



AMSAFE, Aviation Inflatable Restraint

**SUPPLEMENTAL MAINTENANCE MANUAL
Instructions for Continued Airworthiness**

**AMSAFE AVIATION INFLATABLE RESTRAINT
(AAIR®) V23 SYSTEM**

**for
Zenair CH2000 SERIES AIRCRAFT**

SAA Series No. 7032

AMSAFE AVIATION Document Number E508449

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REVISION HISTORY

Updates and revisions to this manual will be distributed only to Zenair, Ltd, as necessary. Distribution or notification of these updates to the individual owner/operator of the affected aircraft will be the responsibility of Zenair, Ltd.

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INTRODUCTION

DESCRIPTION

This manual contains service and maintenance instructions for the AMSAFE Aviation Inflatable Restraint (AAIR®), V23 Version, installed on the Zenair CH2000 aircraft. The AAIR V23 is a self-contained, modular, three-point restraint system that improves protection from serious head-impact injury during a survivable aircraft crash.

SYSTEM OPERATION

Within milliseconds of an injurious crash event, the EMA's crash sensor evaluates the crash pulse and then sends a crash pulse signal throughout the activation circuit. This signal releases the gas in the inflator, rapidly inflating the airbag within the airbag belt's cover breaking through the cover's tearable seam, and filling the airbag to its fully-inflated state. The inflating airbag will automatically position itself between the cockpit controls and the pilot/co-pilot thus providing head protection during the most critical time of the event. After airbag deployment, the airbag deflates to enable the pilot/co-pilot to egress the aircraft without obstruction from the airbag.

The crash sensor's predetermined deployment threshold does not allow inadvertent deployment during normal operations, such as hard landings, strikes on the seat, random vibration, or windmilling conditions. To activate the system, join (buckle) the three-point restraint in the same manner as any other three-point seatbelt.

SYSTEM COMPONENTS AND PARTS LIST

The AAIR V23 System consists of these core components:

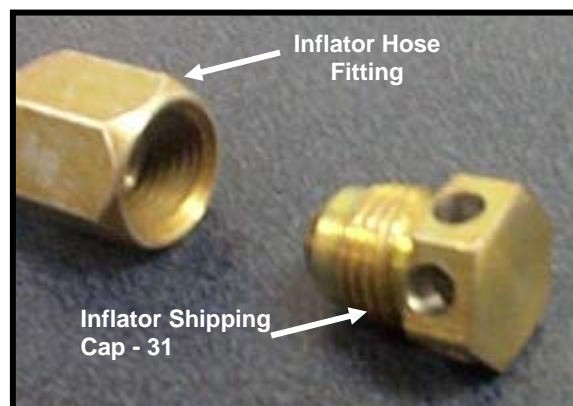
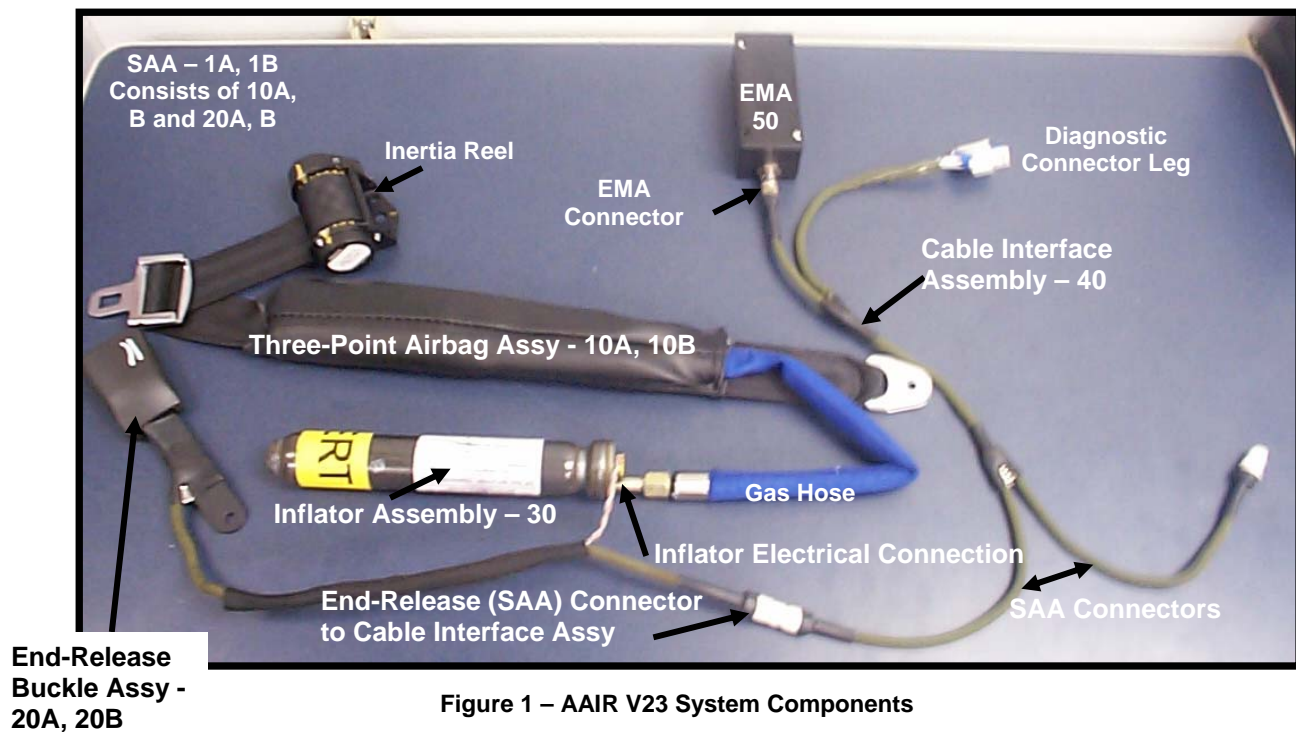
- Seatbelt Airbag Assembly (SAA) – 1 per seat position; 2 per aircraft
- Inflation Assembly – 1 per seat position; 2 per aircraft
- Electronics Module Assembly (EMA) – 1 per aircraft
- Cable Interface Assembly – 1 per aircraft

