Temporary Maintenance Instruction
TMI 189-052

Leading edge erosion shield (main rotor blade) – Replacement

All AW189 Helicopters

The technical content of this document is approved under the authority of DOA nr. EASA.21J.005.

The present TMI will be evaluated for its introduction in the standard set of Technical Publication.
If no further notice is received, the present document expires on: October 12 th, 2023.

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Introduction

This TMI provides the instructions to perform the replacement of the erosion shield(s) on the main rotor blades P/N 4F6210A00132 and P/N 8G6210A01931.

All the information reported in the subsequent pages will be introduced within next issue of pertinent technical publication, Data Module:

ANNEX	DATA MODULE CODE	DATA MODULE TITLE
Annex 1	89-A-62-11-01-12A-921A-C	Leading edge erosion shield (main rotor blade) – Replacement (remove and install a new item)
Annex 2	CSPP-A-60-50-01-00C-259A-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces
Annex 3	CSPP-A-60-50-01-00C-259B-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces
Annex 4	CSPP-A-60-50-01-00A-259B-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces
Annex 5	89-A-62-11-01-00A-361A-C	Main rotor blade - Profiles and twist angles - Dimensions check
Annex 6 ([1])	89-A-62-11-01-14A-720A-C	Butt straps (main rotor blade) - Install procedure

([1]) Annex 6 also replaces and supersedes DM 89-B-62-11-01-14A-720A-C. The new procedure included in DM 89-A-62-11-01-14A-720A-C is also applicable to Main rotor blades (FIPS) P/N 8G6210A00131 and P/N 8G6210A00132.

Leading edge erosion shield (main rotor blade) – Replacement

Table of contents
Refer to attached annexes

List of tables
Refer to attached annexes

List of figures
Refer to attached annexes

References

Refer to attached annexes

Preliminary Requirements

Required conditions
Refer to attached annexes

Support equipment
Refer to attached annexes

Supplies
Refer to attached annexes

Spares
Refer to attached annexes

Safety condition
Refer to attached annexes

Procedure

Refer to attached annexes

Requirement after job completion

Refer to attached annexes

Annex 1

Leading edge erosion shield (main rotor blade) – Replacement (remove and install a new item)

Table of contents

List of tables

List of figures

References

Table 1 References

Data Module	Title
89-A-00-50-00-00A-010A-D	Local supply consumables, materials and expendables – General data
89-A-62-11-01-00A-257A-C	Main rotor blade – Paint and apply marking
89-A-62-11-01-00A-361A-C	Main rotor blade - Profiles and twist angles - Dimensions check
89-A-62-11-01-00A-37DA-C	Main rotor blade - Static balance
89-A-62-11-01-02A-520A-C	Leading edge cover (main rotor blade) - Remove procedure
89-A-62-11-01-03A-520A-C	Trailing edge cover (main rotor blade) - Remove procedure
89-A-62-11-01-09A-520A-C	Lightning bonding strip (main rotor blade) - Remove procedure
89-A-62-11-01-09A-720A-C	Lightning bonding strip (main rotor blade) - Install procedure
89-A-62-11-01-11A-520A-C	Swept tip erosion shield (main rotor blade) - Remove procedure
89-A-62-11-01-11A-720A-C	Swept tip erosion shield (main rotor blade) - Install procedure

Table 1 References

Data Module	Title
89-A-62-11-01-14A-520A-C	Butt straps (main rotor blade) - Remove procedure
89-A-62-11-01-14A-720A-C	Butt straps (main rotor blade) - Install procedure
89-A-ZZ-00-00-00A-066A-A	Local supply support equipment and tools - Support equipment and tools data
CSPP-A-60-30-02-00A-913A-C	Tap test - General maintenance procedure
CSPP-A-60-50-01-00A-259A-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces
CSPP-A-60-50-01-00A-259B-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces
CSPP-A-60-50-01-00C-259A-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces
CSPP-A-60-50-01-00C-259B-C	Metal components (surface preparation for bonding) - Other procedure to protect surfaces

Table 2 Access points

Access Panel / Door Id	Data Module
None	

Table 3 Zones

Zone ID	Data Module
None	

Preliminary requirements

Required conditions

Table 4 Required conditions

Condition	Data Module/Technical Publication
The blade surface finish must be removed	89-A-62-11-01-00A-257A-C
The lightning bonding strip must be removed	89-A-62-11-01-09A-520A-C
The swept tip erosion shield must be removed	89-A-62-11-01-11A-520A-C
The outboard and the inboard butt straps must be removed	89-A-62-11-01-14A-520A-C
The leading edge cover must be removed	89-A-62-11-01-02A-520A-C
The trailing edge cover must be removed	89-A-62-11-01-03A-520A-C

Support equipment

Table 5 Support equipment

Nomenclature	Identification No.	Qty
Heat gun	ZZ-00-00	1 EA
Positioning tool	4F6210L00851A557A	1 EA
Tip positioning tool	4F6210L00551A557A	1 EA
Tip heating blanket (with thermocouple)	4F6210L00551A566A	1 EA
Spatula (flexible - rounded corners)	ZZ-00-00	1 EA
Spatula (Teflon or Nylon)	ZZ-00-00	A.R.
Brush	ZZ-00-00	1 EA
Heating Blanket (with thermocouple)	ZZ-00-00	A.R.
Grinding wheel	ZZ-00-00	A.R.
Milling cutter	ZZ-00-00	A.R.
Vacuum bag set	ZZ-00-00	1 EA
Hammer (rubber)	ZZ-00-00	1 EA
Strap (Elastic)	ZZ-00-00	A.R.
Aluminum hammer	GF-36-00	1 EA
Steel hammer	GF-59-00	1 EA
Scissors (rounded ends)	ZZ-00-00	1 EA
Eddy current flaw detector	ZZ-00-00	1 EA
Clamp	ZZ-00-00	A.R.

Supplies

Table 6 Supplies

Nomenclature	Identification No.	Qty
Solvent	C005	A.R.
Lint-free cloth	C011	A.R.
Isopropyl alcohol	C039	A.R.
Abrasive paper	C055	A.R.
Aliphatic naphtha	C059	A.R.
Acetone	C087	A.R.
Adhesive	C189	A.R.
Adhesive	C191	A.R.
Fiberglass	C192	A.R.

Table 6 Supplies

Nomenclature	Identification No.	Qty
Tape	C258	A.R.
Teflon tape	C223	A.R.
Paint	C421	A.R.
Primer	C534	A.R.
Breather fabric	C917	A.R.
Release film	C920	A.R.
Cleaning compound	Diestone DLS	A.R.
Gauze	Local supply	A.R.
Polyethylene film	Local supply	A.R.
Vacuum bag sealant	Local supply	A.R.

Spares

Table 7 Spares

Nomenclature	Identification No.	Qty
Inboard erosion shield (primed for bonding)	4F6210L00851B	1 EA
Outboard erosion shield (primed for bonding)	4F6210L00951B	1 EA
Tip erosion shield (primed for bonding)	4F6210L00551B or 4F6210L00551C	1 EA

Safety conditions

WARNING

The materials that follow are dangerous. Before you do this procedure, make sure that you know all the safety precautions and first aid instructions for these materials:

- **Solvent (C005)**
- **Isopropyl alcohol (C039)**
- **Aliphatic naphtha (C059)**
- **Acetone (C087)**
- **Adhesive (C189)**
- **Adhesive (C191)**
- **Fiberglass (C192)**
- **Paint (C421)**
- **Primer (C534)**
- **Cleaning compound (Diestone DLS).**

Note

The subsequent procedure must only be done by the Manufacturer or by an authorized repair and overhaul facility.

Procedure

Note 1

This replacement procedure is the same for the inboard, outboard and tip erosion shield and it can be applied to replace one or more shields at the same time. The figures shown are referred to the replacement of the outboard erosion shield.

Note 2

A maximum of two replacements is permitted for each erosion shield (inboard, outboard and tip). If you find two records in the blade Log Card, contact the Design Authority for further information.

Note 3

If all three erosion shields (inboard, outboard and tip) must be replaced, we recommend to do the replacement in two different steps: do the replacement of the outboard erosion shield plus the tip erosion shield first, then replace the inboard erosion shield. This will help you to put them easier in the correct position.

1. **Preliminary operations.**

1.1. Put the main rotor blade on an applicable work table.

1.2. Remove the root balance weights and their attaching parts from the main rotor blade. Refer to the applicable steps of 89-A-62-11-01-00A-37DA-C.

1.3. Remove the cover, the tip balance weights and their attaching parts from the main rotor blade. Refer to the applicable steps of 89-A-62-11-01-00A-37DA-C.

1.4. Put the span weight pot cover in its correct position and secure it with Teflon tape (C223) (see Fig 1).

1.5. (Only for inboard erosion shield replacement) Examine the root end of the inboard erosion shield to make sure that there is no overlap with the leading edge fairing. If necessary, rub this area until the erosion shield comes fully into view to let its removal. Be careful not to damage the leading edge fairing.

2. **Removal of the erosion shield.**

2.1. Clean the whole surface of the erosion shield(s) that must be removed with a Gauze (Local supply) moist with Isopropyl alcohol (C039) or Aliphatic naphtha (C059) or Solvent (C005), or similar cleaner, and let the part dry for at least 30 minutes at ambient temperature.

2.2. Apply 50 mm (2 in) wide Tape (C258) as protection from heat along the boundary of the erosion shield(s) that must be removed (upper side and lower side).

Note

Let the paint dry between layers for at least 10 minutes at ambient temperature.

2.3. Apply two layers of Paint (C421) with a Brush (ZZ-00-00) on the whole erosion shield(s) that must be removed as well as overlapping approx 25 mm (1 in) of the aluminum tape. You must obtain a smooth surface.

2.4. Let the paint dry at least 4 hours at ambient temperature.

2.5. Do a visual inspection to make sure that the paint is applied equally.

2.6. Separate the upper section of the erosion shield(s) that must be removed from the lower one, do as follows:

CAUTION

During milling operation make sure not to damage the underlying surfaces. Stop immediately when the color of the composite material underneath becomes visible.

2.6.1. Mill the leading edge of the erosion shield(s) with a Grinding wheel (ZZ-00-00) or a Milling cutter (ZZ-00-00). Be careful not to damage the underlying dummy heater mat (see Fig 1).

2.6.2. Examine the leading edge to make sure that there is no damage to the composite material of the dummy heater mat. If you find damage, contact the Design Authority for further information.

Note 1

We recommend to do the removal operation with the combined action of two operators minimum, one for heating, the other for the mechanical removal.

Note 2

The change of the thermochromic paint color (color at ambient temperature) shows the moment when the operator must start to insert the spatula to start the debonding operations.

Note 3

Do the heating and removal operations at the same time and in the same zone. This makes the removal easier and prevents damage to the spar material.

2.7. Starting from the leading edge, locally heat the erosion shield(s) that must be removed with a Heat gun (ZZ-00-00) set at 300 - 370°C. Keep the nozzle 3 - 4 cm away from the erosion shield surface during the whole phase of removal (see Fig 1).

CAUTIONS

- **Always use the spatula to break the erosion shield bonding. Use pliers only to make the lift of the removed part easier.**
- **Do not apply traction or peeling loads with pliers to the erosion shield. If you apply a pulling force you can damage parts of the spar.**

Note 1

It is possible to set a higher temperature than the indicated value. If you do this, be very careful not to burn the paint as this can invalidate the removal process.

Note 2

Do not heat the parts that you have lifted before for more than necessary. This will prevent bubbles forming in the paint, which can make incorrect the inspection that follows.

Note 3

During the removal, you can use pliers only on the erosion shield areas that have been removed, while using the spatula at the same time.

2.8. When the thermochromic paint starts to change color from orange (ambient temperature color) to light green, as quickly as possible try to insert a Spatula (flexible - rounded corners) (ZZ-00-00) again and again under the erosion shield, to start the removal (see Fig 1).

2.9. Continue to the root the removal of the erosion shield(s) with one or more Spatula (Teflon or Nylon) until fully removed. It is recommended to use a spatula with these dimensions:

- Length: approximately 300 mm (11.8 in);
- Width: 50 mm (2 in);
- Thickness: max 15 mm (0.6 in).

2.10. After the removal is complete, examine fully the removed erosion shield(s). Make sure that the thermochromic paint has not become brown/black (signs of burning) and that there are no paint bubbles due to overheating. If you find these indications, contact the Design Authority for further information.

Note

A dark green equal color along the length of the removed erosion shield(s) and the absence of paint bubbles due to overheating, show that you did the removal operation at the correct temperature. Thus, the temperature on the adhesive underlying the erosion shield has not reached the limit of 160°C.

2.11. Remove the aluminum tape from the main rotor blade (upper side and lower side).

3. **Cleaning and inspection of the erosion shield(s) bonding area.**

CAUTION

During sanding make sure not to damage the glass fiber of the dummy heater mat. Use gradually finer abrasive paper near the dummy heater mat surface.

Note 1

It is permitted to keep halos of adhesive on the dummy heater mat surface (see Fig 2), to ensure the integrity of the underlying composite surfaces.

3.1. Remove the old adhesive layer from the erosion shield(s) bonding area with Abrasive paper (C055), grit 180 - 240. Be careful not to damage the glass fiber of the dummy heater mat underneath.

3.2. Clean with a Lint-free cloth (C011) moist with Isopropyl alcohol (C039) or Aliphatic naphtha (C059) or Solvent (C005), or similar cleaner, and let the part dry for at least 30 minutes at ambient temperature.

3.3. Examine the full area below the removed erosion shield(s) (dummy heater mat) as follows:

3.3.1. Visually examine the external surface to make sure that there is no damage to the glass fibers.

3.3.2. Examine for debondings/delaminations with a tap inspection. Refer to CSPP-A-60-30-02-00A-913A-C for the tap test procedure.

3.3.3. If you find damage and / or debondings/delaminations, obey these requirements:

- Small damage and / or debondings/delaminations (even if scattered) are permitted and must be repaired as given in Step 3.4.
- Large damage and / or debondings/delaminations require a major repair, contact the Design Authority for further information.

3.4. Repair damaged and / or debonded/delaminated areas of the dummy heater mat, do as follows:

3.4.1. Map the debonded/delaminated area with a Marker pen (ZZ-00-00).

Note

If the debonded/delaminated area is deep, it is possible to remove the part of dummy heater mat up to the spar.

3.4.2. Remove the first debonded/delaminated layers of the dummy heater mat with the Abrasive paper (C055), grit 120.

3.4.3. Continue with the removal of the remaining delaminated layers, if necessary, or finish the area with the Abrasive paper (C055), grit 180 - 240.

Note

The repair will be completed subsequently with the application of layers of fiberglass or adhesive to get an equal level of the removed dummy heater mat.

3.4.4. Clean with a Lint-free cloth (C011) moist with Isopropyl alcohol (C039) or Aliphatic naphtha (C059) or Solvent (C005), or similar cleaner, and let the part dry for at least 30 minutes at ambient temperature.

4. **Coupling test with the new erosion shield(s).**

4.1. Do a "dry test" of erosion shield-dummy heater mat coupling to make sure that there is a distance between the erosion shields and that there is no interference between the erosion shield(s) that must be installed and the blade skin. Do as follows (see Fig 3):

CAUTION

You can do the “dry test” with new treated spares (P/Ns with the suffix “B” or “C”) or with new not treated spares (P/Ns without the suffix). If you use a treated spare, protect the bonding surface correctly with a Polyethylene film (Local supply) to prevent contamination.

Note

To compensate for thermal expansion, the distance between the erosion shields must be 2 - 3 mm (0.08 - 0.12 in), see Fig 3.

4.1.1. Put the new Inboard erosion shield (primed for bonding) (4F6210L00851B) and / or the new Outboard erosion shield (primed for bonding) (4F6210L00951B) and / or the new Tip erosion shield (primed for bonding) (4F6210L00551B or 4F6210L00551C), protected with a Polyethylene film (Local supply), on the dummy heater mat.

Note

(Only for tip erosion shield replacement) The tip end of the tip erosion shield must be correctly aligned with the joggle of the main rotor blade.

4.1.2. Make sure that the erosion shield(s) are correctly located and that there is a distance between them of 2 - 3 mm (0.08 - 0.12 in). If the distance between the erosion shields is in the permitted limits continue with Step 4.1.4. If not, do as follows:

— If you replace the inboard erosion shield and the distance from the outboard erosion shield is below 2 mm (0.08 in), rub its seat at the root area to get the correct distance;

— If you replace the outboard erosion shield and the distance from the inboard or tip erosion shield is less than 2 mm (0.08 in), trim the erosion shield to get the correct distance between the shields as given in Step 4.1.3;

— If you replace the tip erosion shield and the tip end is not correctly aligned with the joggle of the main rotor blade, trim the inboard edge of the erosion shield as given in Step 4.1.3 to get the correct positioning.

4.1.3. If necessary to get the correct distance between the shields, trim the outboard or the tip erosion shield as follows:

4.1.3.1. Mark the new erosion shield to have a distance of 2 to 3 mm (0.08 - 0.12 in).

4.1.3.2. Remove the outboard and / or the tip erosion shield from the main rotor blade and rework the end of the shield up to the marking previously done.

4.1.3.3. Blend the cut edge to get a smooth finish with Abrasive paper (C055), 320 grit.

4.1.3.4. Clean the cut edge of the new erosion shield with the Lint-free cloth (C011) moist with Isopropyl alcohol (C039) or Aliphatic naphtha (C059).

