

General Recommendations (cont)

Navigation

The boat must be correctly inflated to 250 mbar.

The outboard motor must be properly positioned (the motor should align with the central axis of the boat) and through-bolted through the transom.

Secure the engine with a rope to the safety loop of the metallic transom plate.

The adjusting of the angle of the motor in relation to the transom is essential to obtaining the best performance from your boat (generally on the 2nd tilt pin position).

The boat will porpoise if the motor is too far out from the transom (tilt).

The boat will buckle if the motor is too far into the transom (trim).

The height of the outboard motor also affects the boat's performance (water through the clamps, cavitation).

The clamps should be securely tightened by hand and retightened after 10 minutes of running.

The choice of the propeller also is important.

For short-shaft engines, the engine cavitation plate should be a full inch under the lowest part of the transom.

A circuit breaker line is highly recommended to avoid possible accidents. It should be attached to the pilot. In case of this separation from a moving boat, the line will disconnect the circuit breaker and shut off the engine instantly, thus minimizing any limb injuries to an overboard person.

Do not let the gasoline spill in the boat. If it were to happen, wash with abundant water, then wash with soap once returned from the mission.

Load Distribution

The maximum payload is greater than the planing of the boat (1600 to 1800 lbs. for a single 35 hp engine).

In heavy seas from the bow: load the bow of the boat. In heavy seas from the stern: load the stern of the boat. This can be achieved by shifting personnel or objects in the boat. Once on plane, best results are obtained with load toward the transom. Do not sit in the bow triangle. NEVER sit on a collapsible fuel tank.

Towing

Never use the bow carrying handle, use the 2 D-rings on each side of the bow, and attach the towing sling provided as standard equipment. For best performance while towing, cross towing lines, port to starboard and starboard to port, thus describing an "X" with your towing line.

Lifting

To lift the boat in the air with lifting sling (standard equipment), use the 2 eye-bolts of the thrustboard and the 2 eye-bolts in the transom.

Do not hoist boat with personnel on board, unless using a specific certified lifting sling (Coef. 6).

F 420 - F 470 - F 530

Section IV

Maintenance & Repair

GLUING TECHNIQUES - MSDS - KEEL & LBT UPGRADES - ZODIAC MTT



General

As of 1992, only the D53 and D25 rings, the lateral carrying handle, the fabric for the roll-up floorboard and the boat carrying bag are made of plastomer. To make a repair, you must use polyurethane glue 7096. For all the other repairs, use Neoprene glue 7098. (Product Definition Sheets and Spare Parts list will tell you the composition of a part so you can choose the appropriate glue...7098 for Hypalon/Neoprene and 7096 glue for all others.)

Conditions of Repair

Repairs must be performed under the following conditions:

Hygrometry: no greater than 60% RH
The temperature range between: 19 and 25 degrees C or 60 and 80 degrees F approximately.

Do not carry out repairs in direct sunlight or in rain.

WARNING: Read pages 47 through 52 before gluing.

Tracing/Cutting

Tracing is done with a grease crayon or a silver pen, when it is possible on the boat inflated at 200 mb or 3 psi. This is also the correct pressure for scuffing and gluing.

For a 3" to 4" cut or tear, cut an inside patch about 5 cm or 2 inches larger than the tear in every direction. Cut the outside patch 1.2 cm or 1/2 inch larger than the inner patch. Round all corners of any patch (radius minimum 2.5 cm or 1 inch).

Surface Preparation

1) The elastomer fabrics or elastomer parts **must be scuffed** correctly and evenly, using a 4 or 4.5" electric grinder with soft plastic backing wheel, a dremmel, or a pumice stone. The entire surface to be glued must be scuffed.

The threads of the fabrics should not appear after scuffing.

Patches with bevelled edges adhere better and do not peel off, especially patches glued on the bottom of the boat.

The dust must be removed both from the part and from the fabric with a brush. **Do not blow; wipe with solvent. Two coats** of Ethyl Acetate solvent must be applied on **both surfaces** with a lint-free paper towel. A **five-minute** evaporation time must be respected between each Ethyl Acetate application. Do not place wet Ethyl Acetate shop towel or tissue paper on the boat fabric at any time.

2) The plastomer fabric or plastomer parts do not have to be scuffed, but old glue must be removed. When gluing plastomer parts on elastomer fabric, the elastomer fabric needs to be scuffed. **Do not blow; wipe with solvent.**

Gluing Techniques (cont)

Three coats of M.E.K. solvent must be applied on **both surfaces** with lint-free paper toweling. Rub the M.E.K. into fabric **energetically** for good results. A **five-minute** evaporation time must be respected between each M.E.K. application. The time between M.E.K. applications is called "open time."