The SAA (1A, 1B) consists of two primary subassemblies; the Three-Point Airbag Belt Assy (10A, 10B) with Safety Cable Tie (11) and the End-Release Buckle Assy (20A, 20B) (see Figure 1). The SAA mounts to aircraft structure using existing mounting points.

The Inflator Assembly (30) (Figure 1) mounts behind the lower back of each seat. The Inflator Shipping Cap (31) makes the inflator a thrust-neutral device and is to be used whenever the inflator is shipped as a non-installed item. The End-Release Buckle Assy provides the electrical connector to the Inflator Assy to complete the activation circuit.

The Cable Interface Assy (40) connects the EMA (50) to the two SAAs and also provides a Diagnostic Tool Connector leg (see Figure 1). The Diagnostic Tool Connector leg connects to the System Diagnostic Tool to facilitate system functional checks. The EMA, which contains the system electronics and system power (Lithium-type battery), is mounted to aircraft structure in the center console area.

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Figure 3 – V23 System Diagnostic Tool, P/N 508668-201

Fig. No.	Item No.	Part Number	Part Description	Used On	Qty per System
					508504-201-2396
1	1A	7032-1-011-2396	AAIR V23 SEATBELT AIRBAG ASSEMBLY - LH		1
1	1B	7032-1-021-2396	AAIR V23 SEATBELT AIRBAG ASSEMBLY - RH		1
1	10A	7032-2030112396	THREE-POINT AIRBAG BELT LH	A	1
1	10B	7032-2040212396	THREE-POINT AIRBAG BELT RH	B	1
	-11	508085-401	SAFETY CABLE TIE	A/B	2
1	20A	7032-2010112396	END-RELEASE BUCKLE ASSY LH	A	1
1	20B	7032-2010212396	END-RELEASE BUCKLE ASSY RH	B	1
1	30	508538-401	INFLATOR ASSEMBLY	A/B	2
2	31	508531-1	SHIPPING CAP, ROI-V2	A/B	2
1, 5	40	508420-201	CABLE INTERFACE ASSEMBLY – DOUBLE SEAT, 26/26	A/B	1
1, 5	50	508358-409	ELECTRONICS MODULE ASSEMBLY	A/B	1
3	60	508668-201	V23 SYSTEM DIAGNOSTIC TOOL	A/B	1

- Item not shown

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MAINTENANCE AND INSPECTION

Maintenance

No other maintenance is required other than an annual inspection and functional testing of the system.