4.1.3.5. Dry the surface with a clean, dry Lint-free cloth (C011) before the solvent evaporates.

4.1.3.6. Touch-up the cut edge with the Primer (C534). Let the primer cure at ambient temperature for at least 2 hours.

Note 1

During the Eddy current inspection be very careful to prevent damage or contamination of the primed surfaces.

Note 2

Eddy current inspection must be carried out by personnel qualified to Level 2 (minimum) in the ET method in compliance with EN4179 or NAS410.

Note 3

For the inspection, a work instruction containing details of the eddy current equipment, probe and all setup parameters must be prepared. This work instruction must be approved by an Eddy Current Level 3 qualified and certified in compliance with EN4179 or NAS410.

4.1.3.7. Clean the trimmed edge of the outboard and / or the tip erosion shield for approx. 25 mm (1 in) with the Lint-free cloth (C011) moist with Solvent (C005) or Acetone (C087) or Cleaning compound (Diestone DLS).

4.1.3.8. Dry with a clean, dry cloth before the solvent evaporates. Make sure that the area is smooth, dry and free from possible adhering materials.

4.1.3.9. Turn on the high frequency impedance plane Eddy current flaw detector (ZZ-00-00) and ensure that the correct parameters for a 6 MHz Titanium inspection (for outboard erosion shield) or 2 MHz Nickel inspection (for tip erosion shield) are entered into the main menu (see note below). Select the necessary 6 MHz shielded absolute probe (for Titanium) or 2MHz shielded absolute probe (for Nickel) to give full coverage and access to the scan area and connect to the test set. Typical probe types available are:

— Pencil probe;

— 45° crank probe;

— 90° tip probe.

Note

Equipment menus differ between test sets. The following basic parameters must be used when carrying out a 6 MHz Titanium inspection (for outboard erosion shield) or 2 MHz Nickel inspection (for tip erosion shield):

6 MHz Titanium inspection (for outboard erosion shield)					
Phase	**Gain**	**HP/LP filters**	**Frequency**	**Alarm gate**	**Null Point**
Set at Step 4.1.3.13 to ensure lift-off response is at 9-o-clock on the screen display.	Set at Step 4.1.3.14 to give a signal response of 80% FSH from the 0,5 mm reference standard slot.	HP: OFF LP: As req'd	6 MHz	Set at 30% of the signal response from the 0,5 mm reference standard slot.	Set as in Fig 4 at 30% full screen height, 80% full screen width.

2 MHz Nickel inspection (for tip erosion shield)					
Phase	**Gain**	**HP/LP filters**	**Frequency**	**Alarm gate**	**Null Point**
Set at Step 4.1.3.13 to ensure lift-off response is at 9-o-clock on the screen display.	Set at Step 4.1.3.14 to give a signal response of 80% FSH from the manufactured reference standard slot.	HP: OFF LP: As req'd	2 MHz	Set at 30% of the signal response from the manufactured reference standard slot.	Set as in Fig 4 at 30% full screen height, 80% full screen width.

4.1.3.10. Apply Teflon tape (C223) to the tip of the probe to let the probe slide smoothly and to prevent erosion of the probe tip. The tape must be kept in position at all times during subsequent scanning of the shield and replaced when worn.

Note 1

The sensitivity must be verified against the reference standard each time the Teflon tape is changed, every 15 minutes during continuous inspection, before and after each inspection and to confirm a relevant indication.

Note 2

The sensitivity must be considered valid when a vertical deflection of 80% (±10%) FSH from the null point is experienced. If the deflection is below 70% FSH from the null point, then all inspections performed since the last sensitivity check must be repeated.

4.1.3.11. Connect the probe and probe lead to the equipment and carry out "probe balance load" in air.

4.1.3.12. Use a Titanium alloy (Ti-6Al-4V) reference standard (0,5 mm notch) for outboard erosion shield inspection and a Nickel reference standard (from an existing / scrap erosion shield) for tip erosion shield inspection as detailed in Fig 4.

4.1.3.13. Put the probe on the applicable reference standard away from the slot and edges. Carry out probe balancing and set lift-off. Manually adjust the signal phase angle to the 9 o'clock position.

4.1.3.14. Slide the probe tip across the applicable reference standard slot and set the GAIN to give a working spot deflection of 80% (approx.) full screen height (FSH) from the null point. Adjust GAIN X and Y as required to ensure signal response is vertical on the screen display (Fig 4).

4.1.3.15. Set alarm gate to 30% of the signal response from the relevant reference standard slot as detailed in Step 4.1.3.14.

4.1.3.16. Recheck the sensitivity setting as follows:

- move the probe off;
- replace the probe away from slot and edges and re-balance the probe;
- move the probe back over the slot;
- Readjust the PHASE and GAIN to ensure the working spot deflection as shown in Fig 4.

Note

The scanning speed must be the same speed as that used during sensitivity set up at Step 4.1.3.14. A lower value of the LP filter may negatively effect (lower) scan speed.

4.1.3.17. Put the probe at a position on the erosion shield to be examined remote from the inspection area, but of the same material and geometry to the area under examination. Balance the equipment and ensure lift-off signal appears at the 9 o'clock position.

4.1.3.18. Make sure that the procedure has not been carried out over a fault by moving the probe to another area, re-balancing and then carry out lift-off checks.

4.1.3.19. Put the probe along the trimmed edge and balance, and while keeping the probe perpendicular (90˚ to the surface), scan the trimmed edge with a scan pitch of 1 mm (0.04 in). Make sure that the inspection area is fully covered (Fig 4).

4.1.3.20. In areas where cracking is suspected, put the probe near these areas and while keeping the probe perpendicular to the surface, scan the suspected area with a scan pitch of 1 mm (0.04 in) in two directions at 90° to each other.

4.1.3.21. Any indication that cannot be attributed to geometry, edge effect, lift off or probe handling and triggers the alarm is to be considered a relevant indication and reported, stating its position and length. Relevant indication length is to be measured from any discernable spot movement whilst scanning.

4.1.3.22. Nil relevant indications are permitted.

4.1.3.23. Put the outboard and / or the tip erosion shield in its position on the dummy heater mat and check for correct distance between the erosion shields (2 - 3 mm (0.08 - 0.12 in)).

4.1.4. Apply at least three Strap (Elastic) (ZZ-00-00) to keep the new erosion shield(s) in its correct position.

CAUTION

During sanding make sure not to damage the underlying surfaces.

4.1.5. Make sure that there are no residuals of old adhesive squeeze-out that interfere between the blade skin and the new erosion shield(s) (upper side and lower side). If present, remove the erosion shield(s) and remove the interference along the skin edge with Abrasive paper (C055), grit 240 - 320.

4.1.6. Do again the previous operations until you remove all interferences between the erosion shield(s) and the blade skin.

Note

If the "dry test" does not give the correct erosion shield(s) installation, contact the Design Authority.

4.2. When you get the correct positioning (correct distance between the shields and no interferences) mark the position of the new erosion shield(s) at three locations (root, center and outboard) for each erosion shield. The mark must be at least of 30 mm (1.12 in) on the erosion shield(s) and at least of 30 mm (1.12 in) on the blade skin (see Fig 3).

4.3. Clean the surfaces of the new erosion shield(s) with a dry soft Lint-free cloth (C011) to prevent possible contamination.

5. **Preparation of the bonding surface.**

5.1. Make sure that the new spare part has the suffix “B” or “C” on the part number (already treated for bonding) and obey the Shelf life limits. If not, prepare the component as necessary:

— the inboard / outboard erosion shields as given in DM CSPP-A-60-50-01-00C-259A-C (See Annex 2 of this TMI) or CSPP-A-60-50-01-00C-259B-C (See Annex 3 of this TMI);

— the tip erosion shield as given in DM CSPP-A-60-50-01-00A-259A-C or CSPP-A-60-50-01-00A-259B-C (See Annex 4 of this TMI).

5.2. Prepare the bonding surface of the blade, do as follows:

Note

You must bond the new erosion shield(s) to the blade within 72 hours from cleaning by abrasion.

5.2.1. Wipe clean with a soft Lint-free cloth (C011) moist with Isopropyl alcohol (C039) or Aliphatic naphtha (C059) or Solvent (C005), or similar cleaner, and let the part dry for at least 30 minutes at ambient temperature.

CAUTION

During sanding make sure not to damage the glass fiber of the dummy heater mat.

5.2.2. Lightly sand the dummy heater mat surface with Abrasive paper (C055), grit 80 - 100, as preparation for bonding. Be careful not to damage the fibers.

5.2.3. Remove sanding residuals with a dry Lint-free cloth (C011).

5.2.4. Wipe clean with a soft Lint-free cloth (C011) moist with Isopropyl alcohol (C039) or Aliphatic naphtha (C059) or Solvent (C005), or similar cleaner, and let the part dry for at least 30 minutes at ambient temperature.

5.2.5. Protect the bonding surface of the blade with a Polyethylene film (Local supply).

CAUTIONS

- **Do the steps that follow in a dust free environment. You must control the temperature (18 to 27 °C) and the relative humidity (not more than 55%). The area must be fully sealed and the solid particle total count (size 3 µm or larger) not more than 350/dm³.**

- **Always handle the new erosion shield(s) and the blade with clean dry gloves not to contaminate the bonding surfaces.**

6. **First consolidation of the new erosion shield(s).**

6.1. If debonded/delaminated layers of the dummy heater mat were removed (Ref. Step 3.4), apply:

- patches of Fiberglass (C192), for repair of deep damage;
- patches of Adhesive (C189) (weight .06), for repair of superficial damage.

Apply the necessary layers to get an equal level of the bonding surface (see Fig 5).

6.2. Apply the adhesive on the bonding surface as follows (see Fig 5):

6.2.1. Make on a work bench an assembly composed of 1 layer of Adhesive (C191) (weight .06) and 1 layer of Adhesive (C189) (weight .06) without backing film between the layers. Do not remove the external backing films.

6.2.2. Cut the assembly to the same width and length as the new erosion shield(s) plus an extra length of approximately 2 - 3 cm (0.79 - 1.18 in).

6.2.3. Remove the backing film from the Adhesive (C189) from the side that must be applied on the blade bonding surface.

6.2.4. Put the assembly on the blade bonding surface starting from the root up to the tip.

6.2.5. Take the erosion shield(s) to be bonded and put it over the blade bonding surface in the same position where marked during the “dry test” phase.

6.2.6. Lightly tap the whole leading edge with the Hammer (rubber) (ZZ-00-00) to make sure that the erosion shield(s) is correctly located.

Note

You can ignore possible waving on the surface of the erosion shield(s) (upper side and lower side), because it will be removed fully after the adhesive curing is complete.

6.2.7. Tighten Strap (Elastic) (ZZ-00-00), at least three (root, center and outboard) if dimensionally possible, around the airfoil to keep the new erosion shield(s) in position.

6.2.8. Trim with the Scissors (rounded ends) (ZZ-00-00) the unwanted adhesive in line with the blade skin edge on the whole erosion shield(s) seat (see Fig 5).

6.2.9. Remove the elastic straps from the blade.

Note

You must use one tool or both tools in these cases:

- use both tools to replace the outboard erosion shield only or a combination of the outboard erosion with the two other shields;
- use the Positioning tool (4F6210L00851A557A) to replace the inboard erosion shield only;
- use the Tip positioning tool (4F6210L00551A557A) to replace the tip erosion shield only.

6.2.10. Apply the Positioning tool (4F6210L00851A557A) and / or the Tip positioning tool (4F6210L00551A557A) on the erosion shields. Make sure that:

- the marking on the inspection holes is centered at the joints between the shields (see Fig 5);
- there is the distance of 2 - 3 mm (0.08 - 0.12 in) between the erosion shields;
- (If you replace the outboard erosion shield only) the distance between the outboard and the tip erosion shield and between the outboard and the inboard erosion shield is the same.

6.2.11. Lightly tap the whole leading edge of the tool(s) with the Hammer (rubber) (ZZ-00-00).

6.2.12. Tighten Strap (Elastic) (ZZ-00-00), at least three (root, center and outboard) if dimensionally possible, on the new erosion shield(s) area. Additional straps are necessary in these cases:

- (If you replace the inboard erosion shield only): add at least one strap on the opposite side of the tool outside the area of the new inboard erosion shield.
- (If you replace the outboard erosion shield only) add at least one strap on the opposite side of the tool outside the area of the new outboard erosion shield and at least two straps on the tip positioning tool to keep it in position.

6.3. Do the consolidation of the erosion shield(s) as follows (see Fig 6):

6.3.1. Apply one layer of Breather fabric (C917) on the positioning tool(s).

6.3.2. Seal a complete Vacuum bag set (ZZ-00-00) and apply a pressure of 0,6 - 0,8 kg/cm^2.

CAUTION

Apply the clamps only onto the elastic straps to prevent damage to the blade skin trailing edge. Do not apply the clamps on the trailing edge fairing.

Note

If you locally applied patches of Fiberglass or adhesive (ref. Step 6.1) to repair the dummy heater mat, it is recommended to increase the consolidation time up to 4 hours.

6.3.3. Tighten one Clamp (ZZ-00-00) on each elastic strap applied on the new erosion shield(s) area as shown in Fig 6. Let to consolidate for 1 hour min.

6.3.4. Remove the clamps, the vacuum bag set, the elastic straps, the positioning tool(s) and the erosion shield(s) from the blade.

7. **Second consolidation of the erosion shield(s).**

7.1. Remove the backing film from the adhesive outer surface.

CAUTION

Use applicable gloves to prevent contaminations of the bonding surface.

7.2. Apply manual pressure on the whole bonding surface and check that the pressure on the adhesive has been properly applied (the adhesive shall appear well extended and free from wrinkles and swellings, small wrinkles are acceptable as long as the area shows an adequate pressure).

Note

When it is necessary to apply two or more strips of adhesive it is recommended to use minimum one layer of knit supported adhesive.

7.3. Make on a work bench strips and / or patches of Adhesive (C191) (weight .03 and / or weight .06) and / or Adhesive (C189) (weight .06) of the necessary dimension to cover the areas of low pressure (areas of lighter color) (see Fig 7).

7.4. Remove the inner backing film and apply the strips and / or patches of adhesive on the areas of low pressure.

Note

After each application of the adhesive on the areas of low pressure, apply again manual pressure on the whole bonding area to make sure if there are other areas of low pressure.

7.5. Remove the backing film from the outer surface of the adhesive strips and / or patches.

7.6. Cover the adhesive on the blade bonding surface fully with the adhesive backing film or with the Release film (C920).

7.7. Put the erosion shield(s) over the blade bonding surface in the same position where marked during the “dry test” phase (ref. Step 4.2).

7.8. Lightly tap the whole leading edge with the Hammer (rubber) (ZZ-00-00) to make sure that the erosion shield(s) is correctly located.

7.9. Apply the Positioning tool (4F6210L00851A557A) and / or the Tip positioning tool (4F6210L00551A557A) on the erosion shields. Make sure that:

- the marking on the inspection holes is centered at the joints between the shields;
- there is the distance of 2 - 3 mm (0.08 - 0.12 in) between the erosion shields;
- (If you replace the outboard erosion shield only) the distance between the outboard and the tip erosion shield and between the outboard and the inboard erosion shield is the same.

7.10. Lightly tap the whole leading edge of the tool(s) with the Hammer (rubber) (ZZ-00-00).

7.11. Tighten elastic straps on the new erosion shield(s) area as given in Step 6.2.12.

7.12. Do the consolidation of the erosion shield(s) as written in Step 6.3. Let to consolidate for minimum 4 hours.

8. **Final assembly.**

Note

If, after the second consolidation, many areas of low pressure are still present and it is necessary to apply many strips and / or patches of adhesive, we recommend to repeat the Step 7 to do one more consolidation of the erosion shield(s).

8.1. Remove the adhesive backing film or the release film from the bonding surface.

CAUTION

Use applicable gloves to prevent contaminations of the bonding surface.

8.2. Apply manual pressure on the whole bonding surface and check that the pressure on the adhesive has been properly applied (the adhesive shall appear well extended and free from wrinkles and swellings, small wrinkles are acceptable as long as the area shows an adequate pressure).

8.3. If you find areas of low pressure make on a work bench strips and / or patches of Adhesive (C191) (weight .03 and / or weight .06) and / or Adhesive (C189) (weight .06) of the necessary dimension to cover these areas (areas of lighter color) (see Fig 7).

8.4. Remove the inner backing film and apply the strips and / or patches of adhesive on the areas of low pressure.

Note

After each application of the adhesive on the areas of low pressure, apply again manual pressure on the whole bonding area to make sure if there are other areas of low pressure.

8.5. Remove the backing film from the outer surface of the adhesive strips and / or patches.

8.6. Put the erosion shield(s) over the blade bonding surface in the same position where marked during the “dry test” phase (ref. Step 4.2).

8.7. Apply the Positioning tool (4F6210L00851A557A) and / or the Tip positioning tool (4F6210L00551A557A) on the erosion shields. Make sure that:

— the marking on the inspection holes is centered at the joints between the shields;

— there is the distance of 2 - 3 mm (0.08 - 0.12 in) between the erosion shields;

— (If you replace the outboard erosion shield only) the distance between the outboard and the tip erosion shield and between the outboard and the inboard erosion shield is the same.

8.8. Lightly tap the whole leading edge of the tool(s) with the Hammer (rubber) (ZZ-00-00).

8.9. Tighten elastic straps on the new erosion shield(s) area as given in Step 6.2.12.

CAUTION

Apply the clamps only onto the elastic straps to prevent damage to the blade skin trailing edge. Do not apply the clamps on the trailing edge fairing.

8.10. Tighten one Clamp (ZZ-00-00) on each elastic strap applied on the new erosion shield(s) area and do a chordwise compaction for 30 minutes minimum.

