap occurred in 1993, in Holland, and resulted in a fatality. The failed wing spar was recovered and carefully examined, and metal fatigue at the first (1/4") splice block hole clearly led to complete failure of the lower spar cap at that location. The airplane had only about 3,000 flight hours on it, which is a relatively young airplane. Dutch airworthiness authorities discovered, however, that the pilot had a habit of doing aerobatics with the airplane and otherwise flying it hard. With that finding, they basically dismissed the incident as an anomaly.

Based on the Dutch finding, the FAA saw no need for any further action either. Engineers at Ayres Corporation, however, were now keenly aware of the problem, and were on the lookout for a solution that didn't require redesigning the entire spar. Sometime in the early 1990s Paul Nichols, then Engineering Manager for Ayres, started investigating the Cold Expansion System from Fatigue Technology Inc. They had developed a means to quickly and easily expanding an undersize hole to the required diameter, leaving the metal around the hole pre-loaded in compression. Thus, when a load is applied to the hole, the compression is relieved before tension can be developed, so that the hole "sees" less tension than it actually experiences. Repetitive high tension loads are of course what eventually lead to fatigue cracking, so cold expanding holes increases their fatigue life.

Mr. Nichols was actively evaluating this technology in 1996 when another airplane lost a wing due to fatigue at the first splice block hole, again resulting in a fatality. On September 17, 1996, Ayres Corporation issued Service Bulletin SB-AG-39, calling for operators to periodically inspect the first two splice block holes of the lower spar caps for fatigue cracks. Operators then had the option of cold expanding these holes, if there were no cracks, to avoid repetitive inspections.

Because the second lower spar cap failure was almost identical to the Holland accident, the FAA rightfully determined that an Airworthiness Directive was necessary. AD 97-13-11 was issued in the summer of 1997, requiring that the first two splice block holes of lower spar caps be periodically inspected by eddy current, ultrasonic or magnetic particle inspection for fatigue cracks.

SB-AG-39 was revised (Rev. 1) 0n 12/12/1997 to amend the initial and repetitive inspection intervals to match the AD, and it also offered Custom Kit CK-AG-29 as a means of fixing holes with minor cracks. Cold expanding the holes, however, was no longer sufficient to avoid the repetitive inspections.

CK-AG-29 allowed operators to ream out the first two holes if that would clean up the crack, and then required them to cold expand the cleaned up holes. CK-AG-29 also allowed operators to replace their existing wing spar web center splice plate with an improved splice plate plus an additional lower splice plate. Earlier splice plates were "butterfly" shaped, with equal length "wings" top and bottom. Later ones were made of steel, but early ones were aluminum. The new CK-AG-29 splice system was all steel and the lower wings of the "butterfly" were longer than the upper wings. The new lower splice plate doubled the thickness of the "big butterfly" over 2/3 of the length of the lower "butterfly" wings.

Over the years since the first wing spar AD it has been amended several times, most recently by AD 2006-7-15, issued in April of 2006. This was an Immediate AD, allowing no comment period, as opposed to a routine AD, wherein is the rest of the story.

THE REST OF THE STORY

In January of 2006, the FAA set up a meeting with Thrush Aircraft, Inc. at the Thrush facility for February 7, 2006. The subject was to be wing spar AD 2003-07-01 and further action that was needed. FAA personnel from the Atlanta Aircraft Certification Office as well as from Kansas City attended.

The sense of urgency conveyed by the FAA during this meeting was almost palpable. Based on statistical analysis of lower spar cap crack data from the field by their experts, the FAA was proposing an Immediate Adopted Final Rule AD cutting the inspection intervals in half for the lower spar caps. The rationale behind this move was the assertion that 10% of lower spar cap inspections missed cracks. Crack growth curves showed that cracked lower spar caps might not last until the next scheduled inspection under AD 2003-07-01. At the time of this meeting the FAA asserted from their analysis that there were 265 older Thrushes flying with a 1 in 10 probability of already having a cracked lower spar cap. When inspected at the next interval, 26.5 thus would statistically have a bad inspection, meaning that, statistically, 2.65 airplanes would continue to fly with cracked lower spar caps. Thrush Aircraft, Inc. has subsequently learned of several such bad inspections, giving credence to the FAA's position. The outcome of a failed lower spar cap would most likely be wing separation and loss of life.

The FAA team went on to insist that Thrush Aircraft, Inc. had to come up with a "terminating action" for this Airworthiness Directive. That is, we were to design a fix for the lower spar caps that would make the AD go away. Please understand that Thrush Aircraft, Inc. acquired the assets of the Ayres Corporation out of bankruptcy, so we did not incur any liability for airplanes manufactured before us. As owners of the Thrush Type Certificate, Thrush Aircraft, Inc. is required to provide spare parts, but is not otherwise obligated to solve the problems of the old fleet.