System Functional Testing

To perform a functional test for the AAIR V23 System, use the V23 System Diagnostic Tool. For complete instructions on the use of the V23 System Diagnostic Tool, please refer to the V23 SDT Operation and Maintenance Manual.

Inspection

A detailed visual inspection should be performed at a minimum of once annually.

Step	Action
1	Check SAA attachment points
2	Check belt assembly for: <ul style="list-style-type: none">• Cut or worn edges• Damaged stitching and/or broken fabric threads• Holes or tears and/or excessive chafe marks• Excessive wear and/or excessive fraying• Holes in airbag cover or tear-away seam
3	Check SAA for: <ul style="list-style-type: none">• Dirt, oil, or grease• Other unwanted particles or substances
4	Check SAA hardware (end fittings, buckle, connector) for: <ul style="list-style-type: none">• Cracks, dents, and/or corrosion
5	Check exposed hoses and cables for: <ul style="list-style-type: none">• Fraying, excessive wear, and/or tears
6	Check Cable Interface Assembly for: <ul style="list-style-type: none">• Secure connections
7	Check Inflator Assy for: <ul style="list-style-type: none">• Loose mounting hardware• Loose Hose connection• Electrical Connection
8	Check EMA for: <ul style="list-style-type: none">• Loose connections and mounting hardware.

Cleaning

It is recommended that AAIR components be cleaned on a regular (annual) basis. Build-up of dirt and debris could interfere with system operation, shorten the life of the system, and cause corrosion of metal parts. Component cleaning covers the surface cleaning of the belt assembly, hoses, cables, inflation device/cap assembly, and EMA.

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NOTE: Equivalent alternatives are permitted for the equipment and materials in this list.

Qty	Description	Part Number
AR	Warm water in a spill-resistant container	Standard Issue
AR	Soft lint-free washing cloth	Standard Issue
AR	Sponge or soft brush	Standard Issue
AR	Mild soap	Standard Issue (household dishwasher liquid soap, household laundry detergent)
AR	Isopropyl Alcohol	Standard Issue

WARNING DO NOT SOAK PARTS TO BE CLEANED WITH EITHER WATER SOLUTION OR ISOPROPYL ALCOHOL. DOING SO MAY DAMAGE THE AAIR SYSTEM.

CAUTION: THE BELT ASSEMBLY MUST NOT BE DRY CLEANED OR IMMERSED IN WATER.

CAUTION: AVOID EXCESSIVE USE OF WATER WHEN CLEANING. MOISTURE MAY DAMAGE INTERNAL COMPONENTS AND CAUSE COMPONENT FAILURE.

CAUTION: WHEN CLEANING THE AAIR, CARE MUST BE TAKEN TO KEEP FOREIGN MATTER AND CLEANING MEDIA AWAY FROM THE HARDWARE ASSEMBLIES.

CAUTION: NO SOAP OR WATER IS TO BE USED ON METAL PARTS.

CAUTION: WHEN USING ISOPROPYL ALCOHOL, AVOID ANY CONTACT WITH THE WEBBING, AIRBAG COVER, OR GAS HOSE MATERIAL.

When cleaning non-metallic parts, use warm water and household soap/laundry detergent. Care should be taken to use only enough cleaning agent to produce minimal suds. Apply cleaning solution with a damp (wrung-out) washing cloth. Do not leave residue on cleaned areas. Rinse, if necessary, with clear water on a damp (wrung-out) washing cloth. Hand-wash the webbing, airbag cover and gas hose. Gentle scrubbing with a soft brush and cold soapy solution is permissible. Air dry the belt assembly. Do not dry the belt assembly in sunlight or near any source of heat.

If necessary, clean the hardware with a lint-free cloth moistened with isopropyl alcohol.

If cleaning is required, cover cable opening into the EMA with pieces of cloth.

Hand-wash the Inflator and cables with a lint-free cloth moistened with a cold water/mild soap solution.

