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Federal Aviation Administration
Central Region
Office of the Regional Counsel
Attention: Rules Dockets No. 2002-CE-05-AD and 2002-CE-57-AD
901 Locust, Room 506
Kansas City, Missouri 64106

Via FEDEX signature required and e-mail

Gentlemen:

The Cessna Pilots Association (CPA) had previously requested a 180 day extension on the comment period (copy attached) to allow for further research. Having not heard whether this or any other extension has been approved, this organization submits these comments. Should our requested extension be granted CPA will file additional comments that will have the benefit of additional research.

The Cessna Pilots Association (CPA) is an organization that represents and provides technical information to its more than 12,000 members, almost all of whom own Cessna aircraft. CPA's membership includes nearly 1,000 owners of Cessna 300- and 400-series twins, approximately 25% of whom would be directly affected by the Airworthiness Directives proposed in the FAA's Notices of Proposed Rulemaking 2002-CE-05-AD and 2002-CE-57-AD published May 15, 2003, and many more of whom would be affected by the related follow-on rulemaking activities affecting additional Cessna 300- and 400-series models that we have been told the FAA intends to pursue over the next 24 months.

The Association is submitting this single comment in duplicate to both dockets 2002-CE-05-AD and 2002-CE-57-AD because both NPRMs address the same basic issues, share similar implementation problems, and require similar revisions in our view. Furthermore, the Association feels strongly that these two NPRMs, together with not-yet-published proposed ADs affecting additional Cessna 300- and 400-series models, need to be consolidated into a single rulemaking action in order to accurately reflect the economic impact of this proposed rulemaking on small business entities.

Before getting into the technical discussion of the issues involved in these NPRMs it should be pointed out that there appear to be clerical errors in the NPRMs as published. In NPRM 2002-

CE-05-AD in paragraph (d) of the proposed AD on chart item (2) it reads “Inspect and modify at whichever of the following that occurs FIRST”. CPA believes that it was the intend of the FAA to have that sentence read “whichever of the following that occurs LATER”\

In NPRM 2002-CE-57-AD in paragraph (d) chart item (1) under affected aircraft the 402C is included. As all of these aircraft have the later style spar system in common with the 414A beginning with serial number 414A0201, the 402C aircraft and their serial number range should be listed under chart item (2).

In the nearly two years since the FAA issued its original Airworthiness Concern Sheets about Cessna 400-series wing spar fatigue cracks, CPA has been researching the engineering, maintenance and safety aspects of the wing spar fatigue issues in these aircraft. CPA acknowledges that there has been one fatigue-related accident and perhaps a half-dozen non-accident-related lower spar cap fatigue cracks in high-time Cessna 402-series aircraft used in high-cycle air carrier operations, and this Association strongly supports the safety goals of the FAA in addressing this problem before it results in accidents.

However, CPA’s research has convinced us that in drafting the above-referenced NPRMs, the FAA has greatly underestimated the extraordinary difficulty involved in modifying the affected aircraft, the serious risk to safety-of-flight if the spar-strap modification is installed improperly, the length of time that will be required to modify the fleet (given the severe limitations of the available maintenance infrastructure), and the potential for crippling economic impact on the small businesses who own and operate almost all of these aircraft.

Furthermore, CPA believes that the evidence indicates only a small subset of the Cessna 400-series fleet is actually at any demonstrable risk of wing spar fatigue failure, and that the FAA’s broad-brush proposed AD that mandates costly major structural modifications to the entire fleet is simply not justified.

Based on our research findings, CPA has concluded that substantial revisions are necessary to these proposed ADs in order to ensure that the inspections and modifications can be accomplished competently within the mandated compliance times, and to avoid prolonged grounding and needless loss-of-use of these aircraft. Our specific findings and recommendations are detailed in the remainder of this document.

* * *

Finding: The spar-strap modification mandated by these proposed ADs is extraordinarily difficult to install. The procedure is poorly documented, the learning curve is steep, a significant investment in special tooling and fixtures is required, and the potential for damaging the wing spar, wing attach fittings, and/or strap is great. At present, very few maintenance facilities are competent to perform this modification—and if performed by less-than-competent hands the modification is very likely to do more harm than good.

At the time of this writing, the maintenance facilities that have had any actual hands-on experience installing the Cessna spar strap service kits can be counted on the fingers of one hand

(with some fingers left over). An important aspect of CPA's research effort was to identify those shops and visit or interview their mechanics and maintenance managers to find out what real-world experiences they have had performing these alterations. What these folks told CPA was quite disconcerting.

By all accounts, Cessna's spar-strap procedures are technically challenging, poorly documented, and generally felt "not ready for prime time" by the mechanics that have actually performed the procedure in the field. The learning curve is very steep. Doing the job properly requires a significant investment in special jigs and fixtures. Even more disturbing, these folks repeatedly talked about how easy it is to make an error while installing the modification, and the tremendous potential for damaging the spar cap, wing attach fittings and spar strap in the course of the procedure. Every mechanic we talked to emphasized that this modification is definitely not something that the average A&P mechanic or general aviation repair facility would be competent to tackle.

St. Cloud Aviation: To the best of our knowledge, the first SK402-46 field installation (for the tip-tank 402 models) was performed by St. Cloud Aviation in St. Cloud, Minnesota on a 402B in the winter 2001-2002. CPA's technical representative Tom Carr spoke with one of the mechanics who worked at St. Cloud Aviation at the time and was involved with the kit installation. He told Tom that during the installation of SK402-46 they were on the phone about 60 hours with Cessna to obtain guidance on how to perform the procedure and clear up confusion with some of the drawings. They were not able to do the kit installation in the time allotted in the bulletin.