Nonetheless, Thrush Aircraft, Inc. has from the beginning done the right thing and adopted the old fleet. Lots of people depend on this fleet for their income, and we feel it our duty to help them any way we can. It is also good business for us, as we want to maintain operator loyalty. Right or not, any cloud on the Thrush name reflects badly on Thrush Aircraft, Inc. Therefore, we went along with the FAA's demands.

For their part, the FAA proposed to issue an additional routine AD in the fall of 2006 establishing life limits for the lower spar caps of the subject airplanes, mandating that wing spars of airplanes over this limit be refurbished within a certain time period or be grounded.

The irony was that Thrush Aircraft, Inc. already had a terminating action for the AD. One of the last projects undertaken by Paul Nichols, Chief Engineer for Ayres Corporation, and a DER, was to design and certify a new lower spar cap. The wing with this new lower spar cap was static tested to 11,500# gross weight, and fatigue analysis showed its fatigue life to be 29,000 hours. From the very start of production, Thrush Aircraft, Inc. has only produced wings using this new lower spar cap.

While the best fix for the problem, and a terminating action, is a brand new set of 29,000 hour wings, this is beyond the financial capability of most operators. If operators can't afford the fix, then it isn't really a fix. Therefore, Thrush Aircraft, Inc.'s initial intended fix was to offer the new lower spar cap for retrofit in the field. Trial installations showed, however, that this fix was not really feasible. Because fatigued lower spar caps and fatigue cracked wing leading edge skins and ribs go hand-in-hand, it was Thrush's desire to replace the entire wing leading edge assembly with a new one, including a completely new spar with the new lower spar cap. It was soon realized, however, that this solution required breaking open the wing box and

compromising its structural rigidity. It became obvious that the only way to reliably retain the wing twist was to place the wing either in the Thrush production wing assembly jig, or in a very similar jig, while reassembling it.

Further investigation revealed that such a wing jig would cost in the neighborhood of half a million dollars (with a 6 month lead-time), and that six of them would be necessary to meet the FAA's 30 month time line to solve the problem, as stated at their February 7, 2006 meeting. Amortization of these jig costs over a reasonable number of kits meant that the cost again put the fix beyond many, if not most, operators. Thrush went back to the drawing board.

By June of 2006 Thrush Aircraft, Inc. was proposing a more affordable fix that could be accomplished by any A&P Mechanic with reasonable facilities. CK-AG-40, approved at the end of August, 2006, replaced both lower spar caps with new ones having the first two holes factory cold expanded per SB-AG-39, installed the "big butterfly" and lower splice plate of kit CK-AG-29 but with an improved fastener arrangement, and installed new all steel inboard spar web doublers. While it was realized that this would not constitute a terminating action, zero-timing the critical wing splice components along with both lower spar caps, at a price most operators could afford and which could be accomplished locally, was felt to be the best option available. Realistically, it was the only option that would get the fix into the hands of the operators reasonably quickly, since the FAA had stated that the new life-limiting AD would be issued in the fall of 2006. That would have given operators with airplanes already over their life limit the whole 2006 off-season to accomplish the fix.

But it never happened. Rather than the AD being issued as stated, the Airworthiness Concern Sheet didn't even get published until October 5, 2006. It is now 18 months after the FAA started the process without even an NPRM, let alone an AD. What happened to the urgent safety concerns expressed by the FAA at the February 7, 2006 meeting? Issuance of the AD this fall, giving operators already over their life limit at least 500 flight hours to comply (as the Airworthiness Concern Sheet proposed) means that most of them will fly another season before installing the fix. Few operators will install the fix until they have to; that is just human nature and the economic reality. Most operators will not get serious about fixing a potentially fatal problem until the off-season of 2008, or later. If the FAA statistics are anywhere close to correct, several airplanes will be flying around this spraying season and the next with undetected cracks in their lower spar caps.

With the reduced inspection intervals instituted by AD 2006-07-15, the time between inspections should not allow missed cracks to grow to failure. However, if one in ten of those missed cracks is missed a second time, as the FAA asserts will happen, the lower spar cap could very definitely fail. That is why Thrush Aircraft, Inc., in February of 2007, requested an Emergency AD requiring, at the minimum, installation of the "big butterfly" and lower splice plate, attached per CK-AG-40. The "big butterfly" is known to have prevented wing separation in a couple of instances, one being the subject of NAAREF PAASS program presentations recently. Certainly this would only be a stop-gap measure, but one that is fairly quick and inexpensive and could have been put in place prior to the 2007 spray season. Again, it never happened. Five months later nothing has happened.