STORAGE OF SPARES

Inflator Assembly

NOTE: AAIR Inflator must be handled and stored by a person trained in the requirements associated with dangerous goods

Store the Inflator in a cool and dry environment. Acceptable temperature range is -22 to +131°F (-30° to +55°C). The Inflator should be protected from sunlight, dust, moisture, and other contamination. The INFLATOR must be protected from excessive EMI/RFI/ESD environments. Observe all local storage regulations. The maximum continuous storage time for the Inflator is seven (7) years from date of manufacture, after which the Inflator should be returned to AMSAFE Aviation for refurbishment.

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Electronics Module Assembly (EMA)

Store the EMA in a cool and dry environment. Acceptable temperature range is -22 to +131°F (-30° to +55°C). The EMA should be protected from sunlight, dust, moisture, and other contamination. The EMA must be protected from excessive EMI/RFI/ESD environments. The maximum continuous storage time for the EMA is seven (7) years from date of manufacture, after which the EMA should be returned to AMSAFE Aviation for refurbishment.

Seatbelt Airbag Assembly (SAA)

Store the SAA in a cool and dry environment. Acceptable temperature range is -22 to +131°F (-30° to +55°C). The SAA should be protected from sunlight, dust, moisture, and other contamination. The maximum continuous storage time for the SAA is seven (7) years from date of manufacture. After seven (7) years, the SAA should be returned to AMSAFE Aviation for refurbishment.

REMOVAL AND REPLACEMENT

These maintenance instructions provide the necessary detail to remove and replace the AAIR V23 System.

WARNING: AVOID MAGNETIC FIELDS IN THE VICINITY OF THE ELECTRONICS MODULE ASSEMBLY. DEPLOYMENT OF THE SYSTEM MAY OCCUR.

WARNING: THE INFLATOR ASSEMBLY IS A STORED, GAS/ENERGETIC MATERIAL DEVICE. SEVERE PERSONAL INJURY OR BODILY HARM MAY BE CAUSED BY MISUSE AND/OR TAMPERING. DO NOT TAMPER WITH OR MISHANDLE THE PRODUCT IN ANY WAY. NEVER ATTEMPT TO OPEN THE INFLATOR TO SERVICE THE INFLATOR SYSTEM. NEVER APPLY ELECTRICAL CURRENT TO THE ELECTRONICS CONNECTION.

WARNING: INADVERTENT CONNECTION OF SEATBELT HALVES COULD CAUSE DEPLOYMENT OF AIRBAG.

CAUTION: DO NOT DROP THE AAIR EMA. DAMAGE TO THE ELECTRONICS, BATTERY, OR SENSOR MAY OCCUR.

CAUTION: IF SEATBELT AIRBAG REPLACEMENT IS NOT IMMEDIATELY POSSIBLE, COVER INFLATOR NOZZLE TO PROTECT FROM DEBRIS.

Equipment and Materials Required

The following items are required to remove the AAIR System.

Description	Part Number
Repairman Tool Kit	Standard Issue
Safety Glasses	Standard Issue
Screwdriver Bit Set, Hex Drive	Craftsman 42687
Torque Wrenches, In. Lb. Type to accommodate 5 to 130 In. Lbs of torque	Standard Issue
Thread Locking Compound, Loctite 242	Loctite Corporation 1-800-LOCTITE (562-8483)

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The following table identifies the appropriate torque value, tool, and tool size to use for attaching hardware.

Callout/Figure	Part Description	Associated Subassembly	Tool and Size	Torque - In. Lbs.
31	Inflator Shipping Cap	Inflator Assembly	Torque Wrench, In. Lb type	5 - 10
Figure 4	Hose Connection to Inflator	SAA/Inflator Assembly	Torque Wrench, In. Lb type	110 -130

Table 1 - Torque Values and Tool Sizes

Refer to Figures 1, 2, and 3 and parts list in the INTRODUCTION Section for referenced callouts unless noted.

Removal

CAUTION: VERIFY AAIR SYSTEM IS UNBUCKLED BEFORE ANY REMOVAL/REPLACEMENT OF SYSTEM COMPONENTS.

1. Remove (optional) aircraft console shroud (refer to Zenair's aircraft maintenance manual).
2. Access SAA connector(s) (white) to **Cable Interface Assy** and disconnect by squeezing on both sides of the connector and pulling on the connector housing (Figure 1).
3. Remove squib connector from the **Inflator** (40) by squeezing both sides of the connector and gently pulling away from the Inflator (Figure 4).

