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TECHNICAL MEMO # SRF/FE/ESR 07-01

To: All SRF/FE/ESR Owners and CSRs

From: Chris Doyle, Technical Manager

Date: 25 July, 2007

Re: ALT Fuel Cell Information regarding Ethanol blend fuels

Please Read The Following Information

IMPORTANT NOTICE • PLEASE READ

UNLEADED RACE FUEL WITH ETHANOL

Many States in the USA have recently banned the octane enhancer "MTBE" from unleaded road-car and race-car gasolines. Major oil companies are now replacing the MTBE "oxygenate" with an alternative anti-knock additive known as "ethanol" or "ethyl alcohol". Most of these new gasoline blends end up as 85 to 90% unleaded gasoline and 10 to 15% ethyl alcohol (ethanol).

Europe and Asia are expected to follow suit and popularize their own ethanol oxygenated gasolines.

Unfortunately, rubber fuel-system components such as hoses, pump diaphragms, seals, filters and fuel cell bladders are generally suitable for ***either*** gasoline ***or*** alcohol, but ***not both. Also significant, is the fact that gasoline and alcohol do not mix well, and with exposure to low temperatures, water vapor and gravity, they may experience "phase-separation". That is, the heavier alcohol component may sink to the bottom of a bladder, while the lighter gasoline portion may float to the top.***

It is ATL's considered opinion that elevated alcohol concentrations could damage gasoline-type fuel bladders regardless of their brand. As of this writing, ATL knows of no accidents or leaks caused by ethyl alcohol, but the company is taking a pro-active stance, and you can help:

1.) ATL is recommending that, where possible, racers who intend to run unleaded gasoline with ethanol, choose the ATL ***Sports Cell*** or ***Saver Cell*** "hard-rubber" bladder over the ***Super Cell*** "soft-rubber" bladder. Hard-rubber cells exhibit better chemical tolerance of both gasoline and alcohol, but are limited to the FT-3 specification and to 16 standard sizes.

2.) ATL further suggests that racers who are required to use soft-rubber bladders such as ***Super-Cells*** should ***(a)*** pre-agitate their fuel to help homogenize the gasoline and ethanol mix and ***(b)*** drain the fuel bladder after each race or practice.

3.) ATL has petitioned the US producers of race fuel to reconsider ethanol-gasoline blends and to test their gasoline formulations on typical fuel system rubber parts (including bladders) before going to market. You can help by repeating ATL's position to your race fuel supplier.

4.) ATL is developing a 2-ply "barrier liner" for FT-3, FT-3.5 and FT-5 soft-rubber ***Super Cells***, and we suspect all other fuel cell makers are doing similarly. This new treatment promises to help isolate ethanol from the fabrics, elastomers, sealants, binders and tapes that comprise a fuel cell bladder. Yes, this treatment would, regrettably, add some cost to those ***Super Cells*** being designed to accept ethanol oxygenates.

5.) ATL is already experimenting with new ***Super Cell*** materials in an effort to enhance alcohol compatibility, but without sacrificing the ***Super Cell's*** excellent crash resistance, abrasion tolerance, flexibility, gasoline compatibility and modest price.

6.) ATL encourages you, the racer or team manager, to inspect your fuel bladder's interior frequently for any sign of fraying, wrinkling or blistering. But, first read ATL Safety Bulletin #DS-381 which is available upon request and will be downloadable shortly.

ATL has also set-up a toll-free contact, Mr. Richard Clark, at **800-526-5330** to receive, inspect and evaluate any competitor's ATL fuel bladder at no charge.

7.) Again, you can help; please spread the word about ethanol and rubber components to your fellow racers, and circulate this Bulletin. Also, kindly report any inspection evidence (para. 6) to the component manufacturer and also to the fuel supplier.