Hyannis Air Service Inc. (DBA Cape Air): Hyannis Air Service Inc. of Hyannis, Massachusetts, is the world's largest operator of Cessna 402C aircraft, operating a fleet of 50 of these aircraft in air-carrier service as Cape Air and Nantucket Airlines. Each of these aircraft averages approximately 1,000 flight hours per year. Hyannis Air Service is also an authorized Cessna Service Center. Not surprisingly, Hyannis Air Service has more experience installing the SK402-47 (for the wet-wing 402C models) than any other shop. CPA's twin Cessna specialist spent a full day visiting the company's maintenance facility at Hyannis on May 31, 2003, at which time they were just completing their fourth SK402-47 installation.

Cape Air's experience was similar to St. Cloud's. James S. Goddard, the company's Vice President of Maintenance, told CPA that he assigned his four most experienced sheet-metal mechanics to work full-time on performing the wing spar inspections and spar strap modifications on the Cape Air fleet. These maintenance personnel found themselves calling Cessna on a daily basis—sometimes several times a day—for guidance and consultation. The MEB02-5 procedures require special jigs to support the wings and fuselage in a zero-load condition while the inspections and structural modifications are being accomplished. The mechanics wound up trying several different methods of supporting the aircraft before they finally arrived at a workable scheme.

Goddard told CPA that despite their extensive experience doing structural repairs on 402C aircraft, the mechanics found the modification to be extremely challenging. During the course of modifying the first four 402C aircraft, they wound up ruining a \$1,000+ wing attach fitting and

several spar straps. Although the mechanics had the professionalism and courage to “fess up” to these mistakes, Goddard expressed a genuine concern that if the modifications were performed by a smaller and less financially robust firm, it would be easy to imagine such mistakes going unreported and damaged wing spar components could easily wind up being returned to service, very possibly rendering the wing spar more vulnerable to fatigue failure rather than less. CPA shares Mr. Goddard’s concern.

Apparently CPA was not the first to visit the Cape Air facility to learn more about the 402C spar strap modification. Goddard told CPA that a number of other 402C operators had visited to watch the modifications in-process and learn what they could before attempting to modify their own aircraft. According to Goddard, all the operators who made such a visit concluded, after seeing what was involved, that they would not try to tackle the spar strap installation in their own facilities, and that the better part of valor would try to find a shop (like Cape Air) that already has gone through the learning curve (with all the expense and trauma that it seems to entail).

Recomendation: If the FAA is going to issue Airworthiness Directives that mandate the installation of spar straps on these aircraft, CPA believes that the FAA must take steps to ensure that the airframe alterations are performed only by maintenance facilities and personnel with the competence, equipment, experience and special training to ensure that the job is done properly.

One approach would be for the FAA to designate specific Repair Stations with special authorization to perform the mandated inspections and modifications. To receive the FAA’s designation, the Repair Station would have to demonstrate to the FAA that it has the necessary jigs and fixtures, and that its maintenance personnel have the necessary competence, experience, and special training in the procedures involved. CPA would further recommend that, as a condition of designation, each designated Repair Station be required to perform an initial procedure for each type of airplane (tip-tank and wet-wing) under the direct supervision of an appropriate FAA inspector.

At the present time, CPA is aware of only two maintenance facilities in the U.S. that possess the requisite capabilities and experience to do this work properly in addition to having performed the actions required by the NPRMs on more than one aircraft: Hyannis Air Service Inc. (DBA Cape Air) at Barnstable Municipal Airport in Hyannis, Massachusetts, and Yingling Aviation at Mid-Continent Airport in Wichita, Kansas. Clearly, these two shops alone do not have the combined capacity to get the job done, and Hyannis Air Service’s capacity is fully committed for the next several years just to get the Cape Air fleet modified.

There is one other facility that has done one aircraft, however personnel changes at the facility will limit their abilities in this area from the near future.

CPA has also identified eight other maintenance facilities that have sufficient experience with heavy airframe repairs on Cessna 400-series aircraft that they will be viable candidates for FAA designation to perform spar-strap installations. We suspect, however, that not all of these firms are large enough to be interested in undertaking such work

without unacceptable impact on their core business of annual inspections and routine maintenance. In the final analysis, therefore, CPA estimates that the number of maintenance facilities competent, equipped and willing to perform these alterations will start out at two firms and eventually grow to perhaps six or eight firms. It is unlikely that the number of facilities performing these inspections and modifications in any significant number will increase much beyond this number. It is also clear that it will take some time for this estimated number of shops to get through the learning curve, earn their FAA designation, and begin modifying airplanes on a regular basis.

An alternative approach would be for the FAA to work with Cessna Aircraft Company to designate certain Cessna Multiengine Service Centers that have demonstrated the competence, equipment, experience and special training required, and to have Cessna supervise the initial procedures at each designated Service Center. Note, however, that this approach could reduce the number of facilities approved to perform the spar-strap installations, since some of the facilities identified by CPA as potential candidates to do this work are not Cessna Multiengine Service Centers.

The FAA's safety mandate demands that the agency must not permit these technically difficult, high-risk major alterations to critical wing structure be carried out by facilities that are not competent to do them properly. CPA believes that this is almost certainly what would occur should the FAA issue the Airworthiness Directives as currently proposed.

* * *

Finding: The U.S. aircraft registry lists 1,420 aircraft that would be affected by NPRMs 2002-CE-05-AD and 2002-CE-57-AD. Of this total, CPA estimates that more than 700 aircraft exceed the time-in-service limits specified by the NPRMs, so would be affected immediately on the effective date of the Final Rules. CPA estimates that it will require approximately eight (8) years to accomplish the mandated inspections and alterations of these aircraft, given the real-world limitations of the maintenance infrastructure and parts availability. CPA is forced to conclude that the FAA's proposed compliance-time limits of 200 hours or 12 months (2002-CE-05-AD) and 500 hours or 12 months (2002-CE-57-AD) are impossibly inadequate. Imposing such limits would result in grounding hundreds of aircraft for years, with horrendous consequences to the owners and operators of these aircraft.