8.11. Remove the clamps, the elastic straps and the positioning tool(s) from the main rotor blade.

9. **Adhesive curing.**

9.1. Protect from adhesive squeeze-out the boundary of the erosion shield(s) and the boundary of its bonding surface on the blade with Teflon tape (C223), upper side and lower side (see Fig 7).

9.2. (Only for outboard erosion shield replacement), protect the junction area between the positioning tool and the tip positioning tool on the replaced outboard erosion shield from adhesive squeeze-out with Teflon tape (C223), upper side and lower side (see Fig 7).

9.3. Apply the Vacuum bag sealant (Local supply) on the blade, in the area around the erosion shield(s) (see Fig 8).

9.4. Apply the Release film (C920) on the erosion shield(s) / vacuum bag area.

9.5. Put the Positioning tool (4F6210L00851A557A) and / or the Tip positioning tool (4F6210L00551A557A) on the erosion shields. Make sure that the marking on the inspection holes is centered at the joints between the shields.

9.6. Lightly tap the whole leading edge of the tool with the Hammer (rubber) (ZZ-00-00).

CAUTION

The dimension of the heating zone must be equal to the chordwise and spanwise dimension of the new erosion shield(s). This will prevent possible debondings because of overheating of the blade areas around the new erosion shield(s) and possible unbondings because of not correct curing temperature.

Note 1

The heating blanket(s) must have at least one temperature controller and one thermocouple in each heating zone. Also they must have sufficient power to ensure the required ramp rate (ref. Step 9.16) and to keep the necessary curing temperature of the adhesive.

Note 2

If many heating blankets are installed, make sure that they are adjacent to each other with no distance between them or overlaps.

9.7. If you replaced the tip erosion shield, put the Tip heating blanket (with thermocouple) (4F6210L00551A566A) in its correct position on the tip positioning tool and secure it with Teflon tape (C223).

9.8. Put the Heating Blanket (with thermocouple) (ZZ-00-00) on the positioning tool(s). Secure the blanket(s) with Teflon tape (C223).

Note

Be very careful when you install the thermocouples to make sure that the temperature measurement will be correct. Also it is recommended to install the thermocouple next to the temperature controller to monitor continuously the correct operation of the heating blanket.

9.9. Put the thermocouples on the heating blanket(s) and fix them with Vacuum bag sealant (Local supply) and Teflon tape (C223). Make sure that they touch the heating blankets correctly.

9.10. Apply two layers of Breather fabric (C917) on the heating blanket(s).

CAUTION

Protect possible edges with adhesive tape to prevent breaking of the bag.

9.11. Seal the Vacuum bag set (ZZ-00-00) and apply an initial low pressure. After 5 minutes make sure that the bag has not ruptured.

9.12. Tighten elastic straps around the airfoil on the new erosion shield(s) area as given in Step 6.2.12.

CAUTION

Apply the clamps only onto the elastic straps to prevent damage to the blade skin trailing edge. Do not apply the clamps on the trailing edge fairing.

9.13. Tighten one Clamp (ZZ-00-00) on each elastic strap applied on the new erosion shield(s) area.

Note

After approximately 30 minutes, make sure that the tightening of the clamp is correct and if necessary, restore the pressure.

9.14. Apply a pressure of 0,6 - 0,8 kg/cm^2 for a minimum of 1 hour at ambient temperature.

9.15. Remove the clamps and the elastic straps from the blade.

9.16. Move the blade into a pressure equipment and cure as follows:

— Temperature: 125 - 135°C increasing 2 - 3°C/minute;

— Time: 100 - 120 minutes;

— Pressure: 1,8 - 2,5 kg/cm^2.

Note 1

Disconnect the pressure line of the vacuum bag when you get an equivalent pressure (about 0,5 kg/cm^2) into the pressure equipment.

Note 2

The cure time starts when all the thermocouples get the necessary temperature for curing.

9.17. After curing, decrease the temperature to 60°C at 5°C/minute, disconnect the pressure and remove the blade from the pressure equipment.

9.18. Remove the vacuum bag set and other auxiliary devices from the blade.

9.19. Lightly sand to remove adhesive squeeze-out, if present, with Abrasive paper (C055), grit 240 - 320. Be careful to do only spanwise movements on the metallic surfaces.

10. **Inspection.**

Note

Refer to the applicable data modules of Maintenance Publication (89-A-AMP-00-X) for the permitted limits. If you find defects more than the permitted limits, you must replace again the erosion shield(s).

10.1. Do a visual inspection of the blade for condition.

Note

Refer to CSPP-A-60-30-02-00A-913A-C for the tap test procedure.

10.2. Do a tap inspection of the new erosion shield(s) for correct bonding. If applicable, examine the adjacent areas of the erosion shields that were not replaced for possible debondings.

10.3. Do a tap inspection of the composite surfaces around the new erosion shield, approx. 50 mm (2 in), for possible debondings.

10.4. Do the profiles and sweep angles check. Refer to 89-A-62-11-01-00A-361A-C (See Annex 5 of this TMI).

11. **Final operations.**

11.1. Reinstall the lightning bonding strip. Refer to 89-A-62-11-01-09A-720A-C.

11.2. Reinstall the swept tip erosion shield. Refer to 89-A-62-11-01-11B-720A-C.

11.3. Reinstall the outboard and the inboard butt straps. Refer to 89-A-62-11-01-14A-720A-C (See Annex 6 of this TMI).

Note

Pre-balance is necessary to give specific painting requirements (eg many layers of paint or localized application of paint) to make sure that the subsequent balance of the painted blade will be correct.

11.4. Do a preliminary static balance of the unpainted blade.

11.5. Paint the entire blade as near as possible to the weight of the surface finish (given at the preliminary static balance). Refer to 89-A-62-11-01-00A-257A-C.

11.6. Record the erosion shield(s) replacement on the blade log card each time you bond again the shield(s) (a maximum of two replacements is permitted for each erosion shield (inboard, outboard and tip)).

Requirements after job completion

1. Do the static balance of the main rotor blade. Refer to 89-A-62-11-01-00A-37DA-C.

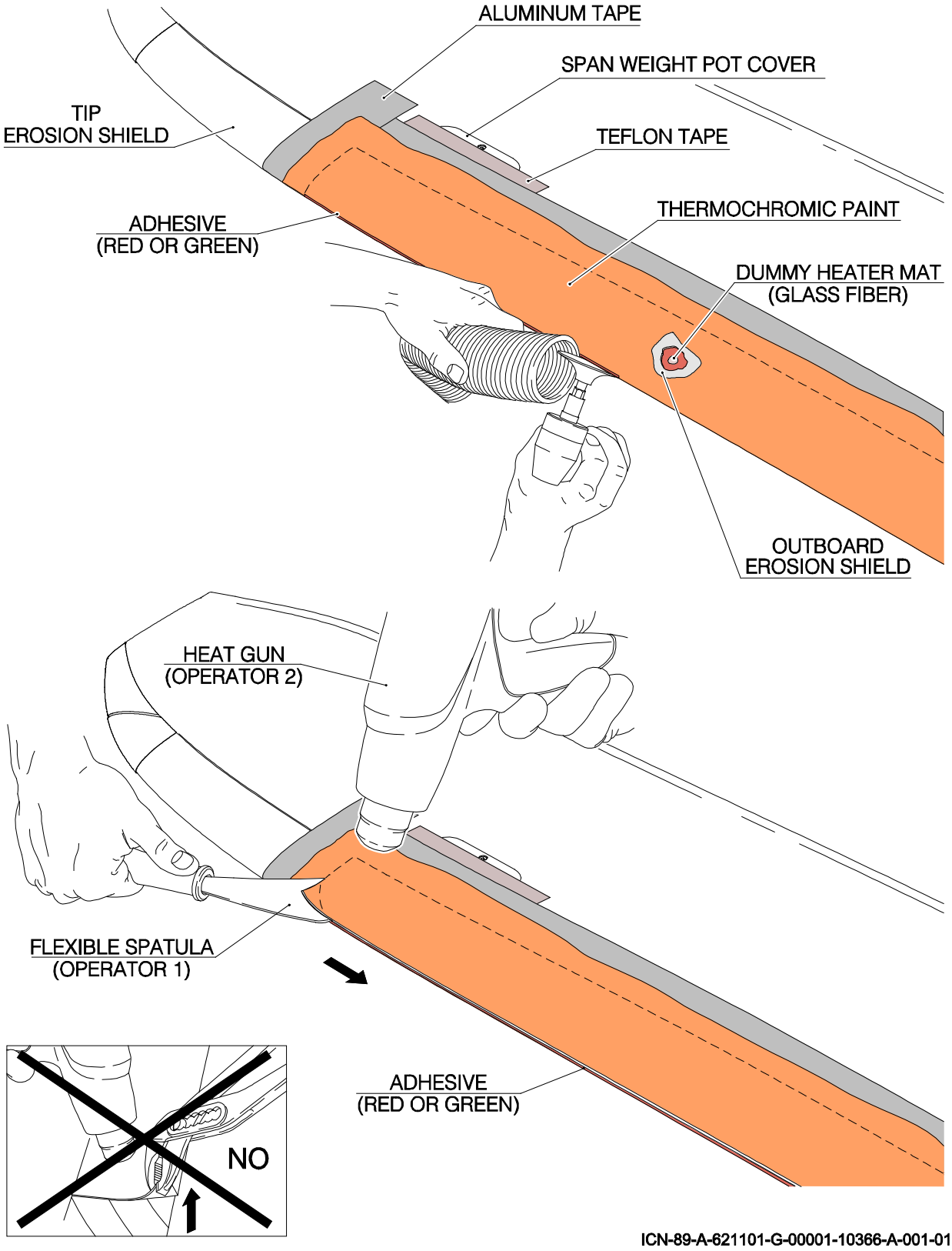
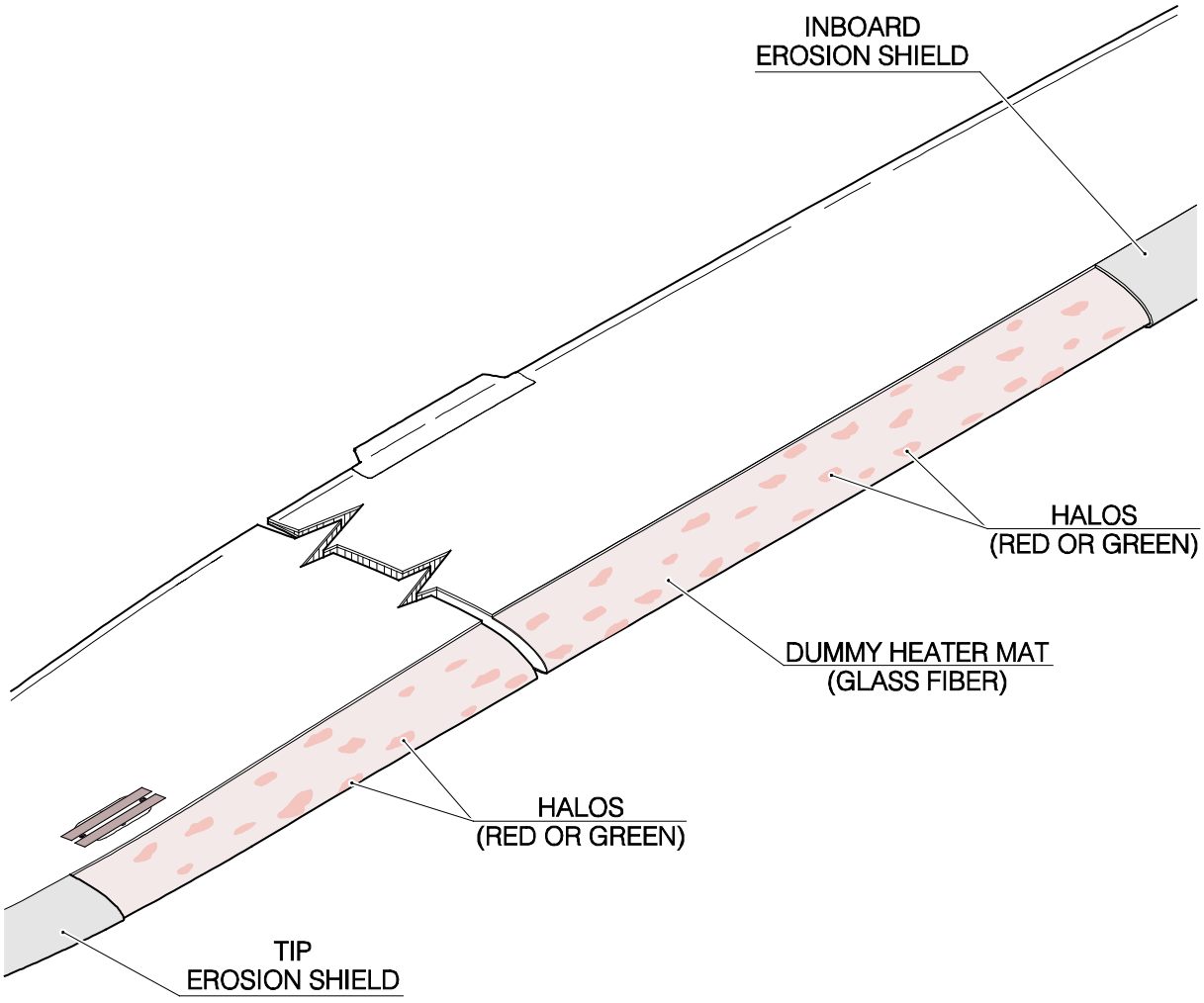


Figure 1 – Erosion shield removal (Typical).



ICN-89-A-621101-G-00001-10367-A-001-01

Figure 2 – Dummy heater mat cleaning (Typical).