Do not place wet M.E.K. shop towel or tissue paper on the boat fabric at any time.

Preparation of the Glue

Before mixing accelerator with glue, make sure you stir the glue, as sediment is found on the bottom of the can. This has to be mixed into the upper layer of glue.

- To be mixed with the hardener at 5% in volume.
- In the shop, you must mix your hardener with the glue at 5% in volume by using a graduated eyedropper and a graduated plastic mixing cup.

The 5% is added to your chosen glue volume (e.g., 100 cc of glue + 5% of hardener = 105 total volume).

In the field, the outside of the cans are graduated horizontally. Those horizontal lines correspond to one-third of the can's contents, to be used with one dose of accelerator. **Do not try to economize on the above. The quality of your final bond depends on it. Do not use hardener that has been left unused overnight. Throw it away.**

- Mix carefully for 2 minutes with a spatula or tongue depressor.
- Leave to settle so that the bubbles are eliminated.
- Cover the glue pot at all times, specifically between glue applications.

Pot Life

In a controlled atmosphere, glue has a **60 to 90 minute** pot life, after which **it should be thrown away** and another dose mixed. Between coats, close pot with cover. Outdoor pot life is **20 to 30 min**. This actually depends on heat, wind and relative humidity, and could even be as low as 10 min.

Brushes

All the glue coatings are to be made with a hard paintbrush with natural hair (silk or boar). It is important that the brush hair be metal bound and not plastic bound, and that the handle be wooden. The hair length should not be longer than 1" and no wider than 2."

When you have finished gluing, put the brush in a pot with Ethyl Acetate. Do not use M.E.K. because the brushes will dry and become stiff.

Gluing Techniques (cont)

Gluing

Make sure you have the right conditions to perform a good gluing (temp., hygro., etc.)

Neoprene Glue (7098/Toluene)

- Apply a **thin uniform** layer of glue without going back twice over spots during any single application. Follow the same procedure on both surfaces to be assembled.
- Allow **5 minutes** of drying time
- Apply a second layer of glue exactly as the first.
- Allow **5 minutes** of drying time.
- After which you have another **5 min.** to assemble your parts.

Polyurethane Glue (7097/MEK)

- Apply a **thin uniform** layer of glue without going back twice over spots during any single application. Follow the same procedure on both surfaces to be assembled.

- Allow **5 minutes** of drying time.
- Apply a second layer of glue exactly as the first.
- Allow **5 minutes** of drying time.
- Apply a third layer of glue exactly as before.
- Allow **5 minutes** of drying time.
- After which you have another **5 minutes** to assemble your parts.

If you have not assembled your parts and boned it down within these **5 minutes, you will have to reactivate.** You will have to reactivate when:

- gluing outdoors, or indoors, in a non-air conditioned atmosphere
- gluing a long or a large patch
- glazing or blushing

Reactivating

Never reactivate between coats, always and only after the last coat. Use Ethyl Acetate or M.E.K., depending on the glue used for the repair.

This is done with the aid of a thoroughly wet and clean, lint-free tissue paper or shop towel, without rubbing off the glued surface, but **just wetting it once.**

When reactivating, you must not wait for the usual evaporation of 5 minutes, but assemble immediately. It is of the highest importance that you actually clock the open time and bone down vigorously.

Glazing

You will recognize glazing when the glue goes white. It rarely goes white all over the patch, but only in certain spots. This is due to two main reasons :

Gluing Techniques (cont)

- You have spread your glue too thickly, and therefore 5 minutes open time is not enough to let the solvents in the glue evaporate. You have trapped the solvents between glue layers.
- A rapid temperature drop has occurred during the open time, or likely, the R.H. is not below 60%. Generally, it occurs when someone opens a door and a fresh gust of air (hotter or colder) comes in and blows over the patch. A few seconds are enough to glaze your glue.
- What really occurs is that a microscopically thin layer of water due to condensation settled over your patch (you can glaze your surface to be glued by merely blowing on it). The ether content in the M.E.K. will mix into the condensed water laying on the top of your glue and will therefore lift it off the glue as it evaporates.

This is why one should assemble immediately, and not wait the 5 minutes...but 5 seconds only.