Thrush Aircraft, Inc. has done everything in its power to solve this issue. The CK-AG-40 kit was even redesigned and tested to meet the fail safe criteria of FAR 23.572(a)(2), thinking this would be the terminating action the FAA wanted at a price operators could afford. Despite the fact that the new design passed the static test with flying colors, the FAA refused to grant fail safe status (replacement on-condition) without Thrush Aircraft, Inc. fatigue testing the new design, CK-AG-41. The regulation says the critical component must be either fail safe or have

an established safe life, but the FAA is requiring us to show both. Fatigue testing is not an inexpensive undertaking, especially on a wing that is no longer in production.

Thrush Aircraft, Inc. has gone to great expense not only to design and test these fixes, but to also establish the flow of parts and materials necessary to support the FAA's "impending" AD. The FAA's delay in issuing this AD and the amount of time allowed for compliance means that few operators are likely to purchase the kits prior to the 2008 off-season. If the material and parts pipeline is kept open, it would mean Thrush Aircraft, Inc. has to sit on considerable inventory, not used for current production, for a year or more. If we have to stop the flow of material for the kits, it will take 9 to 12 months to turn it back on, and it will not be turned back on until we have sufficient orders on the books to justify it. That could mean some operators will have to park their airplanes for a season.

Thrush Aircraft, Inc. management has from the start been dedicated to producing an airplane that is designed and certified for unrestricted flight at the weight that it will be flown at. Let's be honest. Most of the structural problems that agricultural application operators and SEAT operators have, whatever brand they fly, are due to overloading the airplanes. With a new Thrush, overloading is unnecessary because it is certified for unrestricted flight at realistic operating weights. Some will immediately point out that the 510 model is only certified to 6,000# gross weight. What they don't appreciate is the fact that the 510 fuselage, wings and empennage are structurally identical to that of the 550, which is certified for a 10,500# gross weight. The landing gear and engine are the only real differences.

WHAT WE KNOW ABOUT THE IMPENDING AD

Thrush Aircraft, Inc. is not privy to the details of the impending AD, in spite of considerable assistance to the FAA in supplying data for it. Nonetheless, from the Airworthiness Concern Sheet and close involvement in the process some things can be predicted with confidence.

- The NPRM will be issued this summer, so the AD will not be issued until this fall.
- Mandatory life limits for lower spar caps will be established by the FAA. The best estimate for these life limits is below.

Ayres Turbo Thrush

	Group 1 with a Radial Engine	Group 1 with a Turbine Engine	Group 2	Group 3 and Group 6
Replace spar caps at time in service	9,400 hours	6,200 hours	5,400 hours	28,800 hours

The fate of Group 4 & 5 airplanes is unclear. There were no cracks in these groups until early this year, when there were several of them. It appears, however, that these may have been the result of an Ayres manufacturing defect that did not involve all of the aircraft in these groups. We have no knowledge how the FAA might handle these aircraft.

- Recognizing that many Thrushes are already over these life limits, the FAA will allow those that are over the limit at least 500 flight hours to comply. With limited facilities available to accomplish this fix, and limited numbers of kits immediately available, the FAA will most likely require airplanes most severely over the limit be fixed first, and allow those less over the limit even more time to accomplish the fix.
- If CK-AG-41 is not specifically mentioned in the new AD as a fix, it will be an Alternate Means of Compliance (AMOC) for it.

- ✓ CK-AG-41 rebuilt wings will initially have service lives as listed above, based on what airplane group they are in.
- ✓ Initial inspection times and repetitive inspection intervals will be the same as the new AD, based on what airplane group they are in.

THRUSH AIRCRAFT's SUPPORT OF THE NEW AD

Thrush Aircraft, Inc. will do everything in its power to assist operators in getting kit CK-AG-41 installed properly. This is the most carefully researched and documented Custom Kit Thrush Aircraft, Inc. has ever put out. For your safety it must be installed correctly. All of the current Approved Thrush Service Centers can install kit CK-AG-41. In addition, Thrush will publish a list of other maintenance facilities that we determine are capable, having the necessary facilities, personnel and experience, of installing CK-AG-41. Kits installed at these approved service centers will be accepted as completely and properly installed because our QC department will monitor them. Operators who want to install CK-AG-41 themselves must have an IA on staff, and Thrush Aircraft, Inc. must inspect the installation prior to the wing leading edges being reinstalled.

Thrush Aircraft, Inc. will be keeping very close track of kits being installed properly. Once the kit is installed, we will support only those airplanes that we are satisfied were properly refurbished. We designed the kit to essentially zero-time your wings, not wing. Thrush Aircraft, Inc. will not sell individual kit parts to those who have not already installed the kit. We also reserve the right to not sell <u>any</u> parts for airplanes in which the kit was not properly and completely installed. Spar caps will only be sold in pairs, to operators who have previously installed the kit and whose safe life is nearly up. Operators have been installing individual spar caps for years, but this only takes care of one wing. You need two wings to fly safely. Operators need to stop thinking of wings individually and always consider them a matched set. We understand that there will be ground loops and trees that weren't supposed to be there, and will handle those instances case-by-case.