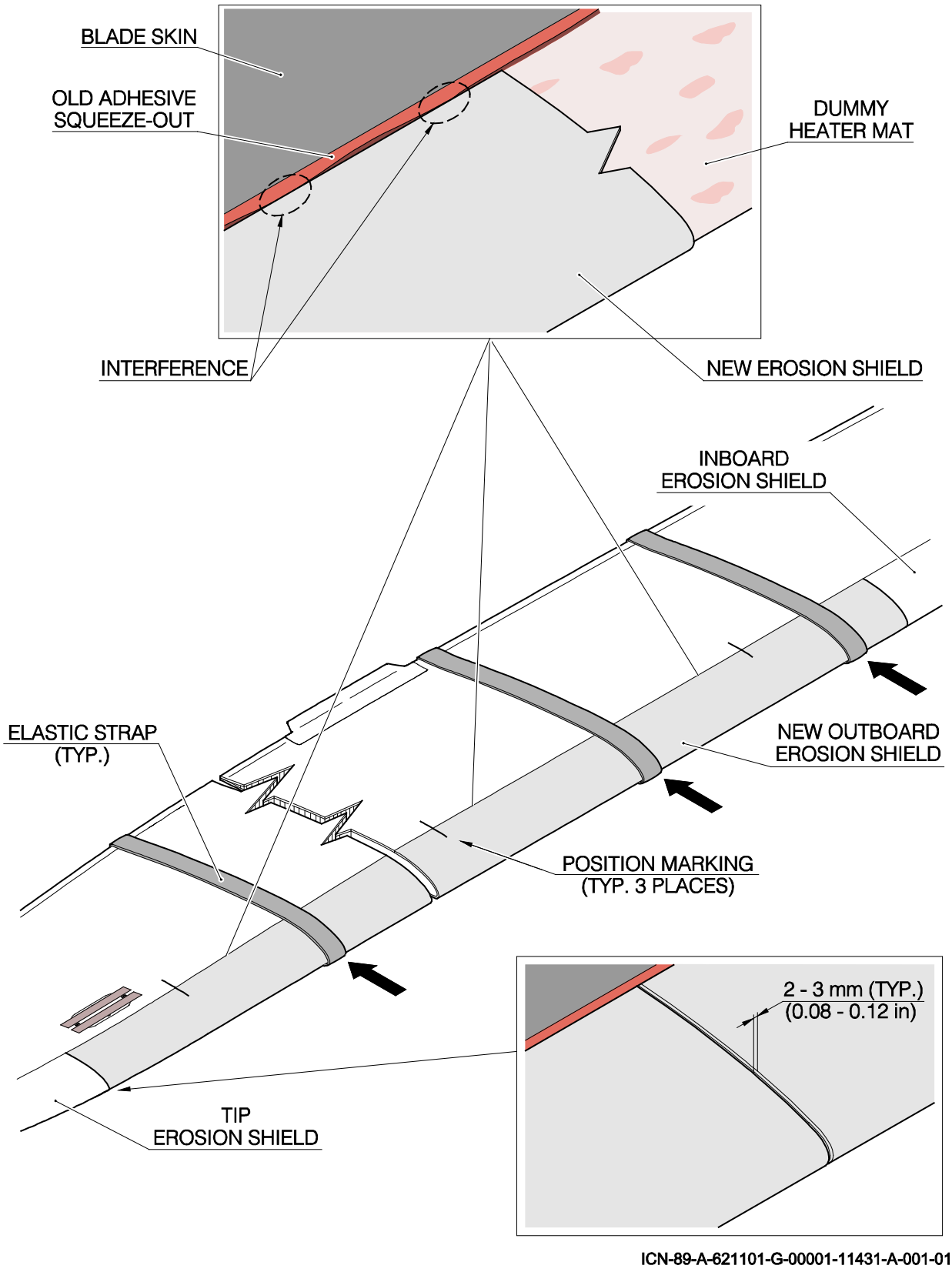
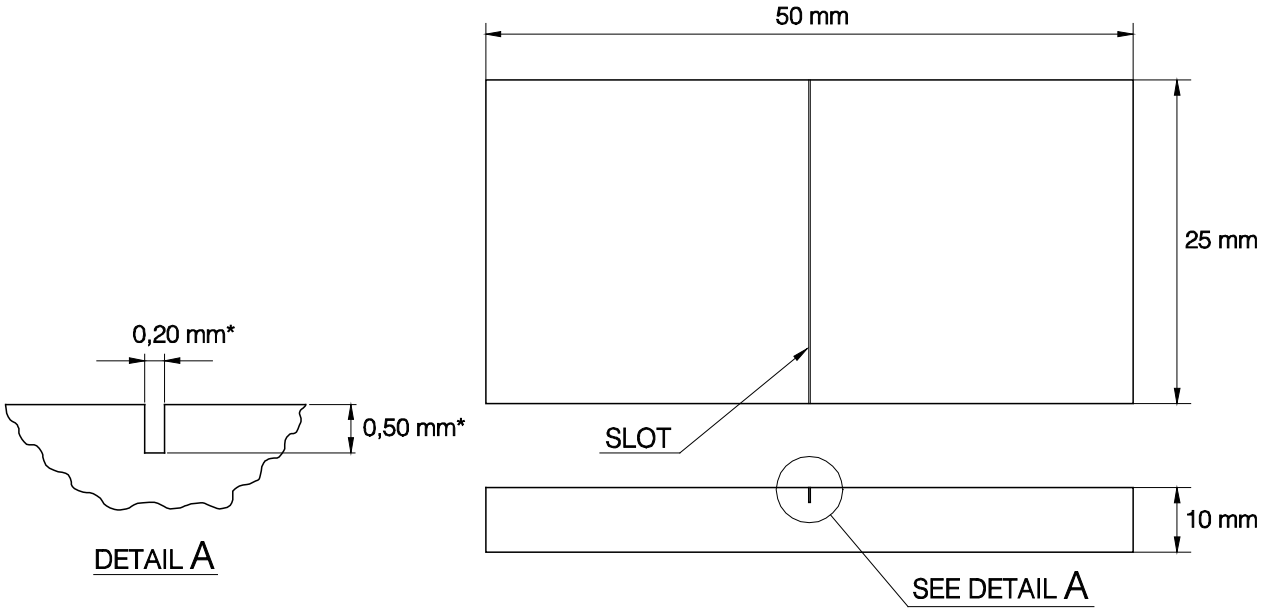
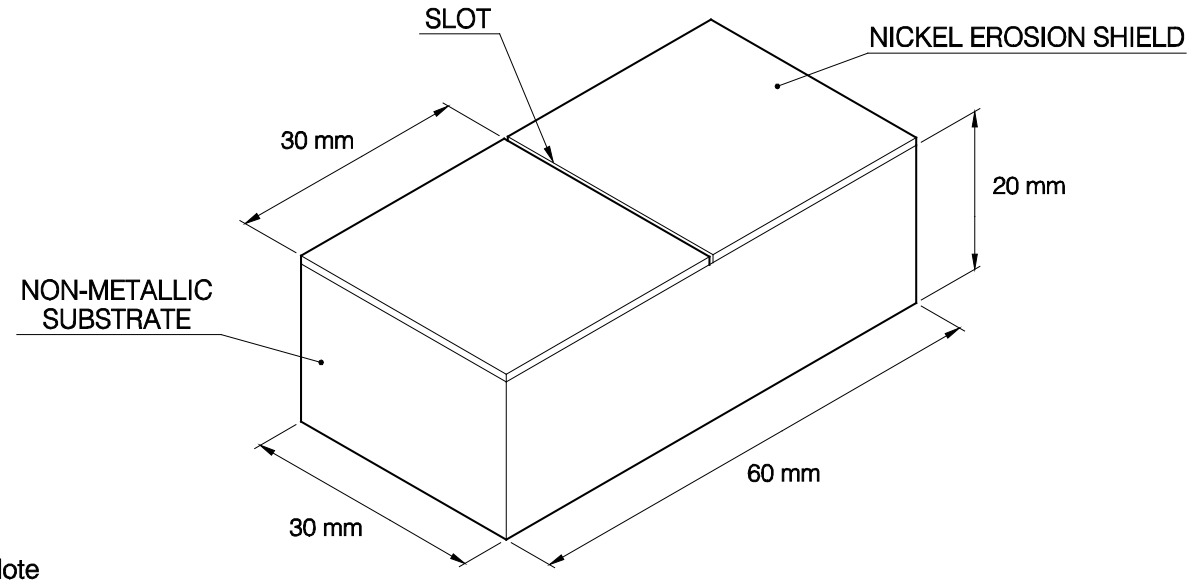


Figure 3 – Dry test (Typical).



Notes
- The dimensions are in mm with ± 0,7 mm of tolerances for all the dimensions apart from those of the notch (*) that must be not higher than ± 0,02 mm; the surfaces must be flat and parallel within ± 0,05 mm; the roughness must be equal or better than 63 RMS.
- The reference notch must be carried out by machining or EDM.

TITANIUM REFERENCE STANDARD
(FOR OUTBOARD EROSION SHIELD INSPECTION)

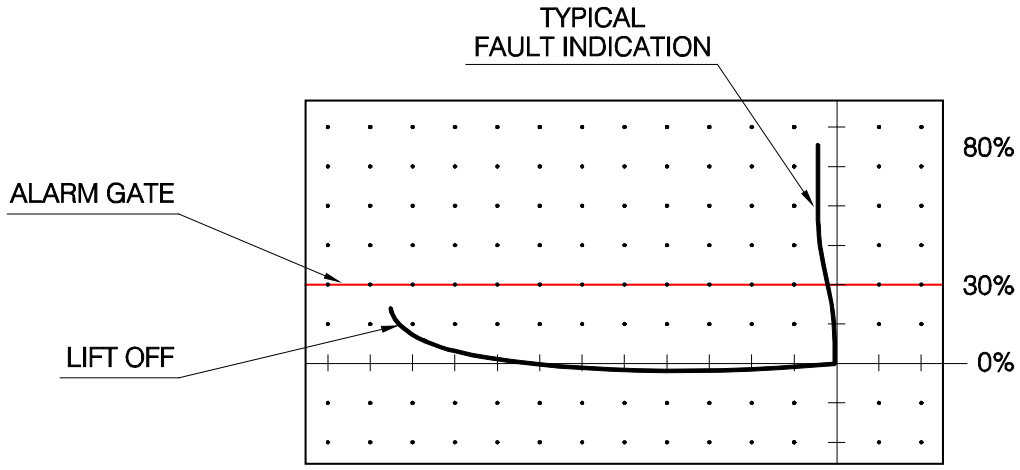


Note
- Manufacture from scrap Nickel erosion shield, butt edges together as closely as physically possible and bond onto non-metallic substrate.

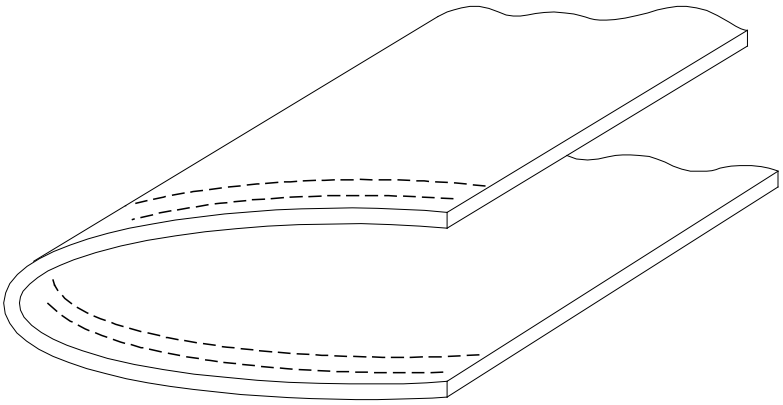
NICKEL REFERENCE STANDARD
(FOR TIP EROSION SHIELD INSPECTION)

ICN-89-A-621101-G-00001-11451-A-001-01

Figure 4 – Eddy current inspection (only for trimmed erosion shield) (sheet 1 of 2).



SET UP SCREEN INDICATIONS



---- = SCAN PATTERN AFTER TRIMMING OF THE EDGE

SCAN PATTERN

ICN-89-A-621101-G-00001-11452-A-001-01

Figure 4 – Eddy current inspection (only for trimmed erosion shield) (sheet 2 of 2).

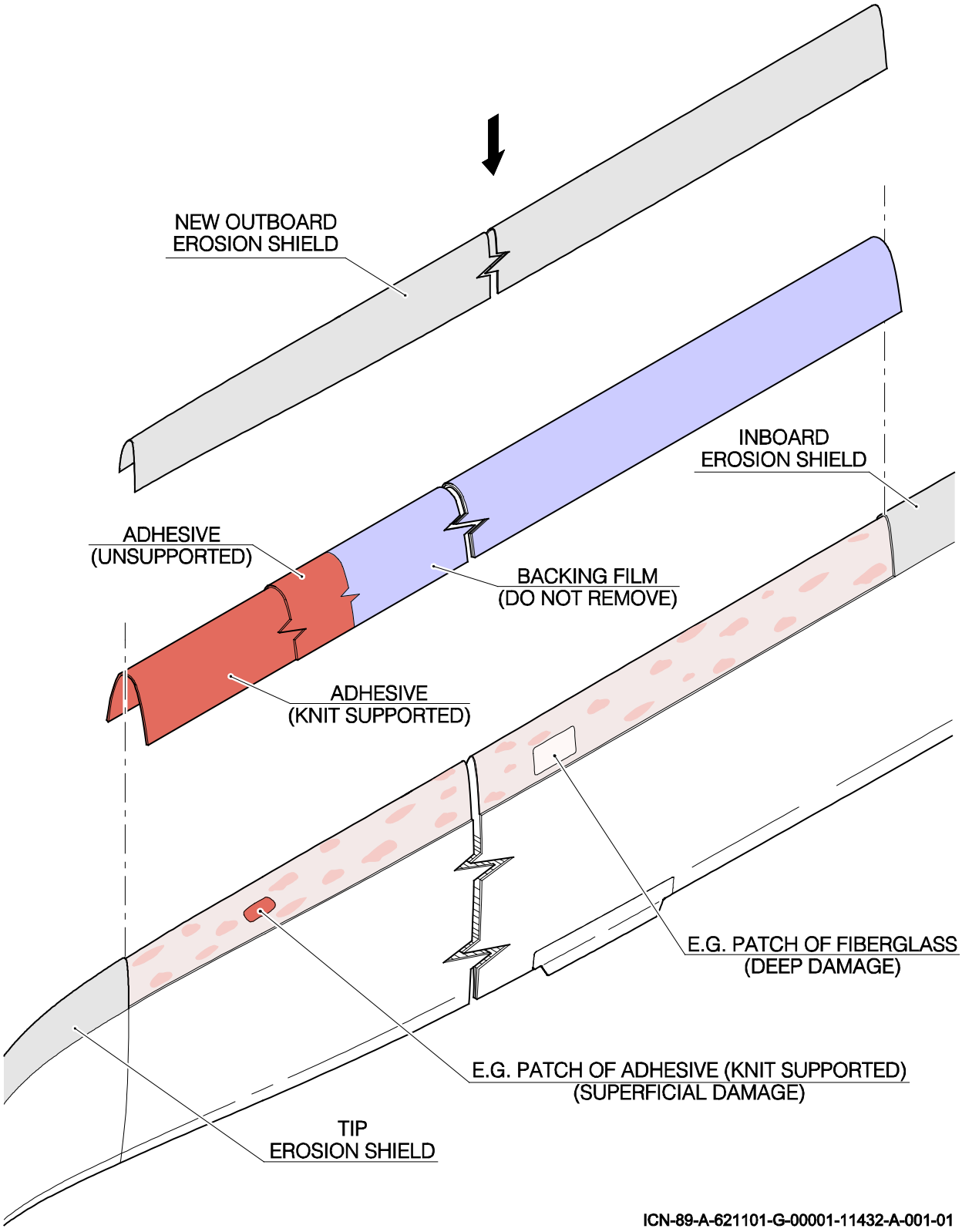


Figure 5 – First adhesive application (Typical) (sheet 1 of 2).

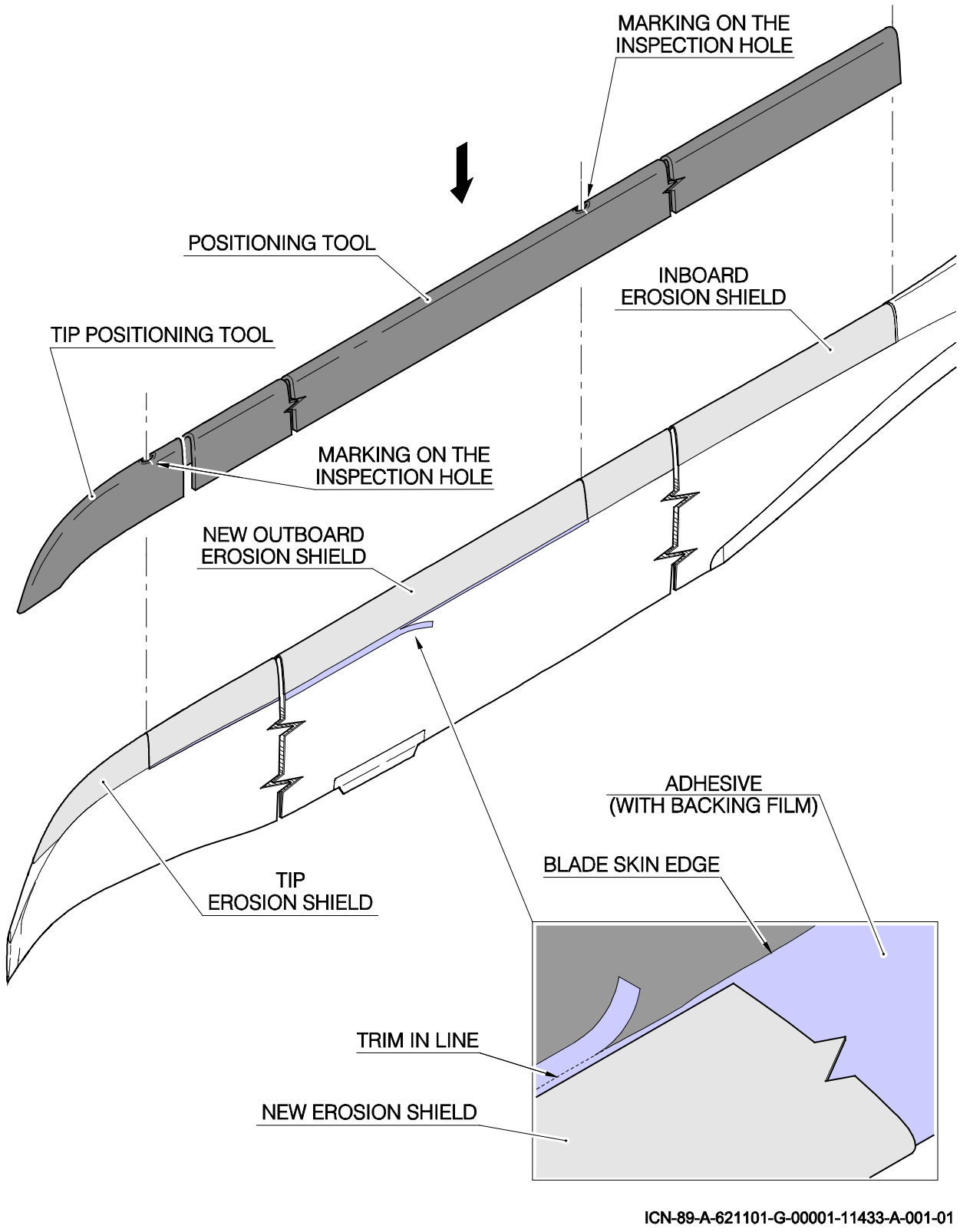


Figure 5 – First adhesive application (Typical) (sheet 2 of 2).