To calculate how much time it will take to accomplish these inspections and modifications, CPA took four factors into consideration:

1. the number of aircraft that exceed the FAA's specified TIS limits;
2. the number of maintenance facilities competent to perform the work;
3. the rate at which these facilities can complete the work; and

4. the availability of the requisite parts from Cessna Aircraft Co.

Here is CPA's analysis of each of these factors.

Number of aircraft affected: In August, 2003, a search of the U.S. aircraft registry lists 1,420 aircraft that would be affected by NPRMs 2002-CE-05-AD and 2002-CE-57-AD, as follows:

- 2002-CE-05-AD—total of 764 aircraft:
 - 167 Cessna 411 and 411A
 - 87 Cessna 401
 - 75 Cessna 401A
 - 52 Cessna 401B
 - 52 Cessna 402
 - 51 Cessna 402A
 - 280 Cessna 402B
- 2002-CE-57-AD—total of 656 aircraft:
 - 216 Cessna 402C
 - 440 Cessna 414A

CPA is unaware of any reliable information concerning the time-in-service of these aircraft. However, our best information is that most 402-series aircraft (used primarily in airline service) exceed the time-in-service limits specified by the NPRMs, whereas only a small fraction of non-402-series aircraft (used primarily for business and personal transportation) exceed those TIS limits.

CPA's best estimate of the number of aircraft that exceed the TIS limits is 90% of the 599 402-series aircraft plus 20% of the 821 non-402-series aircraft, or a total of 703 aircraft. While this is admittedly only an estimate, CPA believes it is a plausible and conservative one.

Number of qualified maintenance facilities: As previously discussed, CPA is aware of only two maintenance facilities in the U.S. that possess the requisite capabilities and experience to do the mandated inspections and alterations competently and have performed these alterations on more than one aircraft. (Hyannis Air Service and Yingling Aviation).

CPA has further identified eight other maintenance facilities that have sufficient experience with heavy airframe repairs on Cessna 400-series aircraft that they will be viable candidates for FAA designation to perform the work, but we suspect that not all of these firms are large enough to be

able to take on such work. Those that are still would need to acquire the necessary fixtures and go through a steep learning curve, and CPA also believes they should be required to pass muster with the FAA.

For purposes of estimating realistic compliance times, CPA uses the following assumptions: Two qualified facilities will exist at the time of publication of the Final Rules, and two additional facilities will become qualified each six months thereafter until a total of eight qualified facilities has been reached (18 months after Final Rule publication).

Rate of completion for each facility: At the time of this writing, CPA knows of only two U.S. maintenance facilities (Hyannis Air Service and Yingling) that have performed the spar-strap modification on multiple aircraft. Yingling has done three aircraft as part of a kit proofing project for the Cessna factory. The experience of Hyannis Air Service to date is more instructive because it is not kit proofing and is real world environment.

When CPA visited the Hyannis Air Service facility on May 31, 2003, the firm had just completed its fourth 402C spar-strap modification. The company had assigned four sheet-metal mechanics to work full-time on these modifications, and the firm's VP of Maintenance, James S. Goddard projected at the time that his firm would be able to complete the NDI inspections per MEB02-5 and install the SK402-47 spar strap modification at the rate of two aircraft per month. However, when CPA followed up with Hyannis Air three months later (in late August), we learned that they had only completed one additional aircraft (#5) and were still weeks away from finishing another (#6). According to Goddard, the firm had run into unforeseen complications while doing the work on aircraft #5 and #6, necessitating partial replacement of a lower spar cap on #5 and cold-working of fastener holes (per Cessna engineering order) on #6. By the time #6 is finished, Hyannis Air's actual completion rate will be six aircraft in six calendar months, or an average of one aircraft per month.

CPA feels that the experience of Hyannis Air Service to date is probably representative of what any shop that performs this work can expect. While work on many aircraft will go smoothly and uneventfully, some aircraft will prove problematic and will require other time-consuming maintenance or repairs before installation of the spar strap can be completed. Consequently, CPA believes that a projected completion rate of one aircraft per month (assuming four full-time mechanics) is about as high as can be reasonably expected. Furthermore, CPA does not believe that any of the facilities it has identified would be in the position to assign more than four full-time mechanics to this activity.

Overall completion rate:

Based on these assumptions, CPA projects an overall completion rate as follows:

Time after publication	Number of qualified facilities	Monthly completion rate per facility	Number of months in period	Number of aircraft completed in period	Cumulative number of aircraft completed
Months 1-6	2	1	6	12	12
Months 7-12	4	1	6	24	36
Months 13-18	6	1	6	36	72
Months 19-24	8	1	6	48	120
Year 3	8	1	12	96	216
Year 4	8	1	12	96	312
Year 5	8	1	12	96	408
Year 6	8	1	12	96	504
Year 7	8	1	12	96	600
Year 8	8	1	12	96	696

Thus, CPA estimates that it would take slightly more than 8 years to complete the estimated 703 aircraft that presently exceed the TIS limits set forth in NPRMs 2002-CE-05-AD and 2002-CE-57-AD.