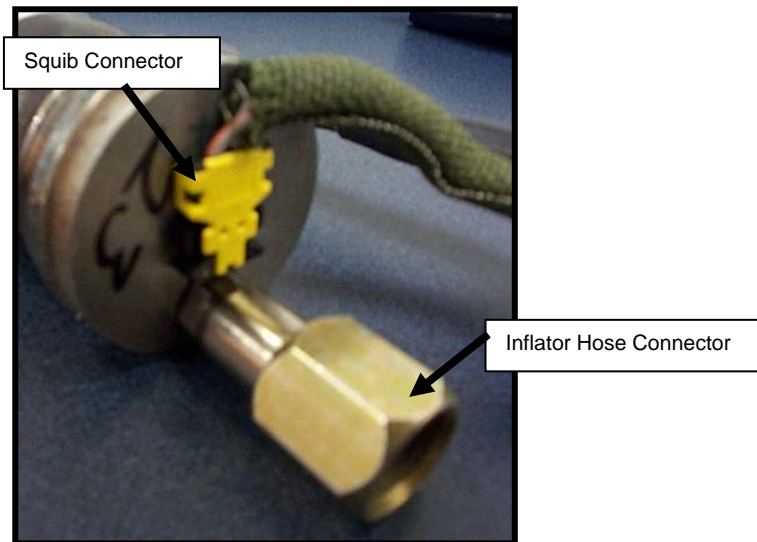


Figure 4 – Electrical and Hose Connectors of Inflator Assembly

CAUTION: If replacement of Three-Point Airbag Belt is not immediately possible, cover Inflator hose connector to protect from debris.

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4. Disconnect the gas hose(s) from the **Inflator Assy(s)**. The gas hose barb is Loctite coated which makes it a very secure fit. Use a second back-off wrench for loosening fitting. DO NOT damage crimp end of gas hose if using vise grips.
5. Loosen the **Inflator Assembly** (40) from its mounting hardware.
6. Remove the **Inflator Assy(s)** from mounting brackets.
7. After removal of Inflator(s), replace **Shipping Cap(s)** in the hose connector fitting. See Table 1 for torque value.
8. Remove inertia reel(s) (**Three-Point Airbag Belt**) from aircraft rollbar and seatbelt floor mounting from aircraft structure mounting point (refer to Zenair's aircraft maintenance manual).
9. Remove **End-Release Buckle Assy(s)** housing from aircraft structure seatbelt mounting point (refer to Zenair's aircraft maintenance manual).
10. Disconnect the **Cable Interface Assembly** from the EMA (Figure 5) by pushing down on connector's locking clip and pulling on the connector housing.