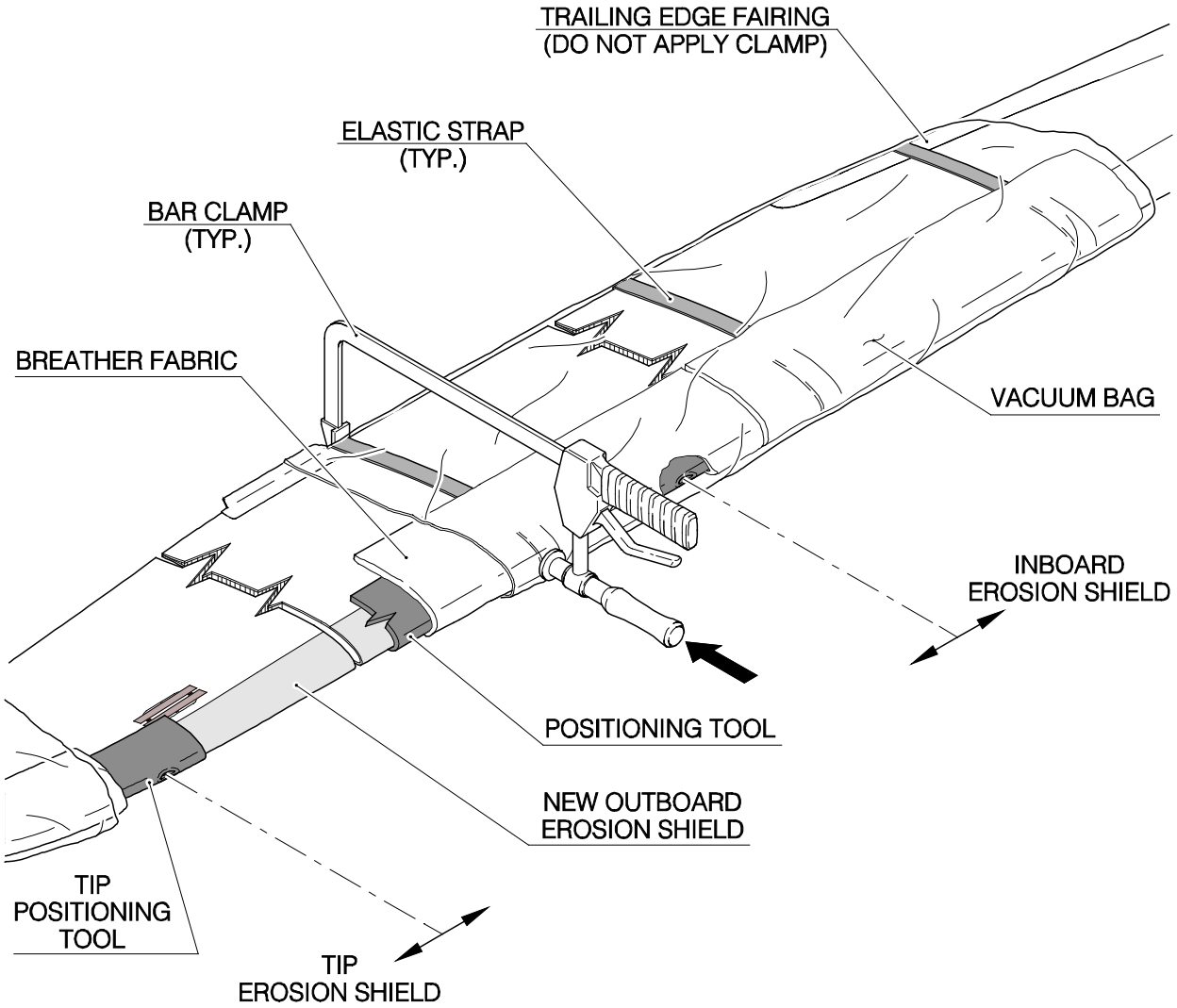


Figure 6 – Consolidation (Typical).

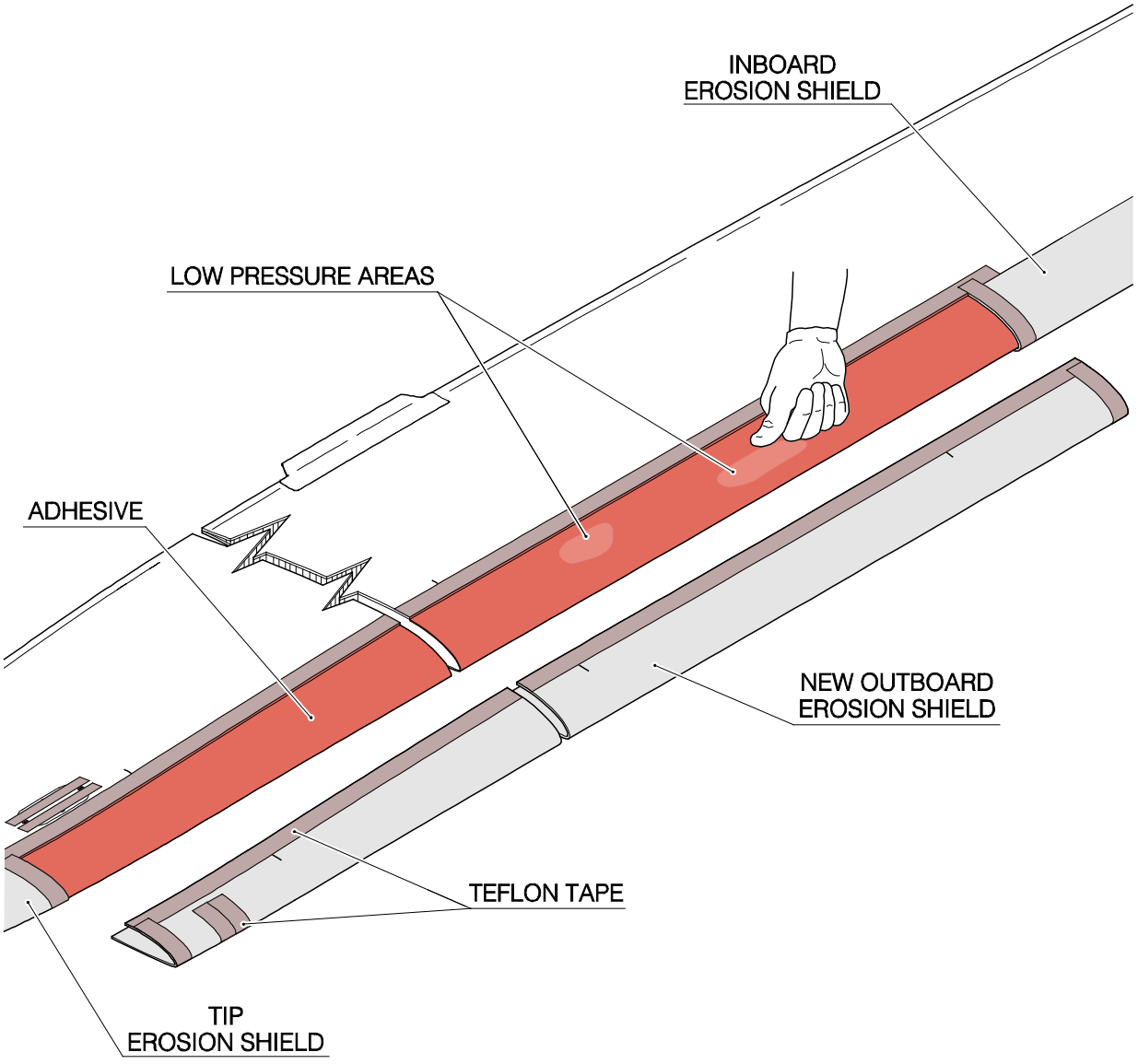


Figure 7 – Low pressure areas check (Typical).

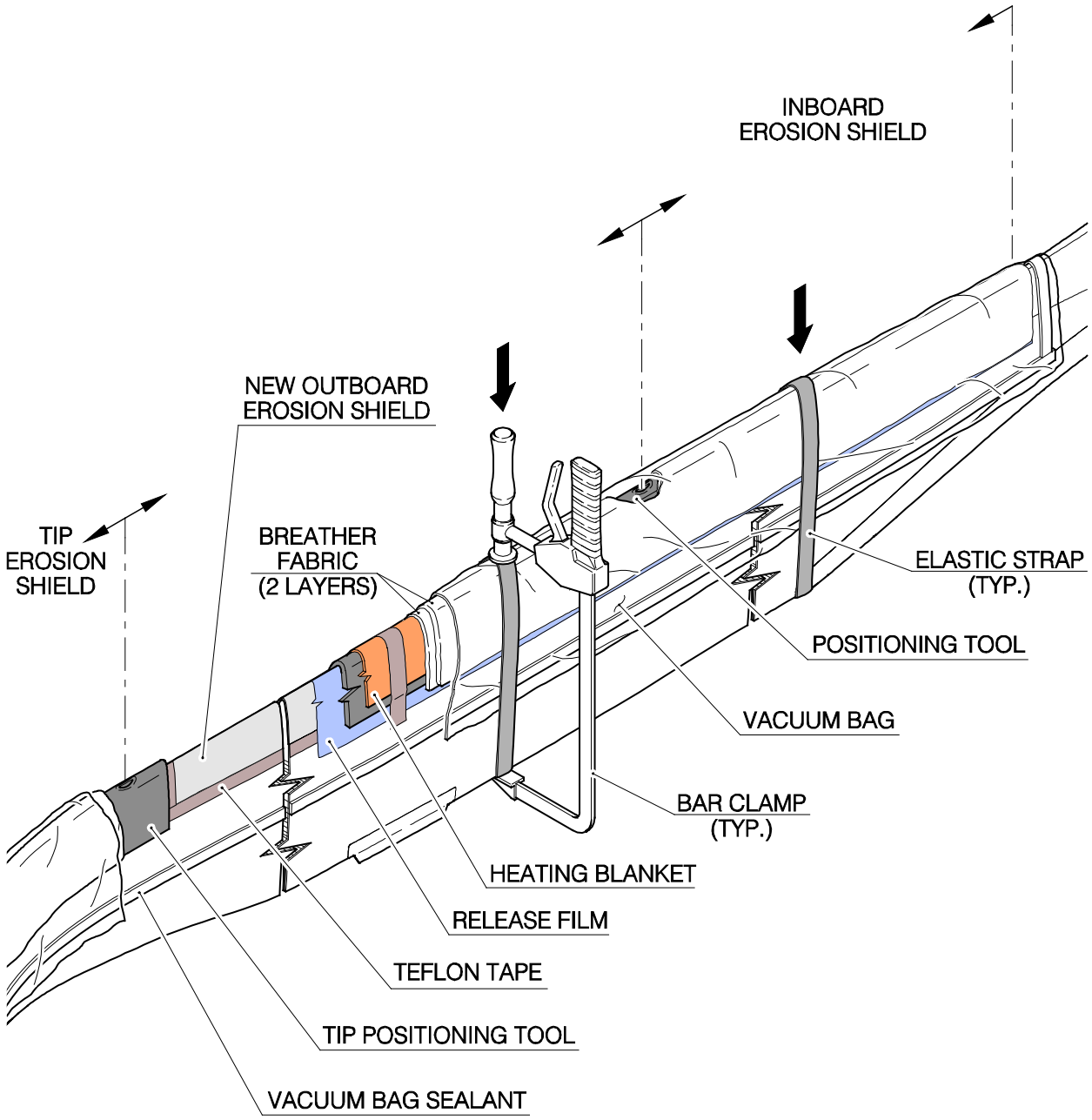


Figure 8 – Final assembly (Typical).

Annex 2

Metal components (surface preparation for bonding) - Other procedure to protect surfaces

Table of contents

List of tables

References

Table 1 References

Data Module	Title
89-A-00-50-00-00A-010A-D	Local supply consumables, materials and expendables - General data

Table 2 Access points

Access Panel / Door Id	Data Module
No Access Point	

Table 3 Zones

Access Panel / Door Id	Data Module
No Zones	

Preliminary requirements

Required conditions

Table 4 Required conditions

Condition	Data Module/Technical Publication
None	

Support equipment

Table 5 Support equipment

Nomenclature	Identification No.	Qty
None		

Supplies

Table 6 Supplies

Nomenclature	Identification No.	Qty
Solvent	C005	A.R.
Lint-free cloth	C011	A.R.
Isopropyl alcohol	C039	A.R.
Acetone	C087	A.R.
Solvent	C133	A.R.
Solvent	C151	A.R.
Adhesive	C189	A.R.
Nitric acid	C283	A.R.
Cleaner, alkaline	C453	A.R.
Abrasive pad	C460	A.R.
Adhesive	C533	A.R.
Primer	C534	A.R.
Primer	BR127	A.R.
Sodium hydroxide	Local supply	A.R.
Hydrogen peroxide	Local supply	A.R.
Hydrofluoric acid	Local supply	A.R.
Water (distilled or demineralized)	Local supply	A.R.

Spares

Table 7 Spares

Nomenclature	Identification No.	Qty
None		

Safety conditions

WARNING

The materials that follow are dangerous. Before you do this procedure, make sure that you know all the safety precautions and first aid instructions for these materials:

- **Solvent (C005)**
- **Isopropyl alcohol (C039)**
- **Acetone (C087)**
- **Solvent (C133)**
- **Solvent (C151)**
- **Adhesive (C189)**
- **Nitric acid (C283)**
- **Cleaner, alkaline (C453)**
- **Adhesive (C533)**
- **Primer (C534)**
- **Primer (BR127)**
- **Sodium hydroxide (Local supply)**
- **Hydrogen peroxide (Local supply)**
- **Hydrofluoric acid (Local supply).**

WARNING

The hydrogen peroxide is a strong oxidizing agent. Operators must be very careful when they handle it to prevent possible burns to the skin.

Procedure

Note

The procedure that follows is valid for the components made of Titanium and Titanium alloys.

1. Remove all grease from the surfaces of the component with one of these methods:

1.1. Vapor degreasing:

CAUTION

Make sure that the immersion time of the component in the solvent vapor phase is not more than 30 minutes.

Note 1

Before you do the vapor degreasing procedure, do the swab degreasing procedure (Step 1.2) to remove all signs of marking inks from the component.

Note 2

To do the vapor degreasing procedure also refer to DM CSPP-A-60-10-01-00A-251A-C.

Note 3

There must be no traces of acid in the condensate.

1.1.1. Vapor degrease the part with one of the solvents that follow for 10 to 25 minutes. Make sure to keep the boiling temperatures in the ranges indicated below:

— Solvent (C133): 87 to 90 °C;

— Solvent (C151): 120 to 124 °C.

1.2. Swab degreasing:

1.2.1. Clean the part fully with the Lint-free cloth (C011) moist with Solvent (C005) or Acetone (C087) or Isopropyl alcohol (C039) with particular care into holes and recesses. Turn the cloth frequently.

1.2.2. Do again the cleaning operations with a new cloth until no dirt or grease is visible on the part or the cloth.

Note

Before you continue with the next operation, make sure that the solvent has fully evaporated.

1.2.3. Let the part dry for 5 minutes or until the solvent fully evaporates. If necessary, use a low pressure, clean, dry air supply.

2. Clean the component spanwise with the Abrasive pad (C460) moist in a solution with 40 - 50 g/l of Cleaner, alkaline (C453) in water.

3. Mount the component onto an applicable tool or attach it to CRES wires.

4. Do the alkaline cleaning of the part as follows:

Note

As an alternative of the Cleaner, alkaline (C453), you can use the cleaner TURCO 4215 NCLT. If you use the cleaner TURCO 4215 NCLT, the mixing ratio must be 30 - 60 g/l.

4.1. Prepare the alkaline cleaning solution with this mixing ratio:

— Alkaline cleaner (C453): 40 - 50 g/l;

— Water (distilled or demineralized) (Local supply): to 1 litre.

Note

If you use the cleaner TURCO 4215 NCLT, soak the component for approximately 5 - 30 minutes at the temperature of 45 to 60 °C.

4.2. Soak the component in the alkaline cleaning solution for approximately 5 - 10 minutes at the temperature of 65 to 75 °C, with the air agitation system set to on, if necessary.

Note

A water-break free surface is a surface that remains without any breaks in the water film for 15 seconds minimum.

5. Flush the component fully in clean cold Water (distilled or demineralized) (Local supply). Make sure that all alkaline cleaning solution is removed and the component surface is water-break free. This is to make sure that the component is correctly clean. If you find water-breaks do again Step 2 thru Step 4 until you get a water-break-free surface.

Note

The pickle solution must be contained in a polypropylene lined tank or a tank made of a similarly inert lining. The tank must be sufficiently ventilated.

6. Prepare the pickle solution with this mixing ratio:

— Nitric Acid (C283) (SG 1.42): 200 - 260 ml/l

— Hydrofluoric Acid (Local supply) (40%): 40 - 50 ml/l

— Water (distilled or demineralized) (Local supply): to 1 litre.

7. Put the part fully into the pickle solution (Ref. Step 6) at ambient temperature for 30 - 60 seconds from the time when the component starts to fizz. If the component does not react after more than 1 minute, contact the pertinent authority to make the analysis of the solution for the hydrofluoric acid content.

8. Flush fully the component in cold, clean, Water (distilled or demineralized) (Local supply) until all the pickle solution is removed.

CAUTION

If the etch solution must be used again within one hour, it must be analyzed for hydrogen peroxide content and the necessary quantity of hydrogen peroxide must be added immediately before use. If the interval is more than one hour or the solution must be used not frequently, the full quantity of hydrogen peroxide must be added before use.

Note 1

The interval between the pickling and the etching must not be more than 30 minutes.

Note 2

The etch solution must be contained in a polypropylene lined tank with an applicable heating system and the thermostat set at 65 - 70 °C. The tank must be have a sufficient ventilation and agitation system.

Note 3

The hydrogen peroxide decomposes quickly during the process. Be careful to add the hydrogen peroxide immediately before you put fully the component into the etch solution.

9. Prepare the etch solution with this mixing ratio:

— Sodium Hydroxide: 20 g/l

— Hydrogen Peroxide (100 vols): 22.5 ml/l, or Hydrogen Peroxide, 35%: 19.3 ml/l

— Water (distilled or demineralized) (Local supply): to 1 litre.

10. Make sure that the solution is filtered continuously to keep constant the level of the precipitate. As an alternative method, if a continuous filtration is not possible, do as follows:

10.1. Use heat to increase the temperature of the bath to 60 °C.

10.2. Add the hydrogen peroxide with the air agitation system set to on.

10.3. Set the air agitation system to off and wait until the bath gets to a constant temperature in the given permitted limits.

10.4. When the temperature is stable, you can do the etching procedure (Ref. Step 11).

Note

If necessary, a small quantity of hydrogen peroxide must be added during the etching process to keep the correct reaction rate.

11. Etch the component in the etch solution (Ref. Step 9) for 10 -0/+1 minutes at a temperature between 65 and 70 °C.

12. Flush the component in cold, clean Water (distilled or demineralized) (Local supply) until all the etch solution is removed.

13. Remove the component from the mounting tool or from the CRES wires and put it on a clean, flat surface covered with clean lint-free cloth or paper. Be careful to avoid contact with the bonding surfaces.