The preceding analysis assumes that the affected aircraft that exceed the TIS limits are modified in no particular order. For the sake of completeness, CPA has also considered the case where a subset of the affected aircraft are most likely to run into complications (i.e., wind up needing spar repairs prior to installation of the spar strap) are somehow identified, and these “problem aircraft” are modified first. (We offer suggestions about how these “problem aircraft” might be identified later in this letter.) Based on the to-date experience of Hyannis Air Service (i.e., two “problem aircraft” among the first six 402C aircraft inspected and modified), CPA projects that one-third of the estimated 703 aircraft that exceed the TIS limits will turn out to be “problem aircraft.” CPA further assumes (again based on the Hyannis Air Service experience) that these “problem aircraft” can only be completed at an average rate of one aircraft every two months, but that the “non-problem aircraft” can be completed at an average rate of two aircraft per month. Here is a projection based on this alternate model:

*Cessna Pilots Association Comments On Proposed Cessna 400-Series Wing Spar ADs
(Dockets 2002-CE-05-AD and 2002-CE-27-AD)*

Time after publication	Number of qualified facilities	Monthly completion rate per facility	Number of months in period	Number of aircraft completed in period	Cumulative number of aircraft completed
Months 1-6	2	.5	6	6	6
Months 7-12	4	.5	6	12	18
Months 13-18	6	.5	6	18	30
Months 19-24	8	.5	6	24	54
Year 3	8	.5	12	48	102
Year 4	8	.5	12	48	150
Year 5	8	.5	12	48	198
Year 6	8	2	12	192	390
Year 7	8	2	12	192	582
Year 8	8	2	12	192	774

This projection indicates that if it were possible to identify the “problem aircraft” and modify them first, the result would be a modest reduction in total calendar time to bring the entire fleet into compliance (from about 8 years to about 7.5 years). More importantly, however, this approach would result in the earliest possible modification of those aircraft most likely to experience wing spar fatigue cracking.

Another consideration that must play into the time line compliance is the simple fact that additional maintenance discrepancies are going to be found on the aircraft going through the spar strap installation. While this condition cannot be figured into the cost for the AD compliance numbers, it will have to be considered in the compliance time line computations. Once the aircraft is jacked, put in a no load on the wing bolts condition, and opened up, any additional repairs that are needed will have to be accomplished at that time. Those additional repairs will probably take away some of the labor force that was previously dedicated to the service kit installation. With only so many hours in a day, any aircraft requiring substantial repairs could tie up a facilities workspace, equipment and workforce thereby adding considerably to the fleet compliance timeline.

Parts availability: CPA has looked into the availability of the necessary spar-strap service kits from Cessna to support the modification program. As this letter is being written, Cessna has only eight SK402-46 kits (for tip-tank models) and two SK402-47 kits (for wet-wing models) in stock. According to Steve Charles, director of propeller aircraft product support at Cessna Aircraft

Company, additional kits are on order and Charles does not anticipate any problem producing enough kits to meet CPA's projected completion timetable. CPA is inclined to agree that the "throughput" of competent maintenance facilities, not the availability of parts, will probably be the limiting factor that dictates how rapidly the fleet can be modified.

Recommendation: : If the FAA is going to issue Airworthiness Directives that mandate the installation of spar straps on these aircraft, CPA believes that the FAA must substantially increase the permissible compliance times proposed in NPRMs 2002-CE-05-AD and 2002-CE-57-AD in order to provide sufficient time for the work to be accomplished, given the real-world constraints of the existing maintenance infrastructure.

Using relatively optimistic assumptions about the number of maintenance facilities that will be available to perform this work and the completion rate that these facilities can expect to achieve, CPA calculates that it will require approximately eight (8) years from the date of AD publication to bring the fleet into compliance.

Recommendation: Because it will take so many years to modify all these aircraft, CPA suggests that the FAA give serious consideration to structuring the compliance requirements in a fashion that attempts to identify the aircraft most likely to be at a higher risk of spar cap fatigue cracks, and causes those "problem aircraft" to be modified first.

For reasons detailed later in this letter, CPA's analysis suggests that factors that distinguish high-risk airplanes from the rest of the fleet include (1) a history of damage and major repairs to the wing and/or main landing gear, and (2) prolonged use in high-cycle low-altitude operations (such as commercial sightseeing flights) that subject the airframe to unusual exposure to turbulence.

* * *

Finding: The Airworthiness Directives proposed in NPRMs 2002-CE-05-AD and 2002-CE-57-AD are unjustified because no unsafe condition has been shown to exist.

CPA has reviewed all the available evidence cited by the FAA as justification for its proposed rulemaking action. This evidence includes:

- One in-flight wing-separation accident involving a Cessna 402C (N819BW).
- Six non-accident 400-series aircraft reported by Cessna Aircraft Co. to have suffered fatigue fractures of a lower wing spar cap.
- Engineering studies performed by Cessna Aircraft Co. under contract to the FAA, the results of which are documented in "DOT/FAA/AR-98/66, Supplemental Inspection Document Development Program for the Cessna Model 402."

- Cessna's request to the FAA for new ADs to supersede existing Airworthiness Directives 79-10-15R2 and 2000-23-01 that mandate repetitive NDI inspection for fatigue cracks.

CPA does not believe that any of this evidence demonstrates the need for installing spar-strap modifications as the FAA proposes to mandate. To the contrary, CPA feels that the evidence strongly indicates that the existing inspection procedures required in AD79-10-15 and AD2000-23-01 have been doing an excellent job of detecting wing spar fatigue problems before they can result in accidents.

In-flight wing-separation accident: There has been only one accident of a Cessna 400-series aircraft attributable to wing spar fatigue. This accident occurred on 27 April 1999 and involved a Cessna 402C registered as N819BW. According to the NTSB factual report on this accident (FTW99FA123):

- In-flight separation of the right wing was caused by a fatigue crack of the main wing spar just inboard of the right engine nacelle. The fatigue crack originated at an area of mechanical damage and deep machining marks that NTSB investigators determined to have occurred during the original manufacture of the aircraft by Cessna Aircraft Company.
- In 1981, 18 years prior to the wing separation, the aircraft sustained substantial damage that caused the right main landing gear to separate from the aircraft. This landing accident undoubtedly caused the right stub wing to undergo stresses far beyond what it was designed to withstand.
- During the eight-year period prior to the wing separation accident (1991 to 1999), maintenance records for the aircraft document a long series of skin cracks, working rivets and other structural anomalies in the vicinity of the right stub wing, wheel well and landing gear. The aircraft was literally crying out that something was wrong with its wing structure in this area, but nothing was done beyond cosmetic repairs.