Orders are now being taken for Custom Kit CK-AG-41, on a first-come first-served basis. Operators should be aware that this leaves the potential open for profiteers to lock in some delivery positions and later demand a premium from other operators who did not get in line soon enough. Thrush Aircraft, Inc. has no control over that, except for laying these facts out in front of everyone and giving them all equal opportunity. Thrush Aircraft, Inc. is also taking orders for factory installation of CK-AG-41 kits, although we are currently limited to two airplanes a month. If more interest than that is shown, we can increase our capacity.

Thrush Aircraft, Inc. realizes that operators, especially in Group 2, are concerned about what they are getting for their money. We realize that agricultural and SEAT operators are in business to make a living, just like we are, and that Thrush operators are our lifeblood. It is therefore the intent of Thrush Aircraft, Inc. to gain a safe life beyond 5,400 hours for those airplanes. The goal is to reduce the hourly cost of CK-AG-41 to about 1% of the operator's hourly gross. The CK-AG-41 wing has a fatigue life significantly longer than 5,400 hours, but we have to prove that to the FAA. Thrush aircraft, Inc. will accomplish this before anyone exhausts their 2,000 hour initial inspection interval. An FAA accepted fatigue life will mean that the loathsome periodic NDI inspections of the lower spar cap's first two splice block holes will go away.

Operators should keep in mind, however, that a safe life established for a critical structural component such as a spar cap is only a statistical estimate, whether based on analysis or fatigue testing. No company can afford to fatigue tests 20 to 30 wings, as would be necessary to determine a safe life with certainty.

Let us say, for example, that we finally convince the FAA that CK-AG-41 refurbished wings have a safe life of 8,000 flight hours. What happens if we have a spar cap crack at 6,000 hours? Until we and the FAA can determine beyond a shadow of a doubt that it had such a short life for some reason other than classical metal fatigue, 6,000 hours becomes the new safe life. Real life always trumps the laboratory.

The advantage that Thrush Aircraft, Inc. has is that we have proven compliance of CK-AG-41 with FAR 23.572(a)(2) fail safe requirements. We tested the wing splice with the lower spar cap completely severed at the first splice block hole and it not only supported the required load, but exceeded it by 13% before failure. If we have to establish a safe life for CK-AG-41 by fatigue testing, that testing will be continued even after lower spar cap failure. If the fail safe butterfly and lower splice plate continue to hold the wings together for a significant amount of time past lower spar cap failure, then the FAA will have to grant CK-AG-41 refurbished wings fail safe status. This means that the lower spar caps only have to be replaced on condition. Operators that take care of their airplane, don't overload them and don't fly them harder than necessary, will probably never have to replace a lower spar cap again!

A LINGERING CONCERN

Thrush Aircraft, Inc. has been asked numerous times and in numerous ways about the cost of kit CK-AG-41, the implication being that we are taking advantage of the AD and gouging operators.

That is a valid concern, so permit us to point out a few things in this regard. First, by selling kits to refurbish the wing spars of Thrushes that we did not manufacture, Thrush Aircraft, Inc. is in fact picking up liability for those airplanes. That is a significant expense that has to be included in the cost of the kits.

Second, Thrush Aircraft, Inc. has incurred significant other expenses in developing CK-AG-41, such as R&D, design, fabrication and materials, testing, documentation, certification, and stocking. These expenses all have to be paid for eventually by selling kits. We are a relatively small company, and the majority of our engineering efforts over the past 15 months have been dedicated to this problem.

Third, Thrush Aircraft, Inc. has no way of knowing how many kits to amortize our expenses over. Because of aftermarket conversions, no one is really sure how many airplanes are candidates for the kit. We can only speculate as to how many operators will elect to refurbish their wings, rather than retire their airplane, or how long it will be before they decide to do so. If we assume we will sell more kits than we actually sell, we will not even recoup our expenses.

Finally, there is still a lot of work to be done to increase the safe life of the wings refurbished according to CK-AG-41. The possibility of having to fatigue test a wing that is no longer in production is a concern.

Thrush Aircraft, Inc. has done its level best to price the kits reasonably. We even went to the extent of selling direct to operators, to reduce their cost.

IS THE DANGER REAL?

Some people consider statistics a means of making the numbers say what you want them to say. Thrush Aircraft, Inc. does not believe that this is the case with the FAA's analysis. They have over 140 reported incidents of lower spar caps cracking at one of the first two splice block holes to work with. That is a statistically significant portion (about 7%) of the Thrush fleet. The FAA has no profit motive, and no ax to grind with Thrush Aircraft, Inc. or the operators.

The only caveat is that the FAA has classified all reported cracks at the first two splice block holes as classical fatigue cracks, while Thrush Aircraft, Inc. does not. Classical fatigue cracks start at shear boundaries within the material because of many cycles of stressing the shear boundaries at the grain or molecular level. Once a fatigue crack starts, the stress at the tip of the crack is intensified, and it grows microscopically with every additional stress cycle. The rate of crack growth increases as the size of the crack increases. Eventually the remaining material is insufficient to support the load, and the member snaps.