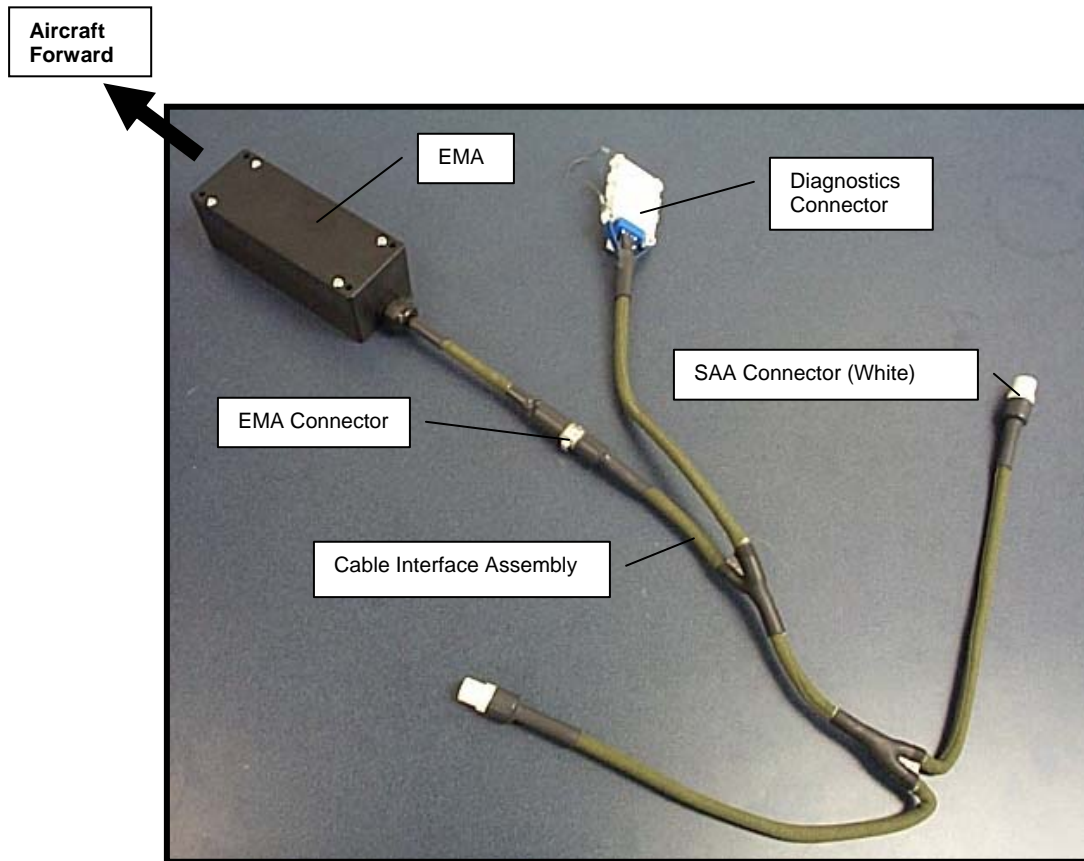


Figure 5 – EMA Module and Cable Interface Assembly

11. Remove **Cable Interface Assembly**.
12. Remove **EMA** from mounting hardware (refer to Zenair's maintenance manual).

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Replacement

Replace SAA sub-assemblies – Three-Point Airbag Belt and End-Release Buckle Assembly - with same handing (RH or LH) part number as removed sub-assembly.

WARNING: AVOID MAGNETIC FIELDS AT ALL TIMES IN THE VICINITY OF THE EMA.
DEPLOYMENT OF THE SYSTEM MAY OCCUR.

NOTE: To protect the airbag from dirt during installation, do not completely remove protective plastic bag from airbag belt until after installation.

1. Before replacing new **Inflator(s) Assy(s)**, unscrew the **Shipping Cap** (31) from the Inflator hose fitting (Figure 2). Do not discard Shipping Cap. It is used for shipping the Inflator Assy.
2. Insert prepared **Inflator Assy(s)** into mounting brackets. Do not secure in mounting bracket at this time.
3. Remove the end cap plug (if new SAA) from **Three-Point Airbag Belt(s)** gas hose and discard. DO NOT REMOVE **Safety Cable Tie** (11) for airbag connector tongue at this time.

CAUTION: Check orientation of Three-Point Seatbelt Airbag Belt(s) before inserting gas hose into Inflator. Gas hose should be protruding on top of seatbelt attachment hardware. Airbag cover must present away from occupant (label orientation is on inside towards occupant). See Figure 1.

NOTE: If reconnecting existing (not new) Three-Point Airbag Belt to new Inflator, apply a thin, even coat of Loctite 242 thread locking compound on the hose barb threads before attaching to Inflator Assy.

4. Connect gas hose from **Three-Point Airbag Belt(s)** to Inflator(s) using required in/lbs torque. See Table 1 for torque value. The Inflator(s) hose connector fitting (Figure 4) is a pressure fitting which must be fully seated (fitting fully extended) onto the gas hose barb for an air-tight fit.
5. Attach Squib Connector(s) (Figure 4) to **Inflator(s)**. Orient connector as shown in Figure 4 and seat into inflator.
6. Secure the **Inflator Assy(s)** within its original position on the mounting hardware. **NOTE:** Do not damage any portion of TRW serial number on Inflator when mounting, especially damage due to pinching by mounting hardware.
7. Insert **EMA** (50) into mounting hardware and secure. EMA pigtail end should be oriented on aircraft structure pointing toward the rear of the aircraft (see Figure 6). Connect EMA to **Cable Interface Assy's** EMA connector.