Thus, CPA is forced to conclude that the wing separation of N819BW was an atypical case that in no way suggests an unsafe condition exists in the rest of the Cessna 400-series fleet.

Six non-accident spar cap fractures: According to Beth Gamble of Cessna Aircraft Co., Cessna is aware of six other 400-series aircraft that were found to have wing spar cap fatigue fractures:

1. 1967 402 s/n 402-0046 (N3246Q)
2. 1967 402 s/n 402-0101 (not in FAA registry)
3. 1968 402 s/n 402-0216 (not in FAA registry)
4. 1968 402 s/n 402-0295 (not in FAA registry)
5. 1969 402A s/n 402A0043 (N170SA, previously N24DA, N4543Q)

6. 1969 402A s/n 402A0080 (N39BW, previously N450Q)

In early August, CPA submitted a Freedom of Information Act (FOIA) request to the FAA asking for all available information on the operational and maintenance history of these six aircraft. At the same time, CPA made a written request of the FAA to extend the public comment period for NPRMs 2002-CE-05-AD and 2002-CE-57-AD in order to provide sufficient time for the FAA to respond and furnish the requested information on these six aircraft and for CPA to evaluate it. At the time of this writing, however, CPA has received no response from the FAA to either of its requests.

In the absence of more complete information on these six reported cases of wing spar cap fractures, CPA offers the following observations:

- All six aircraft cited by Cessna as having wing spar cap fractures are tip-tank 402 and 402A models. CPA is not aware of any documented spar cap fatigue failures in any wet-wing models, any pressurized models, or indeed in any non-402 models.
- Three of the six serial numbers cited by Cessna do not appear in the FAA registry, suggesting that they may have been retired and “parted out.” Did Cessna obtain the wings of these aircraft from a salvage yard? Were these aircraft involved in accidents? Without the data requested by CPA under FOIA, it is impossible to determine the significance of these reports.
- All three aircraft that do appear in the FAA registry were operated in high-cycle low-altitude sightseeing operations that would have subjected the wings to far more turbulence than normal. Aircraft #1 (s/n 402-0046) was operated by Air Maui and used in sightseeing operations over the Hawaiian Islands. Aircraft #5 (s/n 402A0043) and #6 (s/n 402A0080) were both operated by Air Las Vegas and used in sightseeing operations over the Grand Canyon.
- FAA records for aircraft #1 (s/n 402-0046) reveal Form 337s documenting left landing gear trunion replacement and left wing repair (26 Feb 1969), left wing rib replacement at station 57.5 (7 Apr 1975), and installation of SK414-8E to repair wing rib cracks in the main landing gear side brace attachment areas (4 Mar 1981). Clearly the left wing of this aircraft was abused when it was only about two years old, and had obvious longstanding structural problems for years thereafter.
- FAA records for aircraft #5 (s/n 402A0043) reveal Form 337s documenting right wing rib replacement (20 Jul 1985) and wing spar repairs to both wings at stations 65.99 and 75.25 (30 Jan 1991). Once again, it is clear that the wings on this aircraft were subject to abnormal abuse.
- CPA has attempted to obtain FAA records for aircraft #6 (s/n 402A0080), but as of this writing has been unable to locate any Form 337s for this aircraft.

CPA notes that both of the tip-tank 402-series aircraft for which Form 337 information is available, as well as the 402C wing-separation aircraft discussed earlier, all sustained wing damage early-on. If the facts were known about the other four aircraft cited by Cessna (three of which are not in the FAA registry and the fourth of which seems to have a limited Form 337 file), the evidence would likely show that the only Cessna 400-series aircraft in which spar cap fractures have been found, are ones with a history of major wing and/or main landing gear repairs. If this is so, then requiring spar-strap modifications of the entire fleet is clearly not justified.

CPA acknowledges that this remains something of a conjecture, since CPA has so far been unable to obtain any information whatsoever on the operational or maintenance history of four of the six aircraft cited by Cessna. However, this conjecture is strongly supported by the FAA-supported studies by Dr. Dale Cope at the Aging Aircraft Laboratory at Wichita State University's National Institute of Aviation Research (NIAR). Earlier this year, Dr. Cope and his students performed a complete rivet-by-rivet disassembly inspection of a Cessna 402 (tip-tank) airframe with 20,000 hours in commercial air service (three times the 6,500 TIS threshold at which the FAA proposes to require the spar strap modification), and found absolutely no evidence of fatigue cracking in the lower wing spar caps. Clearly, fatigue cracking is not inevitable even in extremely high-time aircraft such as this one.

Common sense dictates that there must be some common factor that distinguishes the small number of airplanes that develop fatigue cracks from the vast majority that do not. The NIAR study and the overall accident-free history of the fleet make it clear that total time in service is not the critical factor. CPA's analysis of the data (albeit limited by the FAA's lack of response to CPA's FOIA request) suggests that the factors that distinguish high-risk airplanes from the rest of the fleet may very likely be (1) a history of damage and major repairs to the wing and/or main landing gear, and/or (2) prolonged use in high-cycle low-altitude operations (such as commercial sightseeing flights) that subject the airframe to unusual exposure to turbulence.

CPA further notes that the reported wing spar fatigue cracks reported in the six 402-series aircraft reported by Cessna were obviously found using existing inspection methods, and did not result in wing separation or any other sort of accident. In CPA's view, this strongly suggests that the wings of these aircraft are empirically fail-safe.

Cessna's FAA-funded SID study: Engineering studies performed by Cessna Aircraft Co. under contract to the FAA, the results of which are documented in "DOT/FAA/AR-98/66, Supplemental Inspection Document Development Program for the Cessna Model 402," seem to confirm the fail-safe nature of the 400-series wing structure. Paragraph 3.5.2 of that report states:

Fail-safe tests were conducted to determine the fail-safe characteristics of the Model 402C wing and empennage. The results show compliance with the fail-safe requirements of FAR 23.572. The fail-safe test results demonstrate that catastrophic failure or excessive deformation which could adversely affect the aircraft flight characteristics will

not occur after fatigue failure or obvious partial failure of a single principal structural element.