ATL's contacts are:

USA Mail:	ATL Fuel Cells, USA Spear Road Industrial Park Ramsey, NJ 07446-1251 USA
e-Mail:	atl@atlinc.com
Tel:	201-825-1400
Fax:	201-825-1962
Hot Line:	800-526-5330
England Mail:	ATL Fuel Cells, UK 1 Patriot Drive, Rooksley, Milton Keynes, MK13 8PU, England
e-Mail:	atl@atlltd.com
Tel:	44-(0) 1908 351700
Fax:	44-(0) 1908 351750

8.) Thank you for your interest, your patience and your vigilance.

Yours for safer racing . . . .

The Folks at ATL Fuel Cells.

PRODUCT SAFETY BULLETIN

PLEASE READ!

**IMPORTANT PRECAUTIONS IN USING ATL RACING EQUIPMENT:
FUEL CELLS, CHECK VALVES, DUMP CANS, REFUELING RIGS,
VENT VALVES, DRY-BREAK COUPLERS, FITTINGS, ETC.**

PLEASE READ THOROUGHLY

AND REFER TO CURRENT ATL COMPETITION EQUIPMENT CATALOG

1. TEMPERATURE – Racing fuel cell bladders rely on deformability to ward off impact and puncture. Decreasing temperatures may limit pliability and could thereby reduce the cell's effectiveness. Most ATL racing type fuel cells are designed for normal competition environments of 30ºF to 120ºF (0º to 50ºC). Use below -20ºF (-30ºC) may diminish performance. Maximum intermittent bladder exposure temperature is 160ºF(60ºC).

2. LIFE SPAN – Major sanctioning bodies such as FIA, NASCAR, ASA, SCCA, etc. have recognized that fuel cells and related equipment are slowly affected by ozone, ultraviolet, aging and the chemical action of gasoline and racing fuels. Hence, a Five-Year Legal Life Span has been set on all fuel cell bladders. The rubber bladder portion of your fuel cell system must be replaced within 5 years of its manufacture date. No repairs may be made to bladders after that 5-year period has elapsed. Upon factory re-inspection, a 2-year extension may be granted by FIA & SCCA.

3. WATER & MOISTURE – Water vapor and direct sunlight exposure may affect fuel cell bladders and foam baffling. Always install you fuel bladder within a metal or composite enclosure, and keep the system externally and internally free of water and water vapor.

4. DIFFUSION – Due to the polymeric nature of fuel cell bladders, molded tanks and hoses, a certain amount of fuel permeation or "diffusion" will occur through the walls. Always provide generous ventilation around the cell and vehicle so as to preclude the accumulation of hazardous fuel vapors.

5. STORAGE - When storing a fuel cell, drain the bladder completely, wash and dry the interior, close off all ports, and keep it in a dark, warm and dry area (see paragraph #18).

6. WEATHERING EFFECTS – Most racing equipment is affected by weathering; that is: sunlight, wind, freeze-thaw cycles, high and low temperatures, rain and airborne contaminants. Ozone, ultraviolet light, water and acids are especially detrimental to many plastic and rubber parts. Protect your fuel cell and refueling equipment from necessary weather exposure.

7. ABRASION – Many racing products, and especially rubberized fuel cell bladders, are susceptible to chafing or abrasion. Handle these items with care and install them gently without force or compaction. Keep free of pebbles, sand and other abrasives which can wear rubber and plastic materials. Be certain that the tank, container, nacell or cavity which holds a fuel cell bladder is thoroughly smooth and continuous on its interior. Do not put sharp, heavy or irregular loose items (i.e. metal pick-ups, baffles, swirl pots, etc.) inside a fuel cell bladder as they could chafe the rubber and create an eventual leak.