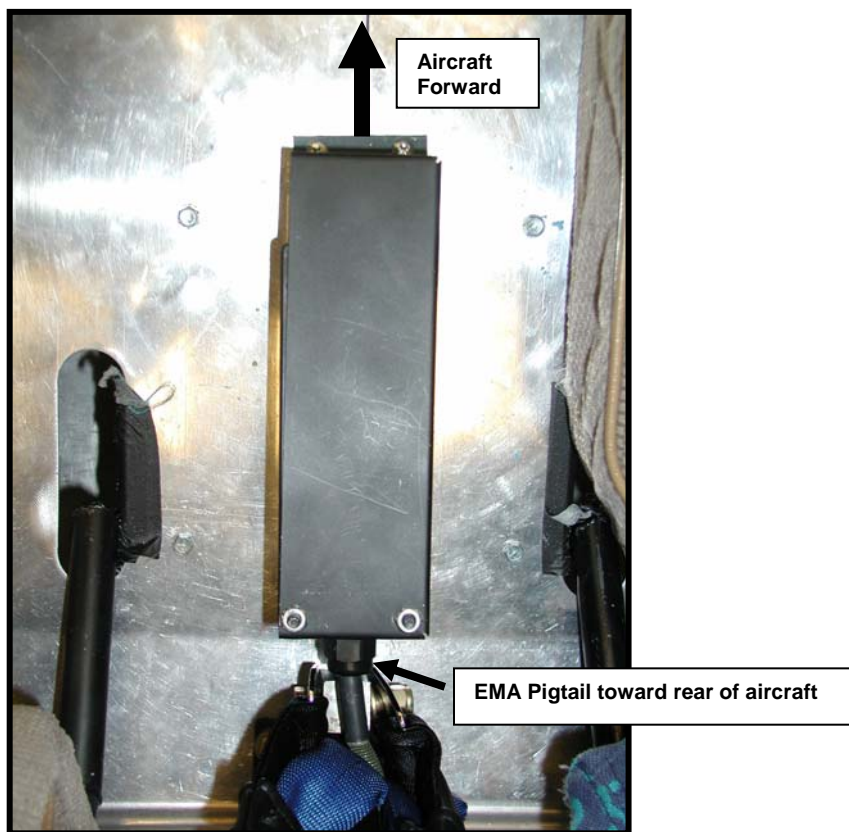


Figure 6 – EMA Aircraft Forward Installation

8. Connect **Cable Interface Assys'** SAA connector(s) to **End-Release Buckle Assy(s)** connector(s). See Figure 1.
9. Secure **Three-Point Airbag Belt(s)** inertia reel end from aircraft seatbelt center bar and seatbelt floor mounting to aircraft structure seatbelt mounting point (refer to Zenair's aircraft maintenance manual).
10. Remove Safety Cable Tie from airbag buckle tongue before performing functional testing.
11. Perform functional test on system (refer to V23 System Diagnostic Tool - Operation and Maintenance Manual for testing procedures).
12. Replace aircraft console shroud covering (if equipped).

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AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

Continued or renewed airworthiness of the AAIR System is to be determined by means of an inspection and may only be performed by the manufacturer or by agencies specially approved by the aviation authorities.

Inspection Intervals

Concurrently with the airworthiness inspection of the aircraft (refer to Inspection section of this manual).

When the equipment has sustained damage.

When the equipment has been over-stressed or if over-stress is suspected.

Upon expiration of the storage/service life as defined in the following sections.

Inoperable AAIR System

If the AAIR System is determined inoperable, the seat may still be occupied provided that the Three-Point Airbag Belt meets the inspection criteria noted in the Inspection section and the system is deactivated electrically by disconnecting the Seatbelt Airbag Assembly (SAA) electrical connector.

Life Limits

The EMA is to be removed and returned to AMSAFE Aviation after:

- a maximum storage period of seven (7) years calculated from the month of manufacture, or;
- upon expiration of the service life defined as the total sum of storage life and installation life, which must not exceed seven (7) years calculated from the month of manufacture.

The Inflator Assembly is to be removed and returned to AMSAFE Aviation after:

- a maximum storage period of seven (7) years calculated from the month of manufacture as indicated in the expiration date stamped on the gas cylinder, or;
- upon expiration of the service life defined as the total sum of storage life and installation life, which must not exceed seven (7) years calculated from the month of manufacture as indicated in the expiration date stamped on the gas cylinder.