Assembly

The gluing of patches or accessories must be done with the boat inflated at 180/200 mbar, or in case of a tear on a smooth and hard surface. The patch should be positioned starting at the middle or an edge, and boned down firmly with a metal spatula from the center towards the edges to drive out air bubbles and any lumps of glue.

Precaution During Assembly

- Avoid manipulating glued parts with your fingers (grease marks will interfere with the gluing).
- Avoid making mistakes that would require ungluing.
- As soon as you realize that you made a mistake, unglue the parts, immediately, with a swift, jerking action.

If glue transfers itself from one part to another of your glued parts, a fourth layer of glue must be applied to the

part where the glue is lacking. The gluing time indicated previously must be respected.

If the edge of patches tend to curl up, it is generally due to:

- No Ethyl Acetate or M.E.K. was rubbed in the faulty area.
- No glue was brushed on in this area (which is why it is strongly recommended to tape the outside area to be glued with masking tape, thus ensuring glue is brushed on fabric up to the external limits of your "to be patched" area).
- You have pressed a finger on your patch, depositing natural "finger grease" on your patch. Glue will not adhere over that area.
- Too much glue (not enough open time and not enough evaporation).
- Glue is past due.
- Sudden heat/cold change
- Humidity out of control.
- Or a mix of the above.

Gluing Techniques (cont)**Smoothing/ Burnishing Down**

Use a metal spatula (stainless steel), Zodiac P/N 7035

Smoothing method:

- Press hard.
- Smooth from the middle to the edge.
- Always smooth in the same direction.
- Smooth the entire surface that has been glued several times.

Cleaning

Excess glue around the patch must be removed immediately with Ethyl Acetate. This operation must be carried out attentively, otherwise the smears of the glue will go yellow in the sun- light and will become impossible to remove.

Gluing Chronology Using Neoprene Glue 7098

Surface Preparation			Gluing		
Solvent			Glue		Assembly
Ethyl Acetate	Ethyl Acetate		7098	7098	Time
5 min.	5 min.		5 min.	5 min.	5 min.

Gluing Chronology Using Polyurethane Glue 7097

Surface Preparation			Gluing			
Solvent			Glue			Assembly
M.E.K.	M.E.K.	M.E.K.	7096	7096	7096	Time
5 min.	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.

With both glues, use 5% of accelerator per volume:

100 cc of glue + 5% of accelerator = 105 cc of total volume

WARNING

The contact of glues, hardeners and solvents is irritating to skin and eyes.

The vapors are irritating to the respiratory tract.

The effects of over-exposure are narcotic.

Wear adequate eye protection and respiratory face mask and gloves at all times.

In case of contact with skin, wash with abundant water for 15 minutes. If contact is made with eyes, wash abundantly with water for 15 minutes and see an eye doctor immediately.

See a doctor at once when ingested, do not induce vomiting.

Keep away from fire. Avoid spilling and dripping.

Mop up with absorbant materials (sawdust, sand). residue must be kept in a tightly closed drum, to be incinerated at an approved center.

**Zodiac 24 Hour Dangerous Substance Hotline
Emergency Telephone:**

MATERIAL SAFETY DATA SHEET*

IDENTITY (as used on label and list): **Transprene 113M - Neoprene Glue
Zodiac Glue 7098 and 7170**
 MANUFACTURER'S NAME & ADDRESS: Bostik SA, R.N. 19 77170 Coubert, France
 EMERGENCY NO. Air Pack - USA 1-800-626-7225
 INFORMATION NO. (33) 1.64.92.12.12
 DATE PREPARED: January 1994

SECTION II - Hazardous Ingredients

Hazardous Components:	MEK	Cyclohexane	Ethyl Acetate	Toluene	Polychloropene (CR)
ACGIH TLV	200 ppm	300 ppm	400 ppm	100 ppm	
%:	20%	30%	20%	5%	25%

SECTION III - Physical/Chemical Characteristics

Boiling Point: 70 degrees C
 Vapor Pressure (mm Hg): 110 mbar (at 20 degrees C)
 Vapor Density: (ALR-1): 3
 Specific Gravity (H2O - 1): 0.86
 Evaporation Rate (Butyl Acetate - 1) Approx. -500
 Appearance and Odor: Clear sandy, solvent smelling

SECTION IV - Fire and Explosion Hazard Data

Flash Point (Method Used): -17 degrees C (closed cup)
 Extinguishing Media: Powder, CO2, Foam
 LEL: 1.1%
 UEL: 12%

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MSDS - ZODIAC Glue 7098 and 7170 (cont)**SECTION V - Reactivity Data**

Stability: Stable
 Conditions to Avoid: Overheating
 Hazard Decomposition or Byproducts: CO-CO2-HCL
 Hazard Polymerization: Will not occur.

