SERVICE BULLETIN

No. SB-300-1-22

COMPLIANCE RECOMMENDED

SUBJECT:	**Non-destructive inspection (NDI) of fuselage primary structure**
AFFECTED:	**EXTRA EA 300/SC**
Purpose:	Cracks in LH upper fuselage longeron tube just aft of the attachment bushing for engine mount support have been reported on two airplanes that are frequently operated at the design limits. This Service Bulletin provides instructions for additional non-destructive inspection (NDI) of fuselage steel tube structure for airplanes which are heavily operated at the edge of given operating limitations during most of the flight time.
Approval:	**The technical content of this document is approved under the authority of the DOA ref. EASA.21J.073.**
Compliance time:	First NDI at 3000 hours time-in-service (TIS) if no service history is available for evaluation (e.g. for pre-owned airplanes) or based on the outcome of operation criteria evaluation. Then recurring NDI as part of the scheduled Significant Items Inspection (1000 hours inspection program).
Contact:	**For questions contact Extra. Contact information is given on:** https://www.extraaircraft.com

CONTENTS

1. Service History

EXTRA gained service history on the structural capability of steel tube fuselage for more than 35 years and about 700 acrobatic airplanes produced. Some of EA 300 airplanes are close to 6000 hours TIS. Reported cracks are first of that kind.

2. Background

Cracks have been reported on two EA 300/SC airplanes that are frequently operated near, at or slightly beyond design limits. A crack was found in the LH upper fuselage longeron tube just aft of the attachment bushing for engine mount attachment within the regular inspection intervals. To that time both airplanes have reached a service time beyond 3000 hours with more than 4600 landings. They are flown in many acrobatic competitions (e.g. World Acrobatic Championship [WAC]) and air shows accompanied with required high numbers of training flights. These two airplanes in particular are heavily operated at the edge of given operating limitations during most of all the flight time. Based on the knowledge gained by those reported occurrences, it seems that operation frequently at limit load level and furthermore cumulative effects of aggressive operating maneuvers will have an adverse effect on the structural capability of the fuselage steel tube frame of the EA 300/SC type design.

There is no life time limit on the fuselage steel tube frame. Given life time limits included in the ALS Chapter 04 of the Maintenance Manuals are eligible for composite structure only.

3. Service Life

The reliability and service life of the fuselage steel tube frame (aircraft structure) can be detrimentally affected if it is repeatedly operated near or at its design limits.

Aggressive acrobatic flight maneuvers with abrupt control inputs to maximum control surface deflection which cause high acceleration in any direction also contribute to dynamic stress level of the steel tubes that tend to shorten service life. These factors should be considered to establish reduced and/or additional inspection intervals. Therefore it is the responsibility of the operator to determine the percentage of time the airplane is used for aerobatics as well as further criteria to establish additional NDIs for his own airplane.

4. Evaluation

Whether additional NDIs of fuselage steel tube structure are reasonable or not is depending on the result of the operation evaluation to be done by the operator. The following criteria should be taken into account for such an evaluation:

1. Combined usage spectrum: Does the operation time ratio between acrobatic and normal flight exceed 40% / 60%?

2. Usage monitoring: Is the airplane flown in acrobatic competitions within the "Unlimited" category and /or Air Shows including respective high numbers of training flights?

3. Operating spectrum: Are there more than 2 times 10g per flight hour? Are any gyroscopic maneuvers performed with high angular velocity such as flat spin with power-on or knife edge spin associated with propeller RPM above 2400? Is there evidence of any exceedances of operation limits (g-load factor, Vne, abrupt and full control input above Va)? Any previous occurrences of damages to the fuselage steel tube structure in the area of engine mount support?

If at least one of the afore given questions are answered with "Yes" an additional NDI is warranted.

5. Additional NDI

The following procedure is provided in case the operation evaluation warrants an additional NDI:

- Remove engine cowling, canopy and main fuselage cover (see Chapters 71-10-00, 53-00-10, 51-00-01)

- Perform detailed visual inspection of steel tubes of the fuselage primary structure in the area of attachments bushings to the engine mount structure. Carefully check for any damage (dents, cracks, deformations etc.) especially at welds (*Refer to Figure 1*).
  Pay special attention to the lower side of the LH & RH longeron tube (dim. 25x1.5mm) just aft of the engine mount attachment.
  Note:
  In case of any doubt: Check steel tubes of uncertain areas using a Liquid/Visible or Fluorescent Dye Penetrant inspection method to ensure no cracks are evident. Applicable Technical Standards should be considered for that purpose (*see Appendix A*).

- Reassemble engine cowling, canopy and main fuselage cover (see Chapters 71-10-00, 53-00-10, 51-00-01)

If no damage is found, the aircraft can be released to service.

Make an appropriate logbook entry of compliance with the NDI of this Service Bulletin, including next scheduled inspection.

A repetitive NDI is required at given compliance time.

Please report the result of the NDI to EXTRA by returning the completed Form (*see Appendix B*).