Fatigue cracks will also start at a stress riser, rather than randomly, if there is one present. A stress riser is simply a scratch, nick or pit in the surface of the material. The stress concentration around the sharp vertex of the scratch, nick or pit is the same mechanism that leads a minute classical fatigue crack to start to grow. The stress riser is already there, however, so the crack will start growing much earlier than if it had to wait for a crack to start at the microscopic level. There are a number of instances where a spar cap has failed at little more than a thousand hours, just as there are a number of airplanes out there that have flown well past the FAA life limits with no problems.

Statistically these instances are known as “outliers”, and normally such anomalies are excluded from the data set. It is not known whether or not they were excluded by the FAA. The point is that because they failed so much quicker than the “norm”, they must have had some help; i.e. a stress riser. Where do stress risers come from? One possibility is inclusions or voids in the raw material. No piece of metal is perfect at the microscopic level. If the machining process uncovers an inclusion or void at the surface, that constitutes a stress riser. Of course if it is big enough to be seen with the naked eye, the factory rejects or reworks the part to remove the stress riser.

Another possible source of a stress riser is the assembly process, either at the factory or at the maintenance facility. Any time a tool contacts the part with force it can create a stress riser. A nick in a drill bit point can cause a scratch in a hole. Having to force a bolt through a hole means there is a very good chance that a scratch will result. At the factory these things are inspected for and corrected when found. How well stress risers are avoided, inspected for and corrected in the field is entirely dependent on the mechanic’s skill and his working environment. It would be Pollyanna to think that there are no mechanics who take short-cuts.

The final variable that the FAA could not take into account is the manner in which the airplane is operated. It is a simple reality that some pilots fly their airplanes harder than others, some operators overload them more than others, and some airplanes operate off airstrips that are rougher than others. These factors mean that the lower spar caps are subjected to higher and more frequent loads than the norm. That will cause them to “age” faster than average, and fail from fatigue earlier, even if there are no stress risers present.

Thrush Aircraft, Inc. did not ask for this impending AD, but we believe the FAA statistics that show that there are airplanes flying around with lower spar caps already cracked. We also know that there are airplanes flying around with stress risers that came from the Ayres factory or were subsequently introduced during maintenance. Every time your lower spar caps are inspected, the bolts have to be removed and reinstalled. Are they a tight fit? Were they “encouraged” back through the hole?

Whether they be classical fatigue cracks or from stress risers, Thrush Aircraft, Inc. is convinced that there are several Thrushes flying that already have cracks. These cracks can start out as small as .005” deep. NDI inspection methods can detect cracks no smaller than .030” deep. Crack growth data shows that it takes about 700 flight hours of normal operation for a crack to

grow from .005" to failure. Thrush Aircraft, Inc. is deeply concerned that several such cracks already exist and are accidents waiting to happen.

This concern is first for the pilot and his family, since a broken lower spar cap will likely lead to a wing separation and a fatality. Thrush operators, however, must consider the probable outcome of such an accident. One can only speculate, but it is a pretty sure bet that the FAA will ground the whole Ayres Turbo Thrush fleet, require another NDI inspection, and only allow those airplanes that are over their wing spar life limit to fly again after their wings have been refurbished. The whole fleet will be grounded for several weeks, and several hundred airplanes could be grounded until their wing spars are refurbished.

WHAT CAN THE OPERATOR AND PILOT DO?

Faced with this reality, what can the pilot and/or operator do to minimize the risk? **Don't have a complacent attitude!** The danger is real, but by being aware and alert, it can be minimized. Some steps that can be taken follow:

- Inspect and maintain the airplane scrupulously. Don't cut corners or put necessary maintenance off.
- Accomplish the wing spar splice improvement described in SL-AG-110 immediately.
- Be sure your lower spar caps are inspected on schedule, by a competent shop, and that the wings are put back together without creating any stress risers.
- Do a very careful visual inspection of the center wing structure at every 100 hour inspection, paying special attention to the lower spar caps around the first two splice block holes. This area should be cleaned thoroughly and inspected using a 10 power magnifier.
- Be aware of the danger of stress risers on fatigue prone surfaces. Avoid them as much as possible, always inspect for them, and replace or repair parts when they are found. Do Not drive fasteners through the spar cap holes!
- Take it easy on your equipment. Those heavy loads and hard turns may get you a few more bucks a day, but is it really worth it?
- Keep your airstrip smooth. A significant portion of fatigue damage comes from taxing, taking off and landing.
- Be aware of the warning signals of a wing spar problem: unusual sounds coming from the wing center section area, excessive flexing of a wing, or unusual handling qualities. Land immediately if you hear, see or feel one of these warning signals. Thoroughly inspect the wing center section before further flight.
- Refurbish your wings with Custom Kit CK-AG-41 as soon as the life limit is reached.
- Contact Thrush Aircraft, Inc. if you have any questions, comments or concerns.