SECTION VI - Health Hazard Data

Routes of Entry: Inhalation, skin and ingestion
 Health Hazards (acute and chronic): Dermal irritation. Effects of over exposure are narcotic.
 Carcinogenicity: NTP - No, IARC Monographs - No, OSHA Reg. - No
 Signs and Symptoms of Exposure: Irritating to skin, eyes and respiratory tract
 Emergency and First Aid Procedures: Breathe fresh air. In case of contact with skin, eyes wash immediately with abundant soap and water. See a doctor immediately if ingested.

SECTION VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled: Keep away from fire. Avoid spilling and dripping. Mop up with absorbant materials (sand, sawdust). Residue must be kept in a tightly-closed drum.
 Waste Disposal Method: Incinerate wastes in an approved place.

SECTION VIII - Control Measures

Respiratory Protection: Recommended
 Protective Gloves: Yes
 Eye Protection: Yes
 Work/Hygenic Practices: Wash hands after use.

IDENTITY (as used on label and list): **Vynacol 1520 - Polyurethane Glue**
Glue 7020 - 7096 - 7097
 MANUFACTURER'S NAME & ADDRESS: Bostik SA, R.N. 19 77170 Coubert, France
 EMERGENCY NO. Air Pack - USA 1-800-626-7225
 INFORMATION NO. (33) 1.64.92.12.12
 DATE PREPARED: January 1994

SECTION II - Hazardous Ingredients

Hazardous Components:	MEK	Acetone	DMF	Toluene	Polyurethane
ACGIH TLV	200 ppm	1000 ppm	10 ppm	100 ppm	
%:	25%	50%	2%	3%	20%

SECTION III - Physical/Chemical Characteristics

Boiling Point: 56 degrees C
 Vapor Pressure (mm Hg): 180 mbar (at 20 degrees C)
 Vapor Density (AIR - 1): 3
 Specific Gravity (H2O - 1): 0.83
 Evaporation Rate (Butyl Acetate - 1): Approx. -500
 Solubility in Water: Partially
 Appearance and Odor: Opalescent - Solvent Smelling

SECTION IV - Fire and Explosion Hazard Data

Flash Point (Method Used): -17 degrees C (closed cup)
 Extinguishing Media: CO2 - Foam - Powder
 LEL: 2.5%
 UEL: 12.5%

* This information taken from approved OSHA form and reformatted for this manual only. Originals available upon request.

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MSDS - ZODIAC Glue 7020 - 7096 - 7097 (cont)

SECTION V - Reactivity Data

Stability: Stable
 Conditions to Avoid: Overheating
 Hazard Decomposition or Byproducts: CO-CO2-HCN
 Hazard Polymerization: Will not occur.

SECTION VI - Health Hazard Data

Routes of Entry: Inhalation, skin and ingestion
 Health Hazards (acute and chronic): Dermal irritation. Effects of over exposure are narcotic.
 Carcinogenicity: NTP - No, IARC Monographs - No, OSHA Reg. - No
 Signs and Symptoms of Exposure: Irritating to skin, eyes and respiratory tract.
 Emergency and First Aid Procedures: Breathe fresh air. In case of contact with skin, eyes wash immediately with abundant soap and water. See a doctor immediately if ingested.

SECTION VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled: Keep away from fire. Avoid spilling and dripping. Mop up with absorbant materials (sand, sawdust). Residue must be kept in a tightly-closed drum.
 Waste Disposal Method: Incinerate wastes in an approved place.

SECTION VIII - Control Measures

Respiratory Protection: Recommended
 Protective Gloves: Yes
 Eye Protection: Yes
 Work/Hygenic Practices: Wash hands after use.

IDENTITY (as used on label and list): **Desmodur RF or Fixdur B E - P/N 7123
Accelerator for 7096/7097/7098 Glues**
 MANUFACTURER'S NAME & ADDRESS: Bostik SA, R.N. 19 77170 Coubert, France
 EMERGENCY NO. Air Pack - USA 1-800-626-7225
 INFORMATION NO. (33) 1.64.92.12.12
 DATE PREPARED: January 1994

SECTION II - Hazardous Ingredients

Hazardous Components:	Ethyl Acetate	Polyisocyanate
ACGIH TLV:	400 ppm	
%:	73%	27%

SECTION III - Physical/Chemical Characteristics

Boiling Point:	77 degrees C
Vapor Pressure (mm Hg):	97 mbar (at 80 degrees C)
Specific Gravity (H2O - 1):	1.0
Evaporation Rate (Butyl Acetate - 1)	Approx. -700
Appearance and Odor:	Yellow to brownish liquid - ether smelling

SECTION IV - Fire and Explosion Hazard Data

Flash Point (Method Used):	-3 degrees C (closed cup)
Extinguishing Media:	Powder, CO2, Halon
LEL:	2.1%
UEL:	11.5%

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 Originals available upon request.