Although the SAA does not have a service life, it may be renewed upon failure of inspection criteria (refer to Inspection section).

Renewal

Upon expiration of the service life (total life), the EMA can only be renewed by the manufacturer.

Upon expiration of the service life (total life), the Inflator Assy can only be renewed by the manufacturer.

The SAA can only be renewed by the manufacturer.

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WARRANTY AND RETURN INFORMATION

Warranty

Seller warrants to Buyer AAIRs subject to this Agreement shall be free from defects in workmanship or material and shall conform to Seller's specifications as set forth in its Declaration of Design and Performance or in the Seat Qualification Statement, or equivalent document, which are acknowledged by buyer and incorporated herein by this reference as if fully set forth below.

All claims for defective AAIR units must be presented to Seller, in writing, within three (3) years after date of manufacture of a defective part; provided, however, in the event of defective webbing, claims must be presented to Seller, in writing, within one (1) year of installation of webbing on AAIR.

Returning AAIR Components and RMA Procedures

AAIR components must be routed to AMSAFE Aviation's Designated Repair Station, I7SR268X at 5456 E. McDowell Road, Mesa, AZ 85215 to ensure they are tested and repaired by qualified repair technicians and returned to service by a licensed repairperson. The RMA process described in the following paragraphs must be followed.

RMA Procedures

Contact AMSAFE Aviation at 1-800-228-1567 and ask for the Customer Service Department. Identify customer's name, location, contact person, and phone number. Request from the customer service representative a Return Material Authorization number (RMA) for either an AAIR repair/replacement component, calibration check, or for re-calibration of the AAIR System Diagnostic Tool.

Mark and identify RMA number on the package label. Mail AAIR component and/or System Diagnostic Tool to:

AMSAFE Aviation
Inflatable Restraints Division
5456 East McDowell Road
Mesa, AZ 85215 USA

Packaging and Shipping Requirements – Inflation device

WARNING: FAILURE TO COMPLY WITH ALL RELEVANT DANGEROUS GOODS REGULATIONS REGARDING THE INFLATION DEVICE MAY RESULT IN CIVIL OR CRIMINAL PENALTIES.

Use the original packaging material in which the inflation device was received, when it is in a serviceable condition. The inflation device must be shipped in an AMSAFE container which is DOT approved having been UN tested and marked under UN Performance Oriented Packing (POP). A new AMSAFE UN POP container may be requested in the RMA process.

The Shipping Cap to the Inflator Hose Connector fitting must be attached for shipping. See Removal and Replacement section for complete information.

Use only AMSAFE UN POP shipping container.

The exterior container shall be labeled durably and legibly to show at least:

- All appropriate hazmat labels per Title 49 CFR Section 172.400.
- All appropriate labels required by country of shipping origin.
- When shipping by air, use cargo plane only label

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The exterior container shall be marked durably and legibly to show at least:

- All appropriate hazmat markings per Title 49 CFR Section 172.300.
- All appropriate markings required by country of shipping origin.

Markings such as RMA number and ship-to/from addresses shall be placed to avoid loss or obstruction during opening and closing of the container.

Any person performing shipping functions for the inflation device must be trained in accordance with the requirements contained in Title 49 CFR Section 172.700.

All local and relevant international handling, shipping, transporting regulations must be followed.

For shipment by air, the inflation device is to be shipped by cargo plane only. AMSAFE Aviation's preferred carriers for shipment of the inflation device are FedEx and Emery Air Freight.

Ship the component to AMSAFE Aviation address as stated in previous **RMA Procedures** section.

Packaging and Shipping Requirements – AAIR Components except the Inflation device

Use the packaging material in which the AAIR was received, when it is in a serviceable condition. If not serviceable, new materials of the same quality and size shall be used.

"Peanut" type foam materials should not be used for dunnage as it tends to migrate in the container, causing the item to shift which can cause shipping damage. Use a minimum of three inches of cushioning material to prevent movement of the item within the container.

Place the RMA number and ship-to/from addresses to prevent loss or obstruction during opening and closing of the container.

REFERENCE PUBLICATIONS

V23 System Diagnostic Tool - Operation and Maintenance Manual, AMSAFE Document No. E508750.