The report goes on to document an extensive fatigue test that Cessna performed on a 421C wing obtained from a salvage yard, which the report states is similar in design to a 402C wing but with a less substantial lower spar cap. In that test, Cessna put the 421C wing through 80,000 hours of simulated flight loads before tiny fatigue cracks (on the order of .05” in length) could be detected in the lower spar cap.

Cessna’s request for new ADs: NPRMs 2002-CE-05-AD and 2002-CE-57-AD both state that the FAA’s proposed rulemaking action was prompted by a request from Cessna Aircraft Co., who determined that existing surface-eddy-current NDI inspection methods could not reliably detect a crack in the lower spar cap until it is .03” longer than the critical crack length. The NPRMs continue on to say:

When the crack reaches the critical length, it is not reliably detectable because it is under the head of a fastener. Once the main spar cap is severed, the remaining structure will no longer meet the residual strength requirements. Wing separation could then occur under significantly less than those established by the design limit load.

In CPA’s view there are several major flaws in the FAA’s use of this analysis to justify the proposed ADs that would mandate costly modifications to more than 1,400 aircraft:

- There appears to be no evidence that lower spar cap cracks are actually occurring in any significant number of Cessna 400-series aircraft, or that any cracks that do occur will grow to critical length in the course of any reasonably postulated aircraft service life. Even if such cracks were to occur and were to grow to critical length, actual experience and Cessna’s engineering study both indicate that the wing will not fail. The sole fatigue-related wing-separation was clearly an aberration, involving an airplane with a defectively manufactured wing spar. The six other cases of spar cap fracture cited by Cessna appear to involve aircraft of dubious heritage—three do not appear in the FAA’s aircraft registry at all, two have a documented history of prior wing and landing gear damage, and the last seems to have no history data on file.
- In the absence of a demonstrated history of fatigue-related accidents or incidents, the FAA cannot properly use Cessna’s engineering analysis to justify requiring the spar-strap modification to these aircraft. To quote DOT/FAA/AR-98/66, these aircraft were “designed and certified prior to the advent of Federal Aviation Regulations which require the aircraft structure to be substantiated fail safe and/or meet certain damage tolerance requirements.” In fact, these airframes appear to indeed meet the fail-safe requirements of FAR 23.572 (although they are not required to do so), but even if they did not, CPA can find no basis for the FAA to retroactively impose damage tolerance requirements on aircraft that were certificated under regulations that imposed no such requirements.

Bottom line: CPA feels that these proposed ADs cannot be justified by any tangible evidence.

Recommendation: CPA strongly urges the FAA to withdraw NPRMs 2002-CE-05-AD and 2002-CE-57-AD because no unsafe condition has been shown to exist.

Recommendation: If the FAA is unwilling to withdraw NPRMs 2002-CE-05-AD and 2002-CE-57-AD altogether, CPA strongly urges the FAA to limit the scope of these proposed ADs strictly to the tip-tank Cessna 402 and 402A models in commercial service for which there is at least some documented history of wing spar cap cracks being found.

CPA feels that pressurized models (414 and 421-series) and models with significantly lower maximum gross weights (all 300-series aircraft) should be excluded, since there is no tangible evidence whatsoever that any of these models are vulnerable to wing spar cap fatigue failures, and convincing evidence that they are not.

Recommendation: CPA suggests that the FAA examine the operational and maintenance history of the six tip-tank Cessna 402 aircraft that Cessna has identified as having experienced actual lower spar cap fatigue failures.

If the history of these six aircraft supports it, the FAA should consider issuing a proposed AD affecting only tip-tank Cessna 402 aircraft and only those with (1) a history of damage and major repair to the wing and/or main landing gear, or (2) prolonged use in high-cycle low-altitude operations (such as commercial sightseeing flights) that subject the airframe to unusual exposure to turbulence.

* * *

Finding: The FAA's cost impact calculations in NPRMs 2002-CE-05-AD and 2002-CE-57-AD significantly understate the actual cost impact on owners/operators. Furthermore, the cost impact calculations for these two NPRMs must be consolidated with those for several nearly identical follow-on NPRMs that the FAA has advised CPA will soon be forthcoming. CPA takes the position that all of these proposed rulemaking actions, when taken together, will unquestionably have "a significant negative impact on a substantial number of small entities" under the provisions of the Regulatory Flexibility Act of 1980 (5 USC 601-612).

Although the two NPRMs cited above affect only certain 400-series Cessna models, the FAA has made it clear to CPA that additional, substantially identical rulemaking actions are "in the works" and can be expected to affect virtually all remaining Cessna 300- and 400-series models. CPA has been told that these remaining NPRMs can be expected "within the next two years."

The combined cost impact of these substantially identical Airworthiness Directives will unquestionably be the largest of any such rulemaking action ever taken by the FAA against piston-powered Cessna aircraft, and very possibly the greatest of any action against any small piston aircraft. CPA finds it entirely improper for the FAA to disguise the staggering cost impact of this rulemaking action by employing a "divide and conquer" strategy, publishing a string of separate but substantially identical NPRMs in order to partition the total cost impact into many smaller pieces that are easier for the FAA to declare as not having "a significant negative impact

on a substantial number of small entities” under the provisions of the RFA. In CPA’s view, to do so clearly circumvents the intent of Congress.