14. Clean the component with clean, lint-free paper only. Apply long, continuous strokes to remove the unwanted water from the surfaces. Let the component air dry.

15. Examine the etched surfaces, do as follows:

15.1. Examine the surface for presence of a thin continuous oxide layer on the surface of the titanium.

15.2. Make sure that the oxide layer has visually changed the color of the titanium surface. Make sure that you agree with these conditions:

— Permitted colors in order of preference are grey, blue, purple, mauve and yellow.

— Very pale color gradients are not permitted.

— Colors or shades affected by water staining are permitted.

— Variations in the color (or shade) of the layer are permitted.

Note

Apply the primer on the part in 2 hours after the treatment.

16. Protect the components until you apply the primer to prevent contamination of the etched surfaces.

WARNING

You must apply the primer compatible with the adhesive that will be used for the bonding of the part:

- **Use Primer (BR127) for Adhesive (C533);**
- **Use Primer (C534) for Adhesive (C189).**

17. Apply one equal layer of Primer (BR127) or Primer (C534), at ambient temperature, on the surfaces to be bonded.

18. Cure the primer according to one of the methods that follow:

— at ambient temperature for 30 minutes, then for 55 to 65 minutes at a temperature between 115 and 125 °C;

— at ambient temperature for minimum 120 minutes.

19. To get the correct preservation, pack the part into a hermetically sealed bag or wrap it in clean paper to prevent dust, grease and humidity contamination.

Requirements after job completion

None

Annex 3

Metal components (surface preparation for bonding) - Other procedure to protect surfaces

Table of contents

List of tables

References

Table 1 References

Data Module	Title
89-A-00-50-00-00A-010A-D	Local supply consumables, materials and expendables - General data
89-A-ZZ-00-00-00A-066A-A	Local supply support equipment and tools – Support equipment and tools data

Table 2 Access points

Access Panel / Door Id	Data Module
No Access Point	

Table 3 Zones

Access Panel / Door Id	Data Module
No Zones	

Preliminary requirements

Required conditions

Table 4 Required conditions

Condition	Data Module/Technical Publication
None	

Support equipment

Table 5 Support equipment

Nomenclature	Identification No.	Qty
Blasting equipment (dry/vacuum type)	ZZ-00-00	1 EA
Blasting equipment (wet/vapour type)	ZZ-00-00	1 EA

Supplies

Table 6 Supplies

Nomenclature	Identification No.	Qty
Solvent	C005	A.R.
Lint-free cloth	C011	A.R.
Quartz wet abrasive blasting	C182	A.R.
Adhesive	C189	A.R.
Solvent	C450	A.R.
Cleaner, alkaline	C453	A.R.
Adhesive	C533	A.R.
Primer	C534	A.R.
Primer	BR127	A.R.
Abrasive blast (No. 180 - aluminum oxide)	Local supply	A.R.
Abrasive blast (No. 220 - aluminum oxide)	Local supply	A.R.
Sodium phosphate tribasic, technical (O-S-642, Type I)	Local supply	A.R.
Potassium fluoride	Local supply	A.R.
Hydrofluoric acid	Local supply	A.R.
Water (distilled or demineralized)	Local supply	A.R.

Spares

Table 7 Spares

Nomenclature	Identification No.	Qty
None		

Safety conditions

WARNING

The materials that follow are dangerous. Before you do this procedure, make sure that you know all the safety precautions and first aid instructions for these materials:

— **Solvent (C005)**
— **Adhesive (C189)**
— **Solvent (C450)**
— **Cleaner, alkaline (C453)**
— **Adhesive (C533)**
— **Primer (C534)**
— **Primer (BR127)**
— **Sodium phosphate tribasic, technical (Local supply)**
— **Potassium fluoride (Local supply)**
— **Hydrofluoric acid (Local supply).**

Procedure

Note

The procedure that follows is valid for the components made of Titanium and Titanium alloys.

1. Clean the component fully, do as follows:

Note

Only the manual degrease is permitted.

1.1. Apply a large quantity of Solvent (C005) on the part with a brush or other applicable device. Move the brush in different directions to let the solvent remove the dirt fully. The cleaning area must not be too large.

1.2. Before the solvent has evaporated, rub the wet surfaces with a clean Lint-free cloth (C011) to absorb the contaminated solvent, until the surface is fully dry.

1.3. Do again these steps on the same area with solvent and clean cloths until the surfaces are free from haloes.

1.4. Do again these operations on the remaining dirty or greasy areas until all the surfaces are equally clean.

2. Prepare the bonding surfaces of the component in one of the ways that follow:

Note

Grit blasted surfaces must be equally treated, with no areas without treatment.

2.1. Abrade the bonding surfaces with the Blasting equipment (dry/vacuum type) (ZZ-00-00) operated with Abrasive blast (No. 180 - aluminum oxide) (Local supply) or Abrasive blast (No. 220 - aluminum oxide) (Local supply) at a pressure less than 345 kPa (50 psi).

2.2. Abrade the bonding surfaces with the Blasting equipment (wet/vapour type) (ZZ-00-00) operated with Quartz wet abrasive blasting (C182) at a maximum pressure of 552 kPa (80 psi).

3. Do the alkaline cleaning with Solvent (C450) or Cleaner, alkaline (C453), refer to the related manufacturer's instructions.

4. After the alkaline cleaning fully rinse the part. We recommend to rinse in a tank with tap water for at least 5 minutes, then put fully in deionized water at a temperature less than 70 °C (158 °F) for 2 to 4 minutes.

5. Mount the component onto an applicable tool or attach it to CRES wires.

6. Do the phosphate-fluoride treatment of the part as follows:

Note 1

Pierced and solid stainless steel containers must be insulated to prevent possible electrical contact.

Note 2

The solution must be maintained at ambient temperature.

6.1. Prepare the phosphate-fluoride solution with this mixing ratio:

— Sodium phosphate tribasic, technical (Local supply): 49 to 52 g/l;

— Potassium fluoride (Local supply): 19 to 22 g/l;

— Hydrofluoric acid (70%) (Local supply): 17 to 20 g/l.

— Water (distilled or demineralized) (Local supply): to 1 litre.

Note

The solution must be analyzed and the total acid content must be maintained at a concentration of 1.5 to 1.9%. To do this, add proportional quantities of the constituent materials as necessary.

6.2. Put the part fully into the phosphate-fluoride solution for 2 minutes (± 30 seconds) at ambient temperature.

6.3. After the phosphate-fluoride treatment fully rinse the part in a tank with water at ambient temperature.

Note

The warm water used for this immersion must not be used for other purpose.

7. Fully rinse the part in a tank with warm water at a temperature between 63 and 68 °C (145 and 154 °F) for 14 to 16 minutes.

8. Do the final rinse of the component in water at a temperature from ambient to 70 °C (158 °F) for 30 to 60 seconds.

9. Dry the part in air at temperature from ambient to 70 °C (158 °F), until the visible surface moisture is removed.

10. Remove the component from the mounting tool or from the CRES wires.

11. Examine the treated surfaces and make sure that:

— The surface is smooth and equal.

— The color is grey to black.

— There is no white dust after drying.

— There are no black residues when you lightly rub the surface with a clean dry Lint-free cloth (C011).

— No bare areas or without treatment are present on the bonding surface.

Note

Apply the primer on the part in 8 hours after the treatment.

12. Protect the components until you apply the primer to prevent contamination of the treated surfaces.

WARNING

You must apply the primer compatible with the adhesive that will be used for the bonding of the part:

- **Use Primer (BR127) for Adhesive (C533);**
- **Use Primer (C534) for Adhesive (C189).**

13. Apply one equal layer of Primer (BR127) or Primer (C534), at ambient temperature, on the surfaces to be bonded.

14. Cure the primer according to one of the methods that follow:

— at ambient temperature for 30 minutes, then for 55 to 65 minutes at a temperature between 115 and 125 °C;

— at ambient temperature for minimum 120 minutes.

15. To get the correct preservation, pack the part into a hermetically sealed bag or wrap it in clean paper to prevent dust, grease and humidity contamination.

Requirements after job completion

None

Annex 4

Metal components (surface preparation for bonding) - Other procedure to protect surfaces

Table of contents

List of tables

References

Table 1 References

Data Module	Title
89-A-00-50-00-00A-010A-D	Local supply consumables, materials and expendables - General data
89-A-ZZ-00-00-00A-066A-A	Local supply support equipment and tools – Support equipment and tools data

Table 2 Access points

Access Panel / Door Id	Data Module
No Access Point	

Table 3 Zones

Access Panel / Door Id	Data Module
No Zones	

Preliminary requirements

Required conditions

Table 4 Required conditions

Condition	Data Module/Technical Publication
None	

Support equipment

Table 5 Support equipment

Nomenclature	Identification No.	Qty
Blasting equipment (dry/vacuum type)	ZZ-00-00	1 EA

Supplies

Table 6 Supplies

Nomenclature	Identification No.	Qty
Solvent	C005	A.R.
Lint-free cloth	C011	A.R.
Isopropyl alcohol	C039	A.R.
Acetone	C087	A.R.
Solvent	C133	A.R.
Solvent	C151	A.R.
Cleaner, alkaline	C453	A.R.
Abrasive pad	C460	A.R.
Primer	C534	A.R.
Sodium dichromate	C594	A.R.
Abrasive blast (No. 180 - aluminum oxide)	Local supply	A.R.
Abrasive blast (No. 220 - aluminum oxide)	Local supply	A.R.
Sulphuric acid	Local supply	A.R.
Ferric chloride	Local supply	A.R.
Hydrochloric acid	Local supply	A.R.
Water (distilled or demineralized)	Local supply	A.R.

Spares

Table 7 Spares

Nomenclature	Identification No.	Qty
None		

Safety conditions

WARNING

The materials that follow are dangerous. Before you do this procedure, make sure that you know all the safety precautions and first aid instructions for these materials:

- **Solvent (C005)**
- **Isopropyl alcohol (C039)**
- **Acetone (C087)**
- **Solvent (C133)**
- **Solvent (C151)**
- **Cleaner, alkaline (C453)**
- **Primer (C534)**
- **Sodium dichromate (C594)**
- **Sulphuric acid (Local supply)**
- **Ferric chloride (Local supply)**
- **Hydrochloric acid (Local supply).**

WARNING

Operators must obey all the safety precautions (e.g. wearing rubber gloves and safety glasses) during preparation or use of the etching solutions.

CAUTION

Do not touch the bonding surfaces after cleaning operations even if you wear protective gloves.

Procedure

Note

The procedure that follows is valid for the components made of Nickel and Nickel alloys.

1. Remove all grease from the surfaces of the component with one of these methods:

1.1. Vapor degreasing:

CAUTION

Make sure that the immersion time of the component in the solvent vapor phase is not more than 30 minutes.

Note 1

Before you do the vapor degreasing procedure, do the swab degreasing procedure (Step 1.2) to remove all signs of marking inks from the component.

Note 2

To do the vapor degreasing procedure also refer to DM CSPP-A-60-10-01-00A-251A-C.

Note 3

There must be no traces of acid in the condensate.

1.1.1. Vapor degrease the part with one of the solvents that follow for 10 to 25 minutes. Make sure to keep the boiling temperatures in the ranges indicated below:

— Solvent (C133): 87 to 90 °C;

— Solvent (C151): 120 to 124 °C.

1.2. Swab degreasing:

1.2.1. Clean the part fully with the Lint-free cloth (C011) moist with Solvent (C005) or Acetone (C087) or Isopropyl alcohol (C039) with particular care into holes and recesses. Turn the cloth frequently.

1.2.2. Do again the cleaning operations with a new cloth until no dirt or grease is visible on the part or the cloth.

Note

Before you continue with the next operation, make sure that the solvent has fully evaporated.

1.2.3. Let the part dry for 5 minutes or until the solvent fully evaporates. If necessary, use a low pressure, clean, dry air supply.

2. Abrade the bonding area of the component with the Blasting equipment (dry/vacuum type) (ZZ-00-00) operated with Abrasive blast (No. 180 - aluminum oxide) (Local supply) or Abrasive blast (No. 220 - aluminum oxide) (Local supply) at a pressure of 280 ±35 kPa (40 ±5 psi). Use jigs where they are applicable.

3. Clean the component spanwise with the Abrasive pad (C460) moist in a solution with 40 - 50 g/l of Cleaner, alkaline (C453) in water.

4. Flush the component with clean, cold Water (distilled or demineralized) (Local supply).

Note

The Jigs may be manufactured from, or coated with nylon, polythene or polypropylene.

5. Mount the component onto an applicable tool or attach it to CRES wires.

6. Do the alkaline cleaning of the part as follows:

Note

As an alternative of the Cleaner, alkaline (C453), you can use the cleaner TURCO 4215 NCLT. If you use the cleaner TURCO 4215 NCLT, the mixing ratio must be 30 - 60 g/l.

6.1. Prepare the alkaline cleaning solution with this mixing ratio:

— Alkaline cleaner (C453): 40 - 50 g/l;

— Water (distilled or demineralized) (Local supply): to 1 litre.

Note

If you use the cleaner TURCO 4215 NCLT, soak the component for approximately 5 - 30 minutes at the temperature of 45 to 60 °C.

6.2. Soak the component in the alkaline cleaning solution for approximately 5 - 10 minutes at the temperature of 65 to 75 °C, with the air agitation system set to on, if necessary.

Note

A water-break free surface is a surface that remains without any breaks in the water film for 15 seconds minimum.

7. Flush the component fully in clean cold Water (distilled or demineralized) (Local supply). Make sure that all alkaline cleaning solution is removed and the component surface is water-break free. This is to make sure that the component is correctly clean.

8. If you find water-breaks repeat the preparation from Step 6, or if necessary, from Step 3 until you get a water-break-free surface.

Note

The etching solutions must be kept in a polypropylene or other chemical resistant non-metallic lined tank. The solution must be used at ambient temperature and it must be shaked before use. The tank must be equipped with a fume extraction system or used in an area with sufficient fume extraction.

9. Prepare the ferric chloride etch solution with this mixing ratio:

— Ferric chloride (Local supply) ($FeCl_3$): 150 - 200 g/l, or ($FeCl_3.6H_2O$): 250 - 300 g/l

— Hydrochloric acid (Local supply) (36% w/w HCl): 155 - 170 ml/l

— Water (distilled or demineralized) (Local supply): to 1 litre.

10. Put the part fully into the ferric chloride solution (Ref. Step 9) at ambient temperature for 150 - 160 seconds.

11. Flush the part with clean, cold Water (distilled or demineralized) (Local supply)..

12. Prepare the Dichromate etch/desmut solution with this mixing ratio:

— Sodium dichromate (C594) ($Na_2Cr_2O_7.2H_20$): 20 - 30 g/l

— Sulphuric acid (Local supply) (SG 1.84): 150 ml/l

— Water (distilled or demineralized) (Local supply): to 1 litre.

13. De-smut the component in the Dichromate solution (Ref. Step 12) for 120 - 130 seconds.

14. Flush with clean, cold Water (distilled or demineralized) (Local supply).

15. Remove the component from the mounting tool or from the CRES wires and put it on a clean, flat surface covered with clean lint-free cloth or paper. Be careful to avoid contact with the bonding surfaces.

16. Clean the component with clean, absorbent paper only. Apply long, continuous strokes to remove the unwanted water from the surfaces. Let the component air dry.

17. Visually examine the part and make sure that the surface is etched correctly. Changes in shade from light to dark because of differences in the surface finish of the pre-etched material, are permitted.

Note

Apply the primer on the part in 2 hours after the treatment.

18. Protect the components until you apply the primer to prevent contamination of the etched surfaces.

19. Apply one equal layer of Primer (C534), at ambient temperature, on the surfaces to be bonded.

20. Cure the primer according to one of the methods that follow:

    — at ambient temperature for 30 minutes, then for 55 to 65 minutes at a temperature between 115 and 125 °C;

    — at ambient temperature for minimum 120 minutes.

21. To get the correct preservation, pack the part into a hermetically sealed bag or wrap it in clean paper to prevent dust, grease and humidity contamination.

Requirements after job completion

None

Annex 5

Main rotor blade - Profiles and twist angles - Dimensions check

Table of contents

List of tables

List of figures

References

Table 1 References

Data Module	Title
89-A-ZZ-00-00-00A-066A-A	Local supply support equipment and tools - Support equipment and tools data

Table 2 Access points

Access Panel / Door Id	Data Module
No Access Point	

Table 3 Zones

Access Panel / Door Id	Data Module
No Zones	

Preliminary requirements

Required conditions

Table 4 Required conditions

Condition	Data Module/Technical Publication
None	

Support equipment

Table 5 Support equipment

Nomenclature	Identification No.	Qty
Coordinate-measuring machine (CMM ZEISS)	ZZ-00-00	1
Laser tracking equipment	ZZ-00-00	A.R.
Saddle	ZZ-00-00	A.R.

Supplies

Table 6 Supplies

Nomenclature	Identification No.	Qty
No Supplies		

Spares

Table 7 Spares

Nomenclature	Identification No.	Qty
No Spares		

Safety conditions

None.

Procedure

Note 1

Do Step 1 of this procedure if you use a CMM equipment or Step 2 if you use a Laser tracking equipment.

Note 2

If you use a Laser tracking equipment, this must have an accuracy for the profile scan within ±70 µm.

1. Check with Zeiss CMM equipment.

1.1. Put the main rotor blade horizontally on the Coordinate-measuring machine (CMM ZEISS) (ZZ-00-00), with the lower surface pointing down.