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Assuming that you have at least 500 more hours to comply with the AD, even if your wings are already over their life limit, it is very tempting to fly another season before doing anything about it. But remember that statistics is a science of probabilities. The life limits are set such that more than 99% of lower spar caps will last the established life limit. But there is a very small percent that won't last that long, especially in light of possible stress risers and/or rough operation. Are you willing to bet your life that you are probably one of the lucky 99? Then too, if your lower spar caps are already over the established life limit, all bets are off. You are flying on borrowed time.

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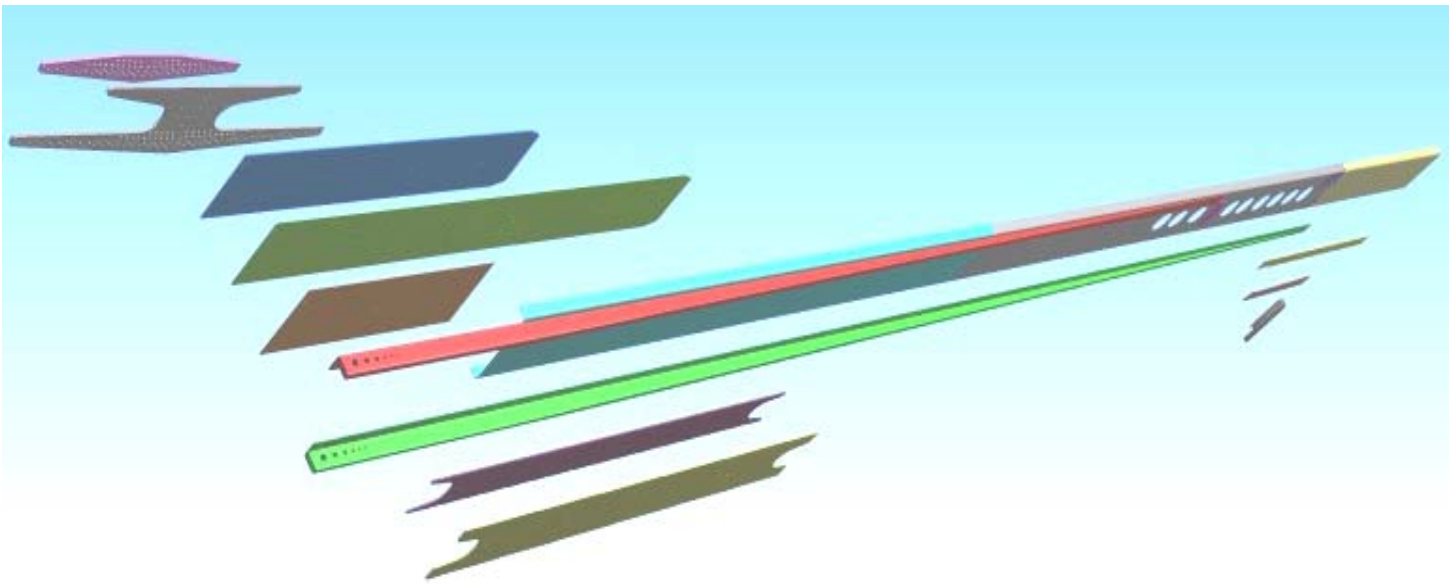
SERVICE LETTER

No. SL-AG-110

Date: 7/17/07

IMMEDIATE WING SPAR IMPROVEMENT



REASON FOR THIS PUBLICATION:

This Service Letter is intended to provide operators with a quick and inexpensive way to improve their lower wing spar splice, thereby increasing their safety.

Thrush Aircraft, Inc. is concerned that operators feel that there is no real danger of wing spar failure because the FAA is taking so long revising and issuing the wing spar AD, as discussed in their Airworthiness Concern Sheet of October 5, 2006.

Nothing could be farther from the truth. The FAA itself has statistical data that says there are at this very moment Thrushes flying with cracked spar caps. They reduced the inspection interval last year because crack growth data showed that a cracked spar cap may not last the old inspection interval. The FAA also believes that 10% of the inspections miss an existing crack either because it is too small or the inspection is not done properly. Thrush Aircraft knows of several instances of bad inspections. What this means is that even with shortened inspection intervals, some lower spar cap cracks will go undetected and could fail before a second inspection is due.