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MSDS - ZODIAC 7098 Glue Accelerator (cont)**SECTION V - Reactivity Data**

Stability:	Stable
Conditions to Avoid:	Over heating
Hazard Decomposition or Byproducts:	CO-CO2-HCN
Hazard Polymerization:	May occur
Conditions to Avoid:	Water, moisture

SECTION VI - Health Hazard Data

Routes of Entry:	Inhalation, skin and ingestion
Health Hazards (acute and chronic):	Vapors irritate respiratory track. Contact irritates eyes/skin.
Carcinogenicity:	NTP - No, IARC Monographs - No, OSHA Reg. - No
Signs and Symptoms of Exposure:	Irritating to skin, eyes and respiratory tract.
Emergency and First Aid Procedures:	Breathe fresh air. In case of contact with skin, eyes wash immediately with abundant soap and water. See a doctor immediately if ingested.

SECTION VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled:	Keep away from fire. Avoid spilling and dripping. Mop up with absorbant materials (sand, sawdust). Residue must be treated like waste.
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Waste Disposal Method:	Incinerate wastes in an approved place.
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SECTION VIII - Control Measures

Respiratory Protection:	Recommended
Protective Gloves:	Yes
Eye Protection:	Yes
Work/Hygenic Practices:	Wash hands after use.

IDENTITY (as used on label and list): **Latex 60% - Zodiac Latex Liquid, P/N 7074**
 MANUFACTURER'S NAME & ADDRESS: CECA SA, Cedex 54, E-92062 Paris La Defense, France
 EMERGENCY NO. Air Pack - USA 1-800-626-7225
 INFORMATION NO. (33) 1.47.96.90.90
 DATE PREPARED: May 18, 1994

SECTION II - Hazardous Ingredients

Hazardous Components: Ammonia
 OSHA PEL: 18 mg/m³
 %: Less than 0.5

SECTION III - Physical/Chemical Characteristics

Boiling Point: 100 degrees C
 Vapor Pressure (mm Hg): 760
 Specific Gravity (H₂O = 1): 0.95
 Melting Point: N/A
 Solubility in Water: Entirely miscible
 Appearance and Odor: Viscous White Liquid - Odor, Ammonia

SECTION IV - Fire and Explosion Hazard Data

Flash Point (Method Used): N/A
 Extinguishing Media: Water, foam, carbon dioxide
 Special Fire-fighting Procedures: Wear suitable breathing apparatus.
 Unusual Fire and Explosion Hazards: Possibility of toxic smokes

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MSDS - ZODIAC Latex Liquid, P/N 7074**SECTION V - Reactivity Data**

Stability: Stable
 Conditions to Avoid: Freezing and heating under normal conditions
 Incompatibility (material to avoid): Acids, alcohols, salts
 Hazard Decomposition or Byproducts: Toxic or irritating vapors or smokes
 Hazard Polymerization: May occur.

SECTION VI - Health Hazard Data

Routes of Entry: Inhalation, skin and ingestion
 Health Hazards (acute and chronic): Do not ingest.
 Carcinogenicity: NTP No IARC Monographs No
 Signs and Symptoms of Exposure: Slight irritation to skin, eyes and respiratory tract.
 Emergency and First Aid Procedures: Breathe fresh air. If contact with skin or eyes, wash immediately with soap and water.

SECTION VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled: Spillage should be contained and covered with sawdust or equivalent.
 Waste Disposal Method: Incinerate wastes in an approved place.
 Precautions to be Taken in Handling and Storing: Keep container in a well-ventilated place.
 Other Precautions: Keep away from frost and heat.
 If large spillage, coagulate with aluminum sulfate, then burn the residue.

SECTION VIII - Control Measures

Ventilation: Local exhaust
 Protective Gloves: Rubber Gloves
 Eye Protection: Goggles
 Other Protective Clothing or Equipment: Eye-shower
 Work/Hygenic Practices: Avoid prolonged contact with skin and eyes.