DS 381
3Q 04

8. FUEL COMPATIBILITY – Most fuel system components are **not** resistant to **all** types of fuels. Therefore, it is essential to identify the intended fuel (i.e. gasoline, diesel, methanol, etc.) **before** purchasing equipment and putting it in service. For example, most fuel cell foam baffling material is adversely affected by alcohol as are certain fuel cell bladders. Other chemical fuels such as nitromethane, nitropropane, hydrazine, and additives such as aniline, toluedine and aromatics can deteriorate hoses, gaskets, valves, bladders and other fuel system parts. Double check compatibility and, when in doubt, contact the ATL factory for advice. **Don't take chances.**

9. INSTALLATION –When installing any fuel cell, dry break valve, vent valve, fuel hoses or other ATL components be **certain** to follow the instructions strictly and carefully. Pay particular attention to location, bracketing, venting, grounding and isolation from the driver compartment. Since every vehicle is different, it is not realistic to prescribe a set method of installation for every ATL product. However, certain basic safety and function practices **must** be adhered to for all installations. Be certain your installation procedure complies with ATL's general instructions as well as the specific requirements of your competition organization or sanctioner. When in doubt, consult a professional chassis builder, vehicle engineer or the ATL factory for installation assistance.

10. SAFETY FOAM BAFFLING – Fuel cell foam is a "reticulate" or open-cell sponge-like material. When used within a fuel cell bladder, foam helps suppress explosion, control fuel slosh and absorb some impact energy. Foam should **never** be handled when wet with fuel as surface fire could erupt. Flush the cell with water before removing foam. Also, SF103 and SF112 foams should be used with **gasoline only** and not with additives, alcohol or an excess of 40% aromatics. SF110 foam offers the best methanol resistance as well as static charge suppression.

11. INFLATION – ATL tanks and bladders are **not** to be inflated or pressurized. However, leak testing of these containers with less than 50 gallons capacity may be performed at 1/4 psi (6" water) maximum pressure. An accurate gauge and a redundant pressure regulator system are essential. Overpressurizing may elongate the tank or bladder and damage its seams without visual evidence.

12. CONTAINERS – All fuel cell bladders are to be installed inside a minimum 20 gauge steel or .062" aluminum enclosure (container). These are **minimums** and thicker walls are sometimes mandatory and always recommended. The container serves to support the bladder, deflect impacts and provide a flame shield. ATL offers ready-made containers as well as drawings and templates for the do-it-yourselfer. When sizing a bladder or container, be sure to leave a clearance for easy installation and removal. Containers for soft rubber bladders (rubberized fabric) should be 1% larger in length, width and height. Containers for molded hard rubber bladders must be 2% larger in each dimension to accommodate linear swell.

13. STATIC GROUNDING – Electrical charges may build up on components due to fuel agitation, high flow rates, and by induction from other sources. To alleviate sparking and possible fuel ignition, always electrically ground fuel handling equipment. Fuel cells, fill necks, dry-break valves, etc. should be installed with a bonding strap to the chassis for unimpeded electrical dissipation. Overhead fueling rigs, dump cans, hose connections, funnels, valves, filter presses, gasoline cans, etc. must be electrically "bonded" together with static straps and then connected to an earth ground before any fuel or vapors are transferred. Always wear **full** protective clothing when working with flammable fuels. Use 1/2" braided grounding cable for bonding and grounding straps. All terminals must make a clean full-circle connection to assure electrical conductivity

14. MODIFICATION & ASSEMBLY – Alterations, modifications and repairs to ATL cells and equipment **must** only be performed by the manufacturer at its facilities. Disassembly for periodic inspection and cleaning purposes is highly recommended and should be performed only by a trained mechanical technician or fuel system engineer. Reassembly must conform to ATL design and a low pressure (1/4 psi) leak test must be applied to all joints, fittings and surfaces. Certain ATL products, notably Saver Cells, Sports Cells and Racells are not repairable if punctured. Patching may provide a seal, but it may not restore lost strength. Replace the bladder immediately. For other items requiring repair or service, contact these Repair Stations: Ramsey, NJ USA and Milton Keynes, England. See the last page for addresses and phone numbers.

15. LUBRICATION – Most ATL products do not require periodic lubrication. However, others, such as dry-break valves do need frequent disassembly for cleaning and lubing. Keep all your racing equipment free from dirt, sand and other contaminants and regularly lubricate moving parts with fuel resistant grease for smooth, safe operation.