Please note that this modification does not make your wing spars fail safe, nor is it a substitute for replacing cracked lower spar caps. It does, however, improve the ability of the "big butterfly" to pick up the lower spar cap tension load in the event it does fail at one of the first two splice block holes. Analysis shows that in this event, the "big butterfly" modified per this Service Letter will keep the wing on in normal 1g flight, but will not withstand much maneuvering. Thus it is necessary for all pilots to be on the alert for any unusual noises coming from the wing center section area, any unusual flexing of a wing, or any unusual handling qualities. If any of these occur, level out and land immediately! Before the next flight, inspect the wing center section structure, especially the lower spar caps around the first two splice block holes. If these "warning signals" are caused by a cracked lower spar cap, the crack will be visible, especially when significant up-force is applied at the wing tip.

MODELS AFFECTED

Aircraft affected by this Service Information Letter are those that are subject to AD 2006-07-15. That is:

MODEL	SERIAL NUMBERS	GROUP
(1) S2R	5000R through 5100R, except 5010R, 5031R, 5038R, 5047R and 5085R	1
(2) S2R-G1	G1-101 through G1-106	1
(3) S2R-R1820	R1820-001 through R1820-035	1
(4) S2R-T15	T15-001 through T15-033	1
(5) S2R-T34	6000R through 6049R, T34-001 through T34-143, T34-145, T34-147 through T34-167, T34-171, T34-180 and T34-181	1
(6) S2R-G10	G10-101 through G10-136, G10-138, G10-140 and G10-141	2
(7) S2R-G5	G5-101 through G5-105	2
(8) S2R-G6	G6-101 through G6-147	2
(9) S2RHG-T65	T65-002 through T65-018	2
(10) S2R-R1820	R1820-036	2
(11) S2R-T34	T34-144, T34-146, T34-168, T34-169, T34-172 through T34-179, T34-189 through T34-232 and T34-234	2
(12) S2R-T45	T45-001 through T45-014	2
(13) S2R-T65	T65-001 through T65-018	2
(14) 600 S2D	All serial numbers 600-1311D and up	3
(15) S2R	1380R, 1416R through 2592R, 3000R and 3002R	3
(16) S2R-R1340	R1340-001 through R1340-035	3
(17) S2R-R3S	R3S-001 through R3S-011	3
(18) S2R-T11	T11-001 through T11-005	3
(19) S2R-G1	G1-107, G1-108 and G1-109	4
(20) S2R-G10	G10-137, G10-139 and G10-142	4
(21) S2R-T34	T34-225, T34-236, T34-237 and T34-238	4
(22) S2R-G1	G1-110 through G1-115	5
(23) S2R-G10	G10-143 through G10-165	5
(24) S2R-G6	G6-148 through G6-155	5
(25) S2RHG-T34	T34HG-102	5
(26) S2R-T15	T15-034 through T15-040	5
(27) S2R-T34	T34-239 through T34-270	5
(28) S2R-T45	T45-015	5
(29) S2R	5010R, 5031R, 5038R, 5047R and 5085R	6

NOTE:
Any Thrush that has had the powerplant or hopper size modified from that with which it was originally delivered is potentially subject to AD 2006-07-15. Check with the FAA for clarification.

COMPLIANCE

Compliance is recommended at the earliest opportunity, but no later than within 100 flight hours.

BY WHOM THE WORK MUST BE ACCOMPLISHED

An FAA licensed airframe or A&P mechanic, or foreign equivalent.

APPROVAL

This Service Letter is authorized by Thrush Aircraft, Inc. The FAA has made no findings with respect to this Service Letter. The technical content of this Service Letter, however, is the same as for the wing splice installation of CK-AG-40, which is an FAA approved Alternative Means of Compliance (AMOC) for AD 2006-07-15.

PROCEDURE

Because the "big butterfly" has proven in a couple of instances to be able to hold a wing with a broken lower spar cap together, Thrush Aircraft, Inc. recommends that all Thrushes have it installed per CK-AG-29. We know that most operators have installed the "big butterfly", but every Thrush flying should have it.