1.2. Make sure that the blade is correctly positioned on the saddles and that it is stable and unable to move during the measurement operations.

Note

To get the correct reference system the origin of the measurements must be as close as practical to STA 520 that is the blade attachment lugs station.

1.3. Measure the external plane of the blade attachment lugs (STA 520) as origin of the measurements.

1.4. Set the CMM equipment to get the reference system (see Fig 1) that follows:

— One axis: along the blade span passing through the blade;

— One axis: from the trailing edge to the leading edge of the blade (or viceversa);

— One axis: the one that forms a right-hand reference system.

1.4.1. Generate the Plane A as the mid plane between the blade root flat surfaces to do a primary alignment (spatial reference).

1.4.2. Generate the Axis B from the intersection points of the blade attachment lugs axes with Plane A.

1.4.3. Set the reference system as follows:

— One reference (STA): normal to the plane passing through the blade attachment lugs axes;

— One reference: parallel to axis B;

— One reference: normal to Plane A;

— Reference system origin: midpoint between the intersection points of the blade attachment lugs axes (defining Axis B) with Plane A, plus a translation of -520 mm (-20.47 in) along the blade span.

1.5. Starting from the leading edge on the upper and lower surfaces of the blade, measure the profile and twist angles at the blade stations that follow:

— STA 2628;

— STA 3796;

— STA 4380;

— STA 4672;

— STA 4964;

— STA 5225;

— STA 5725;

— STA 6059;

— STA 6315;

— STA 6470;

— STA 6730;

— STA 7015.

Note

For each station, check 1 point every 7 mm measured on the chord, starting from the leading edge, both on upper and lower surfaces. For example, for a chord of 490 mm do the check on 70 points on the upper and 70 points on the lower surfaces.

1.6. Make an analysis of the measurement results as given in Step 3.

2. Check with Laser tracking equipment.

Note 1

The saddles must be applied at a distance of 100 mm minimum from the scanning sections (Step 2.5).

Note 2

It is necessary to support the root of the blade adequately.

2.1. Put the blade with the leading edge up on at least four Saddle (ZZ-00-00) (see Fig 2) and make sure that it is stable and unable to move during the scanning operations.

2.2. Put the Laser tracking equipment (ZZ-00-00) in a way that each single continuous scan will include both the whole lower and upper surfaces or, if it is not possible, in one of these alternatives:

— at least the whole lower surface and the upper surface from the leading edge as close as practical to the 25% of chord;

— at least the whole upper surface and the lower surface from the leading edge as close as practical to the 25% of chord.

2.3. Scan these areas as origin of the measurements:

— The blade profile at STA 520;

— The external plane of the blade attachment lugs (upper and lower surface);

— The inner diameter of the blade attachment bushes for approximately 10 mm (0.4 in) (or as necessary to get sufficient points for the correct scan positioning).

2.4. Set the Laser tracking equipment to get the reference system (see Fig 1) that follows:

— One axis: along the blade span passing through the blade;

— One axis: from the trailing edge to the leading edge (or viceversa);

— One axis: the one that forms a right-hand reference system.

2.5. Scan the main rotor blade at the stations that follow:

Note

The trailing edge must be scanned as first or last point of each station. Point the touch probe or the laser scanner at the trailing edge with a 45° inclination. Make sure that you do not scan the end side of the trailing edge (see Fig 3).

— STA 2628;

— STA 3796;

— STA 4380;

— STA 4672;

— STA 4964;

— STA 5225;

— STA 5725;

— STA 6059;

— STA 6315;

— STA 6470;

— STA 6730;

— STA 7015.

Note

At each station, make sure that you scan at least 3 points in an area of approximately ± 15 mm (spanwise) at intervals of 15 mm (0.6 in) maximum along the chord (see Fig 3).

2.6. Make an analysis of the measurement results as given in Step 3.

3. Analysis of the resulting profiles.

3.1. Send the output file (in STL format or in text free format) with the blade ordinates that obey all the previous statements to Leonardo Helicopters S.p.A. for evaluation. The main rotor blade must be in these limits shown for reference only:

— Profile deviation (at each station):

Chordwise Region Ordinate Position	Deviation (mm) [positive outside]
Leading Edge to 0.25 chord	± 0.500
0.25 to 0.35 chord	± 0.500

Chordwise Region Ordinate Position	Deviation (mm) [positive outside]
0.35 to 0.60 chord	± 0.675
0.60 to 0.70 chord	± 0.550
0.70 chord to Trailing Edge	± 0.500

— Twist error (at each station): ± 0.25 deg.

Requirements after job completion

None

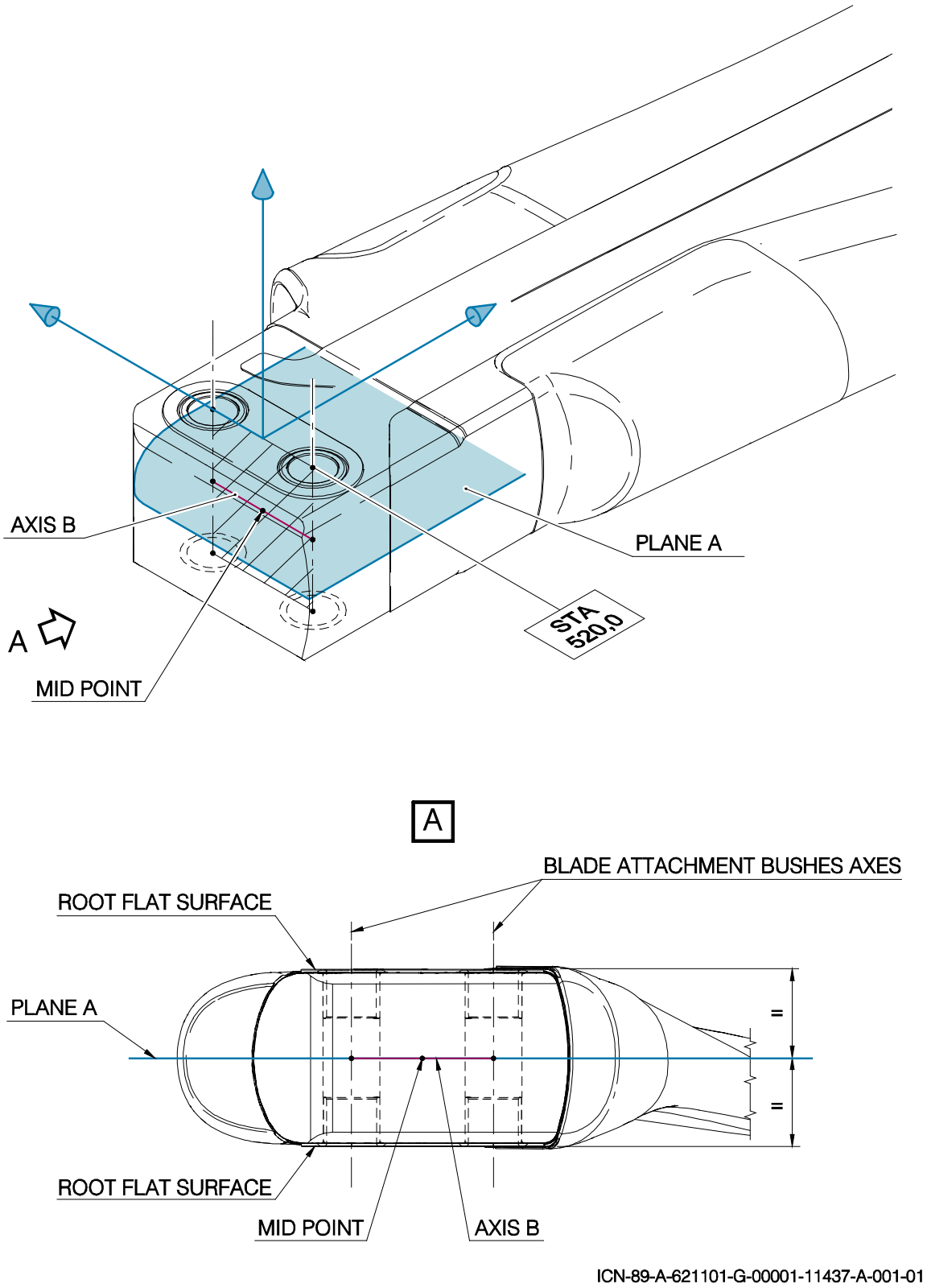


Figure 1 – Reference system.

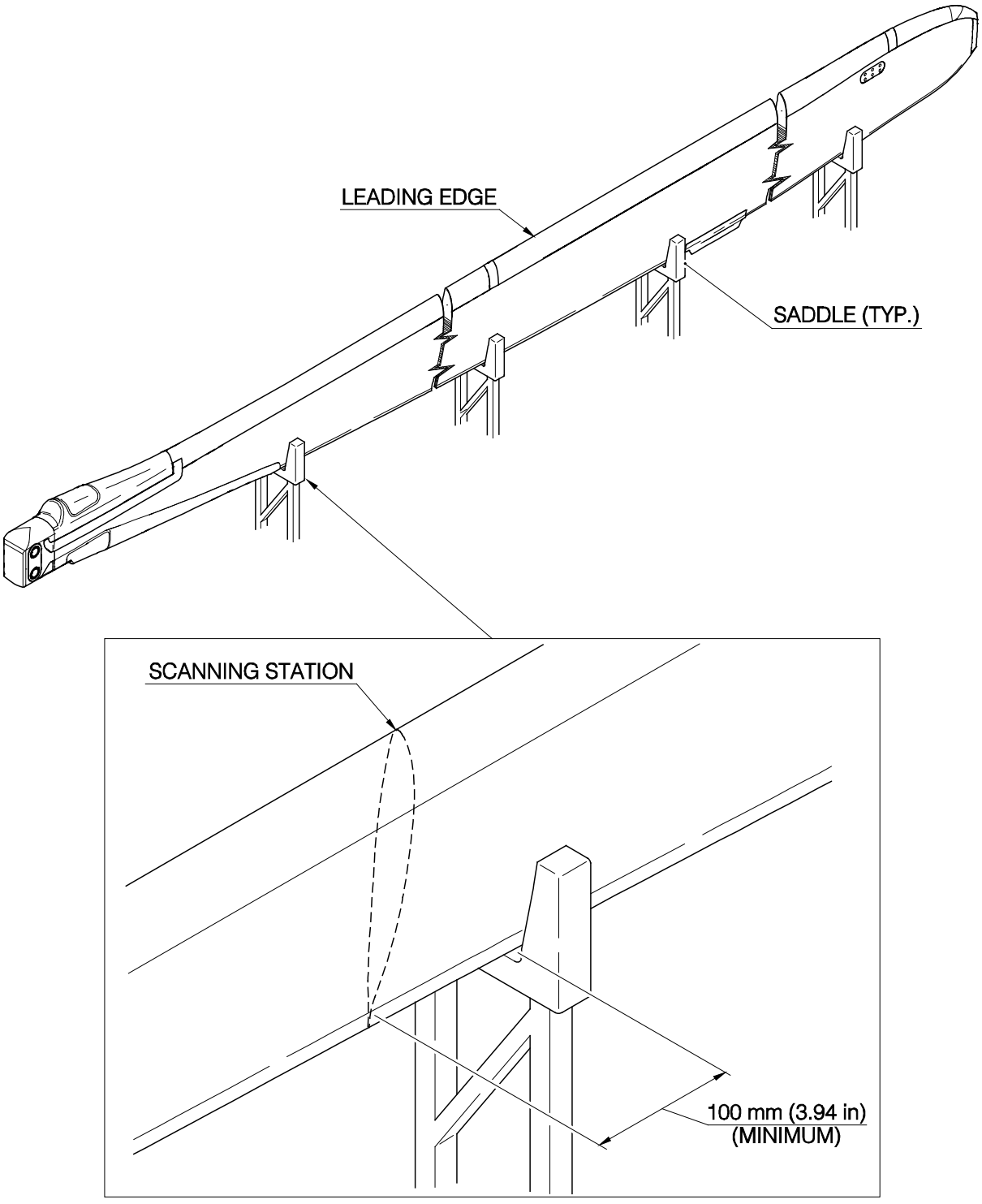


Figure 2 – Main rotor blade positioning (with the Laser tracking equipment).

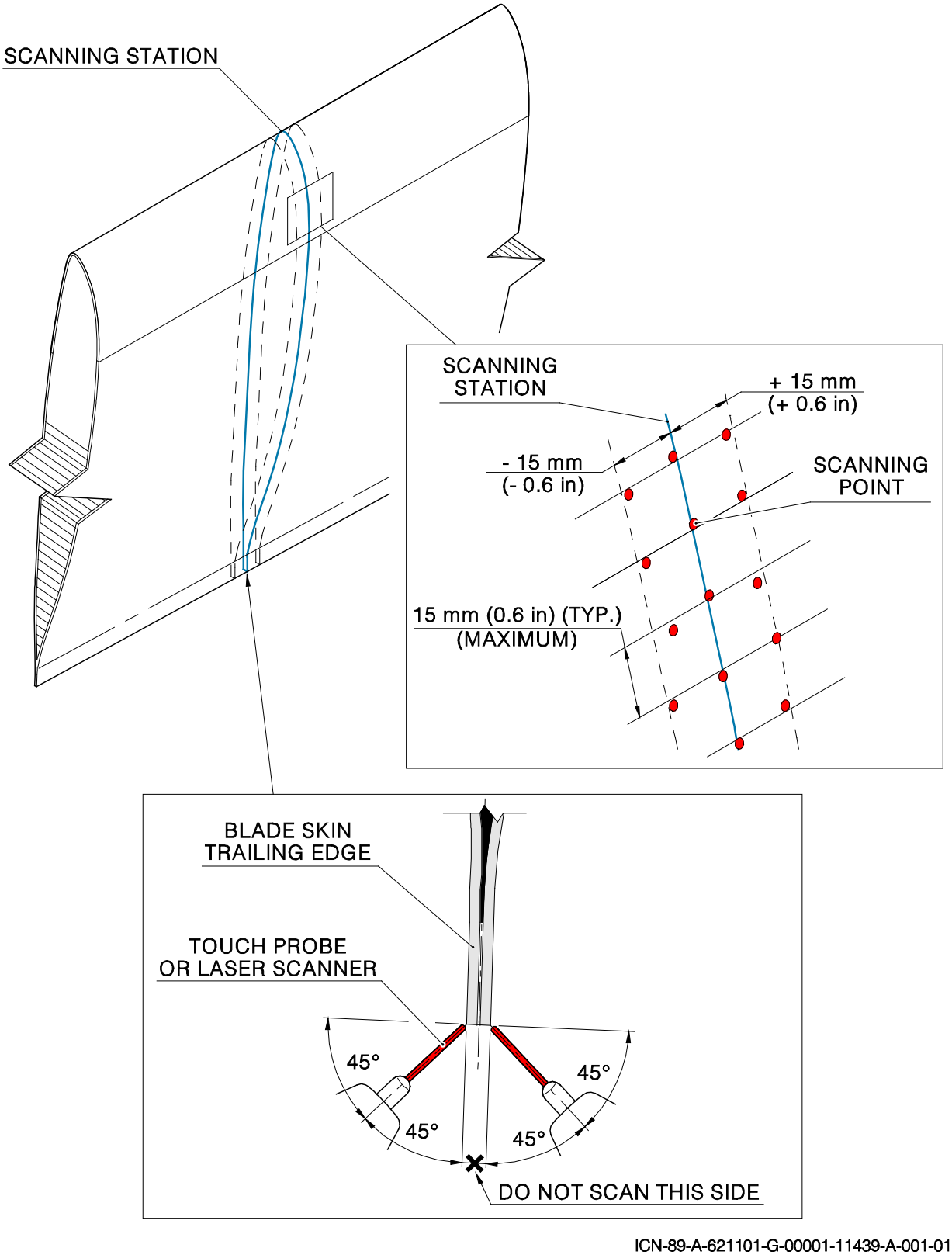


Figure 3 – Requirements for the station scan (with the Laser tracking equipment).

Annex 6

Butt straps (main rotor blade) - Install procedure

Table of contents

List of tables

List of figures

References

Table 1 References

Data Module	Title
CSPP-A-60-30-02-00A-913A-C	Tap test - General maintenance procedure
CSPP-A-60-50-01-00C-259A-C	Metal components (surface preparation for bonding) - Other procedures to protect surfaces
89-A-00-50-00-00A-010A-D	Local supply consumables, materials and expendables - General data
89-A-62-11-01-00A-31AA-B	Main rotor blade - Detailed inspection
89-A-62-11-01-00A-257A-C	Main rotor blade - Paint and apply marking
89-A-62-11-01-00A-37DA-C	Main rotor blade - Static balance

Table 2 Access points

Access Panel / Door Id	Data Module
None	

Table 3 Zones

Zone ID	Data Module
None	

Preliminary requirements

Required conditions

Table 4 Required conditions

Condition	Data Module/Technical Publication
None	

Support equipment

Table 5 Support equipment

Nomenclature	Identification No.	Qty
Feeler gauge	ZZ-00-00	1 EA
Straight edge	ZZ-00-00	1 EA
Blasting equipment (dry/vacuum type)	ZZ-00-00	1 EA
Vacuum bag	ZZ-00-00	1 EA
Heating Blanket (with thermocouple)	ZZ-00-00	A.R.
Heating mat	4F6210L01151-W57 (CP324)	1 EA

Supplies

Table 6 Supplies

Nomenclature	Identification No.	Qty
Solvent	C005	A.R.
Lint-free cloth	C011	A.R.
Isopropyl alcohol	C039	A.R.
Adhesive	C189	A.R.
Masking tape	C471	A.R.
Masking tape	C521	A.R.
Adhesive	C533	A.R.
Primer	C534	A.R.
Release film	C535	A.R.
Peel ply	C536	A.R.
Primer	BR127 (AWMS08-001 class II)	A.R.