CPA also finds that the FAA’s estimates of cost impact contained in NPRMs 2002-CE-05-AD and 2002-CE-57-AD significantly understate the actual cost impact on owners/operators:

- The FAA’s calculations assume an hourly labor rate of \$60 per hour. In CPA’s experience, actual shop rates are considerably higher (\$75 to \$90 per hour), especially in major metropolitan areas and near the east and west coasts of the U.S. CPA believes that \$75 per hour represents a more realistic average shop rate nationwide.
- The FAA’s calculations do not take loss-of-use into account. CPA projects that compliance with the proposed ADs will result in loss-of-use between two weeks (absolute best case scenario for getting the aircraft back in service) and two months (worst case scenario for getting the aircraft back in service). While insurance normally compensates an owner/operator for loss-of-use that results from an accident or incident, there is typically no compensation if the loss-of-use results from an AD. The cost impact of loss-of-use is normally calculated as the cost of renting or leasing a substitute aircraft during the period the original aircraft is down for repair. In this case, the cost could vary quite widely, from less than \$2,000 for a low-utilization owner-flown aircraft that is down for only two weeks to \$50,000 for a high-utilization Part 135 operational aircraft that is down for two months getting the service kit installed. In CPA’s view, a reasonable average allowance for loss-of-use might be \$6,000 per aircraft.

Recalculating the cost impact taking these changes into account yields the following:

- 2002-CE-05-AD:
 - Labor hours: 485 hours labor cost: 485 hours X \$75 per hour = \$36,375 per airplane
 - Parts cost: The kit price listed in the NPRM was \$1,763 per airplane. As of September, 2003, the SK411-59 for the 411 and 411A models has a list price of \$1,178, while the SK402-46 for the 401 and non-402C models has a list price of \$3,712,
 - Loss-of-use allowance: \$6,000 per airplane
 - Total cost per airplane for the 411,411A models: $\$36,375 + \$1,178 + \$6,000 = \$43,553$
 - Total cost for 411, 411A models, with 167 aircraft on FAA current registration and assuming no more than 10% of the fleet has already been modified with one of the prior SK strap kits: $151 \times \$43,553 = \$6,576,503$

- Total cost per airplane for the 401 and non-402C models: $\$36,375 + \$3,712 + 6,000 = \$46,087$
- Total cost for the 401 and non-402C models with 597 aircraft on FAA current registration and assuming no more than 10% of the fleet has already been modified with one of the prior SK strap kits: $537 \times \$46,087 = \$24,748,719$
- Total cost on U.S. operators for 2002-CE-05-AD: $\$6,576,503 + \$24,748,719 =$
 $\$31,325,222$

The cost impact total cost on U.S. operators listed in 2002-CE-05-AD was only **$\$12,345,200$** .

- 2002-CE-57-AD

- Labor hours: 485 hours labor cost: $485 \text{ hours} \times \$75 \text{ per hour} = \$36,375$ per airplane
- Parts cost: The kit price listed in the NPRM was 14,000 per airplane. As of September, 2003, the SK402-47 kit plus the other required to be purchased parts listed in MEB02-5 totals to be \$12,112.
- Loss-of-use allowance: \$6,000 per airplane
- Total cost per airplane: $\$36,375 + \$12,112 + \$6,000 = \$54,487$
- Total cost for the 402C and 414A models with 656 aircraft on FAA current registration and as of this date CPA is only aware of 5 aircraft that have been modified: $651 \times \$54,487 =$
 $\$35,471,037$

CPA finds that the combined cost impact of these two NPRMs is approximately \$66,796,259. Should the FAA issue substantially identical ADs against the remaining Cessna 400-series piston and turbine twins that Cessna already has service bulletins and service kits issued against (414, 421, 421A, 421B and 425 models, another 1198 aircraft) which as CPA understands the FAA intends to do, the total cost impact could easily approach \$125 million and will most assuredly exceed that number when the 624 US registered 421C models are added to the compliance list.

Using the same analogy of “common wing design”, when bulletins, kits and an AD are issued for the 300 series Cessnas models:

- Labor hours: 485 hours labor cost: $485 \text{ hours} \times \$75 \text{ per hour} = \$36,375$ per airplane
- Parts cost: The kit price, \$2000 is a conservative estimate for the kit

- Loss-of-use allowance: \$2,000 per airplane, down from \$6,000 since there are not as many commercial operators using the 300 series models as compared to the 400 series aircraft
- Total cost per airplane: $\$36,375 + \$2,000 + \$2,000 = \$40,375$
- Total projected cost for just the 2244 US registered 340, 340A, 335, T310P, T310Q, T310R, 310Q and 310R aircraft: $2244 \times \$40,375 = \$90,601,500$.

This estimate does not include the 1912 other 310 models or the 328 320 models with the “common wing design” that are currently on the US registration that surely would have to be affected as well. CPA feels the total cost effect to the Cessna 300-400 fleet should this “common wing design” fatigue fault thought process be enacted, to be well over \$250,000,000.

Recommendation: The FAA should revise its cost impact estimates to account for, realistic hourly labor rates, current parts prices and a reasonable allowance for loss-of-use.

Recommendation: The FAA should consolidate these two NPRMs and all anticipated substantially identical NPRMs against Cessna 300- and 400-series aircraft into a single rulemaking action, so that the total cost impact is fairly stated.

Recommendation: The FAA should rescind its declaration that the proposed action will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act of 1980. The FAA should prepare an initial regulatory flexibility analysis, publish it in the Federal Register, and transmit a copy to the Chief Counsel for Advocacy of the Small Business Administration, as required by 5 USC Section 603. The initial regulatory flexibility analysis must contain “a description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.” In CPA’s view, this requires that the FAA fully explore all repetitive NDI inspection alternatives to the proposed spar strap modifications.

* * *

Finding: If the FAA issues the proposed Airworthiness Directives for the reasons it has stated in NPRMs 2002-CE-05-AD and 2002-CE-57-AD (i.e., failure to meet damage tolerance criteria due to shortcomings of current surface eddy-current NDI methods) and in the face of a complete absence of tangible evidence that an unsafe condition exists in the affected fleet, the agency will be setting a disastrous and devastating precedent. Such action would be a radical departure from longstanding FAA rulemaking policy, and could ultimately lead to grounding of a vast portion of the general aviation fleet.