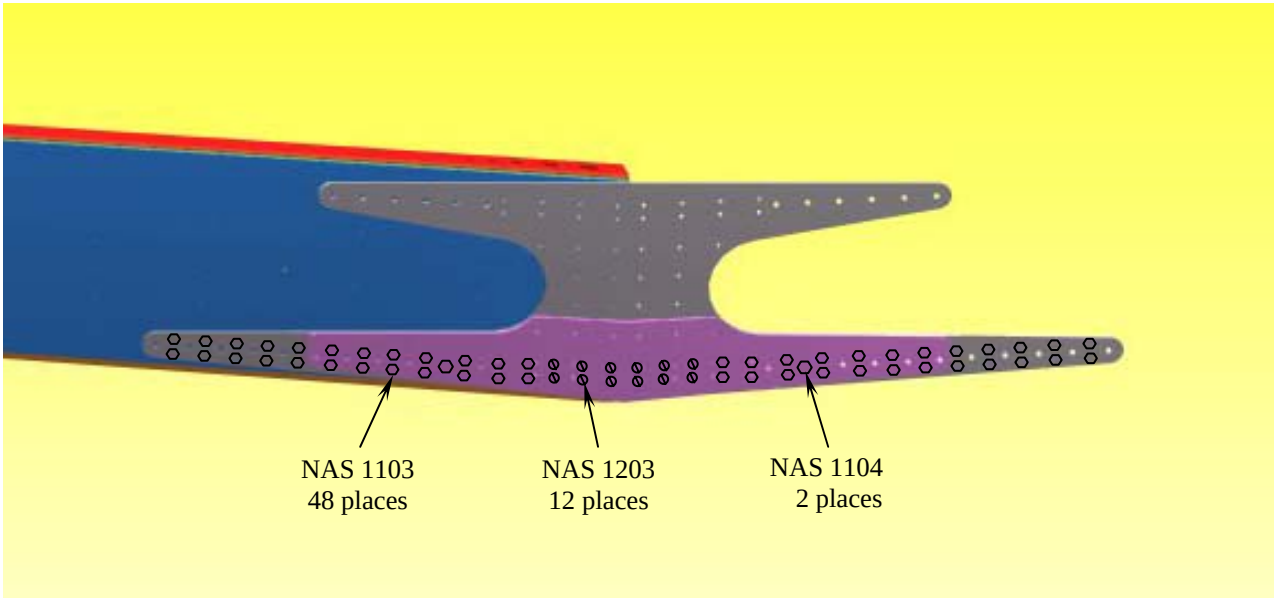
Not only that, but the big butterfly should have all the fasteners installed per CK-AG-40. CK-AG-40 is an FAA Approved Means of Compliance with AD 2006-07-15. New "big butterfly" installers should simply follow the directions of CK-AG-29 Rev. 1. Operators who already have the "big butterfly" installed should proceed as follows:

Reinforcing the Spar Web Splice Plates

The "big butterfly" and lower splice plate (P/N 20211-9 and 20211-11) were originally attached to the lower spar cap with a single row of ¼" fasteners through the lower spar cap web and spar web doublers. There are additional #10 fasteners under the "big butterfly" that only attach the lower spar cap web to the spar web and doublers. These should be extended through the "big butterfly" and lower splice plate.

- Park the airplane where it is protected from wind gusts and gain access to the wing center section by removing belly access panels. Operators may want to take advantage of this time to have their periodic NDI inspection per the AD, if they are close to their next inspection.
- If desired, for easier access, the wings may be detached from the wing attach angles on both sides of the fuselage and slid forward, after a shim is placed between the lower spar caps and the fuselage frame lower longerons.
- Trace around the lower "wings" of the "big butterfly" onto the aft face of the spar web, for visual reference. Remove the "big butterfly" and lower splice plate from the aft face of the wing spar.
- Remove both lower splice blocks to gain access to the lower spar cap flange fasteners behind them.
- Remove the rows of #10 fasteners through the lower spar cap flange above and below the row of ¼' fasteners that was holding the "big butterfly" on, if they are inside the outline of "big butterfly". Fasteners that would have an edge distance less than .29" should not be removed.
- Replace the "big butterfly" on the back of the spar web temporarily, using a few fasteners.

- Using the holes where #10 fasteners were just removed as drill guides, drill these two rows of holes through the "big butterfly" (some may already be through, depending on model).
- Drill out the #10 holes at WS 7.41 to ¼" diameter for an NAS 1104 bolt on each side as shown in the figure below.
- Remove the "big butterfly" and attach the lower splice plate onto the back of it in the proper position.
- Using the new holes in the "big butterfly" as drill guides, drill the two rows of #10 holes and two ¼' holes through the lower splice plate.
- Deburr all the freshly drilled holes in the "big butterfly" and lower splice plate.
- Reinstall the "big butterfly" and lower splice plate with new fasteners the same as removed, except through the lower spar cap flange. There, use NAS 1103 bolts of appropriate length in the new #10 holes, or NAS 1203 bolts where countersunk. Secure with MS21042-3 nuts and AN960-10 washers on the aft side, torqued to 25 to 30 inch pounds.
- Install the two new NAS 1104 bolts with MS21042-4 nuts and AN960-416 washers on the aft side, torqued to 80 to 100 inch pounds.
- Reinstall the lower splice blocks and fasteners per the maintenance manual.
- It is recommended that the joints where the "big butterfly" and lower splice plate meet the aft spar web be sealed with fuel tank sealant or a high quality silicone sealer, to keep corrosive chemicals out.



Additional Fasteners through Big Butterfly and Lower Splice Plate

- Make an entry in the aircraft log book that the center wing splice installation has been modified per Thrush Aircraft, Inc. Service Letter SL-AG-110.

WEIGHT AND BALANCE

No change.

NOTE

Additional copies of this Service Letter may be downloaded from the Thrush Aircraft, Inc. website, www.thrushaircraft.com