Table 6 Supplies

Nomenclature	Identification No.	Qty
Abrasive blast (No. 180 - aluminum oxide)	Local supply	A.R.
Abrasive blast (No. 220 - aluminum oxide)	Local supply	A.R.
Abrasive paper (No. 180 - silicon carbide)	Local supply	A.R.
Abrasive paper (No. 220 - silicon carbide)	Local supply	A.R.
Abrasive paper (No. 240 - silicon carbide)	Local supply	A.R.

Spares

Table 7 Spares

Nomenclature	Identification No.	Qty
Butt strap (outboard outboard - treated for adhesive C189)	4F6210L01151B	1 EA
Butt strap (outboard - treated for adhesive C533)	4F6210L01151A	A.R.
Butt strap (inboard - treated for adhesive C189)	4F6210L01051B	1 EA
Butt strap (inboard outboard - treated for adhesive C533)	4F6210L01051A	A.R.

Safety conditions

WARNING

The materials that follow are dangerous. Before you do this procedure, make sure that you know all the safety precautions and first aid instructions for these materials:

- **Solvent (C005)**
- **Isopropyl alcohol (C039)**
- **Adhesive (C189)**
- **Adhesive (C533)**
- **Primer (C534)**
- **Primer (BR127).**

Note

The subsequent procedure must only be done by the Manufacturer or by an authorized repair and overhaul facility.

Procedure

Note 1

The install procedure is the same for the two butt straps (inboard and outboard).

Note 2

Only for main rotor blades P/N 4F6210A00132 and 8G6210A01931 it is possible to supply new butt straps (outboard and / or inboard) with the suffix “A” on the part number for the installation with adhesive (C533).

1. Supply a new Butt strap (outboard) (4F6210L01151B) and / or a new Butt strap (inboard) (4F6210L01051B) with the suffix “B” on the part number (3, Fig 1).

2. Make sure that the new butt strap(s) has the suffix “A” or “B” on the part number (already treated for bonding) and obey the Shelf life limits. If not, prepare the component as given in CSPP-A-60-50-01-00C-259A-C (See Annex 2 of this TMI) or CSPP-A-60-50-01-00C-259B-C (See Annex 3 of this TMI).

CAUTION

Always handle the new butt strap (3) and the main rotor blade (1) with clean dry gloves to prevent contamination of the bonding surfaces.

Note

Do not handle the bonding area of the new butt strap (3).

3. Examine the two edges of the erosion shields, lower and upper side, to find a possible step between them with a Feeler gauge (ZZ-00-00) and a Straight edge (ZZ-00-00). See detail B of Figure 1.

4. If there is a step, record the value and its location. If the value is more than 0,25 mm contact the Design Authority for further information.

5. Clean the bonding surface on the erosion shields with the Lint-free cloth (C011) and Solvent (C005) or Isopropyl alcohol (C039).

6. Let the bonding surface dry for at least 30 minutes.

7. Locally mask the area around the bonding surface on the erosion shields, starting from 35 mm each side of the joint with Masking tape (C521).

8. Prepare the bonding surface on the erosion shields in one of the ways that follow:

Note

As an alternative you can use Abrasive blast (No. 100 - aluminum oxide) (Local supply) or Abrasive blast (No. 120 - aluminum oxide) (Local supply).

8.1. Abrade the bonding area of the erosion shields with the Blasting equipment (dry/vacuum type) (ZZ-00-00) operated with Abrasive blast (No. 180 - aluminum oxide) (Local supply) or Abrasive blast (No. 220 - aluminum oxide) (Local supply) at a pressure of 280 ±35 kPa (40 ±5 psi).

8.2. Lightly sand the bonding area of the erosion shields with Abrasive paper (No. 180 - silicon carbide) (Local supply) or Abrasive paper (No. 220 - silicon carbide) (Local supply).

9. Remove the residue of abrasive with a dry Lint-free cloth (C011).

10. Clean the bonding surface on the erosion shields with the Lint-free cloth (C011) and Solvent (C005) or Isopropyl alcohol (C039).

11. Let the bonding surface dry for at least 30 minutes.

12. Apply primer on the bonding surface of the erosion shields as follows:

Note 1

You must apply Primer (BR127) for the installation with Adhesive (C533), or Primer (C534) for the installation with Adhesive (C189).

Note 2

On main rotor blades (FIPS) P/N 8G6210A00131 and 8G6210A00132 you can apply only Primer (C534) and Adhesive (C189).

12.1. Application of Primer (BR127).

Note

You must apply the primer within 30 minutes from surface preparation.

12.1.1. Apply a uniform layer of Primer (BR127), at ambient temperature, on the vacuum blasted or sanded area with a Lint-free cloth (C011) soaked with primer. Apply it one time to have a thin coat of primer.

12.1.2. Let the primer dry for a minimum of 4 hours in a clean area.

12.2. Application of Primer (C534).

Note

You must apply the primer within 4 hours from surface preparation.

12.2.1. Apply a uniform layer of Primer (C534), at ambient temperature, on the vacuum blasted or sanded area with a Lint-free cloth (C011) soaked with primer. Apply it one time to have a thin coat of primer.

12.2.2. Let the primer cure at ambient temperature for at least 2 hours in a clean area.

13. Remove the local masking from the erosion shields area.

Note 1

You must apply the adhesive within 8 hours from primer application.

Note 2

On main rotor blades (FIPS) P/N 8G6210A00131 and 8G6210A00132 you can use only Adhesive (C189).

14. Apply one layer of Adhesive (C189), for Primer (C534), or Adhesive (C533), for Primer (BR127), on the inner surface of the new butt strap (3) and trim it in line with the edges.

15. If there is a step between the erosion shields (ref. to Step 3 and to Detail B of Fig 1) do as follows:

15.1. If the value recorded in Step 4 is between 0,1 mm and 0,15:

— add one more layer of Adhesive (C189) or Adhesive (C533) on the erosion shield(s) at the step location.

15.2. If the value recorded in Step 4 is between 0,15 mm and 0,25:

— add one more layer of Adhesive (C189) or Adhesive (C533) on the erosion shield(s) at the step location.

— add a second layer of Adhesive (C189) or Adhesive (C533) on the erosion shield(s) and cut it as necessary to compensate the step of the butt strap (3).

16. Align the new butt strap (3) with the center of the joint between the two erosion shields.

17. Make sure that the new butt strap (3) is correctly engaged.

18. Secure the butt strap with two 1” pieces of Masking tape (C471) in a chordwise position.

19. Mask the two erosion shields around the butt strap with Masking tape (C471). Make sure that the tape is about 5 mm from the edge of the butt strap (3).

20. Mask on top of the PTFE tape with Masking tape (C521).

21. Cover the butt strap assembly with Peel ply (C536).

Note

Make sure that the peel ply extends beyond the heating mat.

22. Cover the butt strap assembly with perforated Release film (C535) on the repair area only.

CAUTION

If you use a local supply heating blanket, the dimension of the heating zone must be equal to the chordwise and spanwise dimension of the new butt strap. This will prevent possible debondings because of overheating of the blade areas around the new butt strap and possible unbondings because of not correct curing temperature. Also the blanket must have sufficient power to ensure the cure cycle of the adhesive (ref. Step 25).

23. Attach the Heating mat (4F6210L01151-W57 (CP324)), if available, or the Heating Blanket (with thermocouple) (ZZ-00-00), and hold in position with Masking tape (C471).

24. Assemble a Vacuum bag (ZZ-00-00) over the butt strap assembly and apply a pressure of 0,6 - 0,8 kg/cm^2.

CAUTION

Be careful to hold the blade in nose up position during the cure cycle.

25. Apply the cure cycle as follows:

25.1. Cure cycle of the Adhesive (C533).

- Heat to 93 °C at 2 to 4 °C per min.
- Dwell at temperature for 40 +10/-0 mins.
- Heat to 140 °C ±5 °C at 2 to 4 °C per min.
- Dwell at temperature for 150 +15/-0 mins (based on most delayed thermocouple).
- Cool to below 50 °C at up to 5 °C per min.

25.2. Cure cycle of the Adhesive (C189).

- Heat to 90 °C ±5 °C at 2 to 5 °C per min.
- Dwell at temperature for 35 ±5 mins.
- Heat to 125 °C ±5 °C at 2 to 5 °C per min.
- Dwell at temperature for at least 60 mins.
- Cool to 30 °C at no more than 10 °C per min. before releasing the air pressure.

26. After curing, remove the vacuum bag.

27. Remove the masking tape from the main rotor blade (1).

28. Examine the new butt strap (3), the blade skin (4) and the blade erosion shields (2) or the tip erosion shield (5) to make sure that there is no damage.

29. Examine the new butt strap (3) for presence of an uniform adhesive squeeze-out. If necessary, lightly sand with Abrasive paper (No. 240 - silicon carbide) (Local supply) to blend the adhesive squeeze-out.

Note

Refer to CSPP-A-60-30-02-00A-913A-C for the tap test procedure.

30. Do a tap inspection of the new butt strap (3) for correct bonding. No unbondings are permitted. If you find voids replace the butt strap.

31. Do a tap inspection of the surrounding area (erosion shields and blade skin), approx. 50 mm (2 in), for possible debondings. Refer to DM 89-A-62-11-01-00A-31AA-B for the permitted limits.

Requirements after job completion

1. Remove all the tools and the other items from the work area. Make sure that the work area is clean.

2. Paint the repaired area. Refer to 89-A-62-11-01-00A-257A-C.

3. Do the static balance of the main rotor blade. Refer to 89-A-62-11-01-00A-37DA-C.

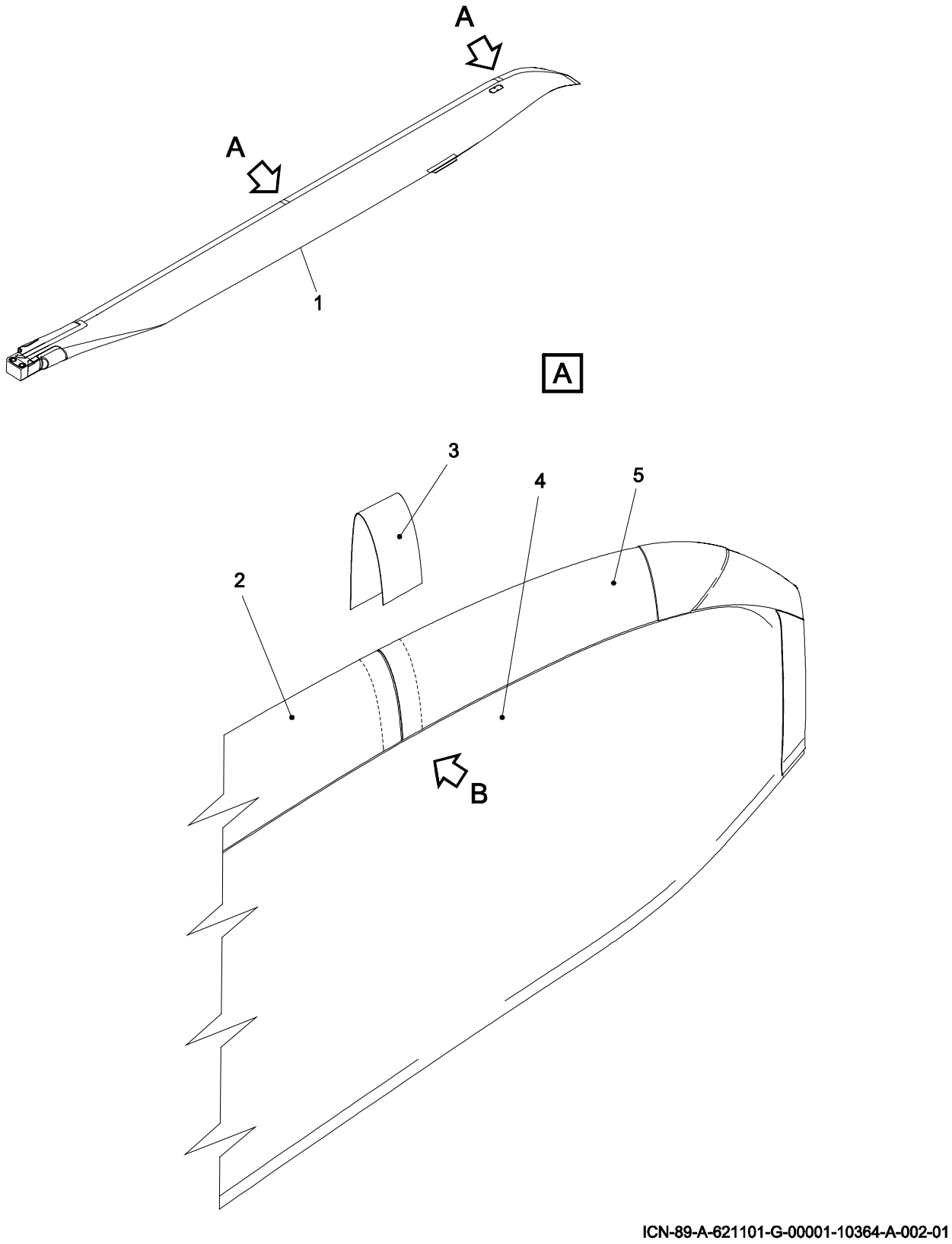


Figure 1 – Butt straps (main rotor blade) - Install procedure (sheet 1 of 2).

B

EXAMPLE OF A POSSIBLE STEP BETWEEN EROSION SHIELDS WITH ADHESIVE APPLICATION

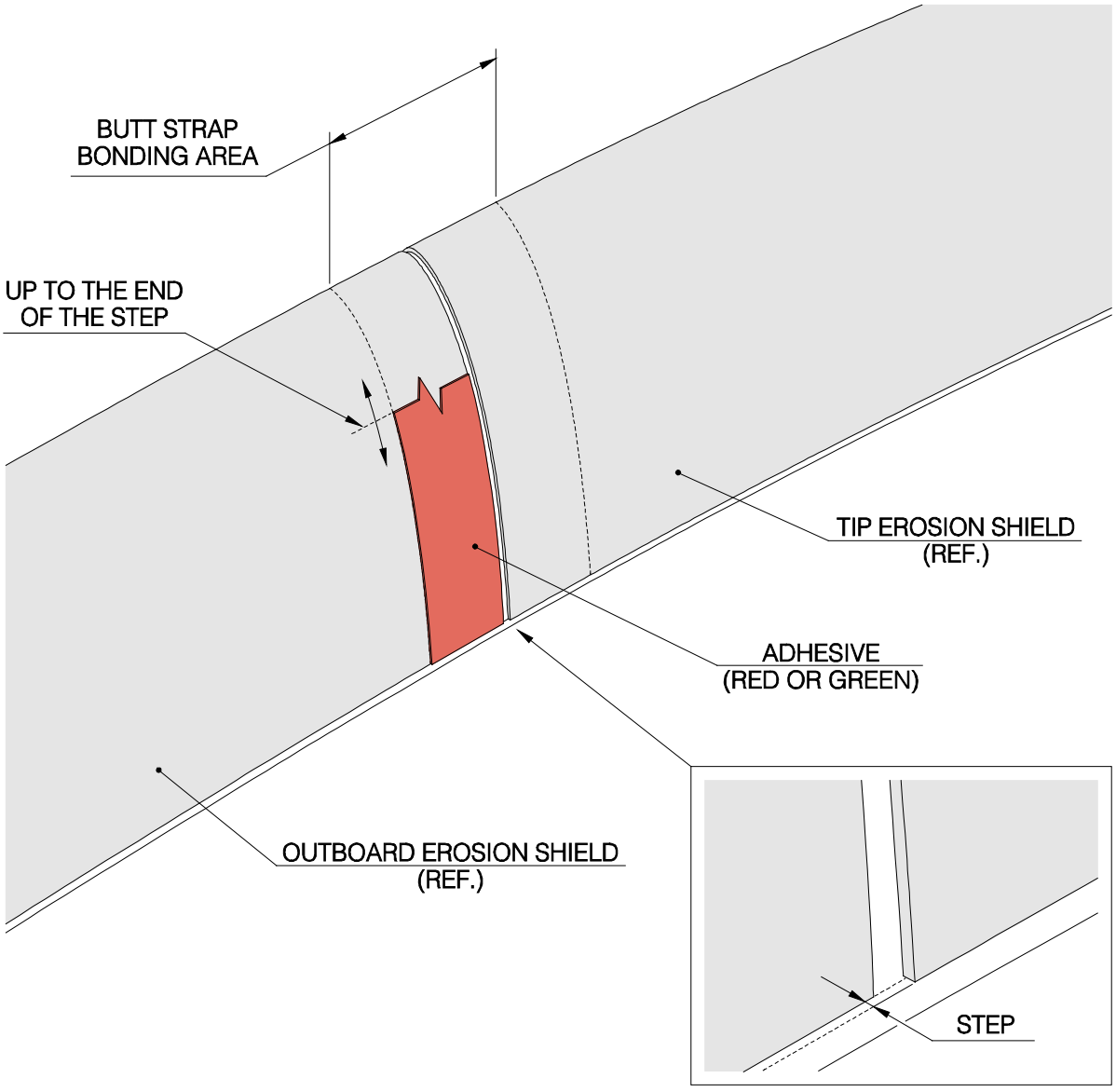


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Figure 1 – Butt straps (main rotor blade) - Install procedure (sheet 2 of 2).