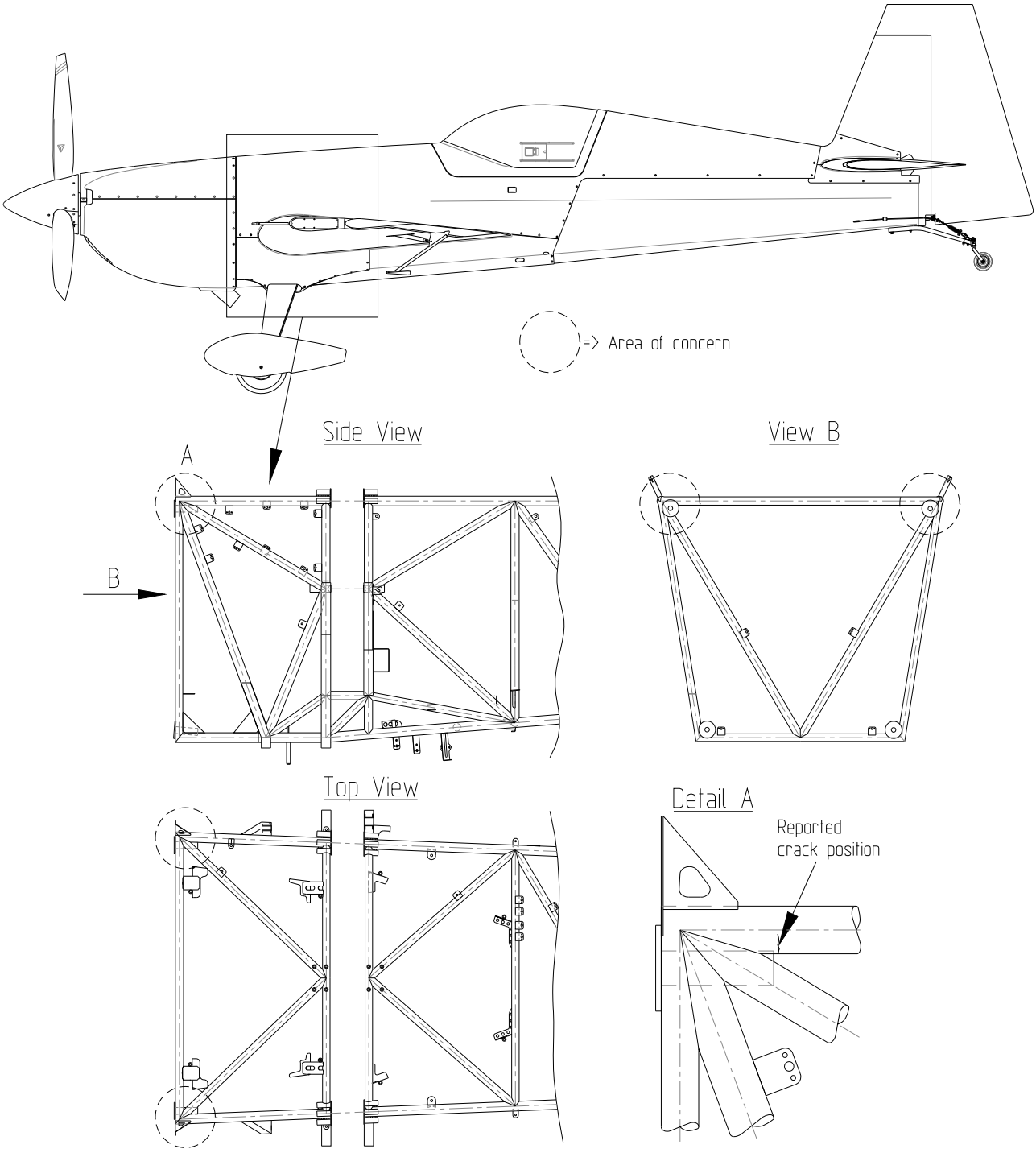

Figure 1: Area of fuselage steel tube structure to be nondestructive inspected

Appendix A:

Technical Standards

Two of the more generally accepted aerospace industry standards are MIL-I-25135E, Inspection Materials, Penetrants and ASTM-E-1417. The penetrant materials specification (MIL-I-25135E) is used to procure penetrant materials and the process control specification (MIL-STD-6866) is used to establish minimum requirements for conducting a penetrant inspection.

Listing of commonly accepted standards and specifications for Liquid/Visible penetrant inspection:

ASTM-E-165	Standard Practice for Liquid Penetrant Inspection Method
ASTM -E-1220	Standard Method for Visible Penetrant Examination Using the Solvent Removable Method
MIL-STD-1907	Inspection, Liquid Penetrant and Magnetic Particle, Soundness Requirements for Materials, Parts and Welds
MIL-STD-6866	Inspection, Liquid Penetrant
MIL-STD-728/3	Liquid Penetrant Testing
MIL-STD-25135E	Inspection Materials, Penetrants

PENETRANT SYSTEMS	DEVELOPERS	SOLVENT REMOVERS
Type I Fluorescent Dye Type II Visible Dye Type III Visible and Fluorescent Dye (dual mode)	Form a Dry Powder Form b Water Soluble Form c Water Suspendible Form d Nonaqueous Form e Specific Application	Class (1) Halogenated (chlorinated) Class (2) Nonhalogenated (nonchlorinated) Class (3) Specific Application
Method A Water Washable Method B Post emulsifiable, Lipophilic Method C Solvent Removable Method D Post Emulsifiable, Hydrophilic		
Sensitivity Level ½ Ultralow Sensitivity Level 1 Low Sensitivity Level 2 Medium Sensitivity Level 3 High Sensitivity Level 4 Ultrahigh		

Table 1: Overview classification of penetrant inspection materials covered by MIL-I-25135E

Appendix B:

Aircraft Type and model: **EA 300/SC** Serial Number: _____

Owner: _____ Registration: _____

Total Time: _____ Total landings (if known): _____

The aircraft mentioned above has been inspected according this Service Bulletin.

Damage/Crack has been found: ❒ Yes ❒ No

If yes, description of damage found (if possible attach supporting sketch):

Comments:

Company: _____

Aircraft inspector: _____ Date: _____

Please return a copy of this page to:

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