Almost all Cessna 300- and 400-series piston aircraft were certified under CAR 3, and were not required to demonstrate fail-safe design or to meet any specific damage tolerance criteria. The

FAA's longstanding policy is that a certificated aircraft is "grandfathered" under the certification rules that existed when its type certificate was originally issued, and not required to meet current certification standards. Because FAA certification regulations have historically been a rapidly moving target, this "grandfathering" policy has been absolutely essential to preserve the viability of the certificated aircraft fleet. Without this policy, owners/operators of certificated aircraft would have no assurance of not suddenly finding their aircraft de-certificated (and therefore grounded) simply because the FAA amended its certification regulations (as it does frequently) and their aircraft suddenly failed to meet the latest requirements.

The Cessna 300- and 400-series fleet has chalked up an admirable safety record over more than three decades. There appears to be absolutely no tangible evidence that lower spar cap fatigue cracks are rendering these aircraft unsafe. There has only been a single fatigue-related accident, and the NTSB report makes it clear that this accident was a one-of-a-kind aberration, involving an aircraft whose wing spar was defective when it left the Cessna factory, was then subjected to extraordinary stresses in a landing accident that tore the main landing gear off the aircraft, after which the wing spar continued to hold together for 18 years of intensive commercial service before finally failing in-flight. The other six airplanes reported by Cessna to have experienced lower spar cap fatigue fractures involve aircraft of dubious heritage, three of which are not listed in the U.S. aircraft registry (and could very well have been salvage yard wrecks), two of which have a documented history of wing and landing gear damage, and one of which seems to have no history at all (at least that we could find). In addition to a history devoid of fatigue-related accidents and incidents, the recent rivet-by-rivet disassembly inspection of a 30-year-old tip-tank Cessna 402 by NIAR revealed a squeaky-clean wing spar despite 20,000 hours of hard commercial service.

So why is the FAA proposing to issue ADs that will require owners of these demonstrably safe aircraft to spend approximately \$45,000 to \$55,000 depending on the model to beef up their wing structure? According to the FAA's own explanation in the NPRMs, the reason is that (1) the FAA paid Cessna to study the fatigue characteristics of 400-series wings to determine if they met the fail-safe or damage-tolerance requirements of FAR Part 23 (which as CAR 3 aircraft they were never required to meet); (2) Cessna actually determined that the wing structure actually meets the fail-safe criteria of FAR 23.572 (which it was never required to meet); but then (3) Cessna subsequently determined that surface eddy current NDI inspections could not detect spar cap cracks reliably enough to meet the damage tolerance criteria of FAR 23 (which was never a requirement for these aircraft, and in any case should be irrelevant since the structure was declared to be fail-safe).

If the FAA goes through with this proposed rulemaking, it will be effectively forcing a large fleet of CAR 3 aircraft with a virtually blemish-free history to comply with FAR 23 fatigue requirements. If this is permitted to go unchallenged, then every other CAR 3 aircraft in the fleet is at risk of being grounded or forced to undergo major alterations simply because they do not meet the latest and greatest FAR 23 certification standards. What's to prevent the FAA from deciding that all single-engine Cessnas must be fitted with anti-siphon fuel filler ports, or that all Beech Bonanzas must be retrofitted with 26g seats?

Recommendation: The FAA should withdraw this ill-conceived rulemaking proposal.

* * *

The Cessna Pilots Association has a long history of working cooperatively and constructively with the FAA to solve safety problems in Cessna aircraft, and to do so in ways that meet the FAA's safety mandate while at the same time minimizing the burden on the Cessna owners and operators that constitute its membership.

Five years ago, for example, CPA worked closely with the FAA's Wichita Aircraft Certification Office and with the FAA's Small Airplane Directorate in Kansas City to craft a workable solution to a serious safety problem related to exhaust system failures in turbocharged Cessna 300- and 400-series piston twins that resulted in the issuance of AD 2000-01-16, which replaced AD 75-23-08R5. In this case, there was a clear and present danger to safety, with some 30 exhaust-related fatalities in a 30-month period. CPA assumed a leadership role in this effort, and the result was hailed as a resounding success by the FAA and the owners/operators alike. The proof is in the pudding: there have been no exhaust-related accidents in turbocharged twin Cessnas during the past five years.

When CPA first became aware of the FAA's concern about Cessna 400-series wing spar fatigue (following the 1999 wing-separation accident and the FAA's first ACS on the subject), we fully expected that our involvement would be similar to what it was in the case of the twin Cessna exhaust problem. But the more we looked at the evidence, the more we were forced to conclude that this was nothing at all like the exhaust problem. No reasonable person could deny that there was a serious safety problem with twin Cessna exhaust systems—airplanes were catching on fire and people were dying—and the only real question was how best to fix the problem, and to do it quickly before anyone else got hurt.

But the Cessna 400-series wing spar fatigue issue looks to us to be quite different, because this time the FAA's concerns seem to be based on purely theoretical considerations that have no apparent basis in field experience. CPA would like nothing more than to help the FAA find a constructive solution to the 400-series wing spar fatigue problem—except that the closer we look, the more we become convinced that there's really no problem to be solved here. These aircraft have chalked up an admirable safety record over more than three decades. Unless and until that safety record takes a turn for the worse, CPA has no alternative than to oppose these proposed ADs (and the substantially identical ones affecting other twin Cessna models that we are told are in the pipeline), and to ask the FAA to withdraw them.

Taken all together, this entire rulemaking initiative threatens to cost aircraft owners something on the order of \$250 million, and to provide no tangible safety benefit (since we've been unable to find a shred of evidence that any tangible safety problem exists with these aircraft). CPA feels that this initiative is ill conceived, and will set a disastrous precedent for the rest of the general aviation fleet that was certificated under CAR 3 (including the vast majority of single-engine Cessnas).

Respectfully Submitted,
CESSNA PILOTS ASSOCIATION

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