16. VENTING – Proper fuel cell venting is essential to fuel system operation and fire safety. If your fuel cell is to be "quick-filled", you will need a 1" or 1-1/2" diameter vent, ball check valve, vent hose and Discriminator Valve. Regular-fill fuel cells require a 3/8" vent, vent check valve (TF210 or TF350) and vent hose. Be certain the vent hose is firmly attached to the fuel cell and is routed **upward** and **away** from the cell, engine, exhaust and driver compartment. Always use top quality resistant hose, make air-tight joints and exit the vent rearward to a catch tank or into the free air stream and away from any potential ignition source.

17. ALTERNATIVE APPLICATIONS – ATL racing fuel cells and related fuel system equipment may qualify for use in commercial and military vehicles, road cars, off-road equipment and boats. However, be certain the **entire** installation complies with required agency regulations such as NHTSA, D.O.T., E.P.A., NMMA, Coast Guard, I.C.C. or applicable Mil-Specs. Pay particular attention to safe location, secure mounting, appropriate venting, non-spill filling, static grounding, ventilation, firewalls and ground clearance. Contact ATL or the relevant Agency for assistance in compliance.

18. FOAM REMOVAL – ***CAUTION:*** All fuel tanks, fuel cells, and gasoline containers must be purged and inerted before inspection, disassembly or storage. Fuel cells are best treated by draining all fuel and then **filling** with water for 5 minutes and emptying. The internal foam baffling should be removed immediately thereafter and dried outdoors. After wiping the bladder dry, the foam may be cleaned and reinstalled or replaced with new. **NEVER REMOVE OR INSTALL FOAM THAT IS WET WITH FUEL AS IT MAY SPRAY DROPLETS OR IGNITE FROM A STATIC CHARGE. ALWAYS WEAR FULL PROTECTIVE CLOTHING WHEN WORKING ON ANY FUEL CELL, FUEL CONTAINER OR ACCESSORY.**

19. DATA BLOCK – All ATL fuel cells are individually manufactured, inspected and serial numbered. Information regarding your ATL fuel cell is located on the fuel bladder in the "data block". This information includes the manufacture date, inspector, Model #, material of construction, capacity and serial number. Write down this information **before** contacting ATL with any questions. It will help immeasurably in speeding your inquiry.

20. SPILLAGE – Some accidents occur in the pits or even at home in the garage due to sloppy or leaky filling procedures. Fill your fuel cell **slowly** allowing time for vapors to discharge and avoiding "back-surge" or dripping. If your cell is designed for quick-filling, then be certain you have the appropriate dry break valve, roll-over valve, and proper vent. Use a Discriminator Valve, catch tank or overflow can to prevent or collect any liquid fuel discharge from the vent line. Also, check frequently that all fuel lines, pumps, level gauges, dipsticks and fuel return lines are drip free and air-tight. Your fuel cell is only as good as its peripheral equipment and accessories. Be sure your entire fuel system from dump-can to intake manifold is completely spill free and leak free well **before** the flag drops.

21. PERSONNEL PROTECTION – Pit crews, mechanics and all others involved with handling flammables must wear **FULL** protective clothing and equipment of an impervious, non-static and flame resistant type. Multi-layer suits of the duPont Kevlar or Nomex type are appropriate when used with a fire protective hood, underwear, socks, shoes and face shield.

22. LIMITS OF WARRANTY – ATL (AERO TEC LABORATORIES) WARRANTS ONLY THAT ITS PRODUCTS ARE CONSTRUCTED TO GENERAL INDUSTRY STANDARDS AND HAVE PASSED ATL'S OWN IN-PLANT INSPECTION. BECAUSE OF THE GRAVE AND UNAVOIDABLE DANGERS INVOLVED IN RACING AND ESPECIALLY IN THE USE OF FUEL HOLDING AND FUEL HANDLING DEVICES, ATL MAKES **NO** WARRANTY, EXPRESS OR IMPLIED OF **ANY** PRODUCTS' SUITABILITY FOR USE. NOTWITHSTANDING ITS LONG HISTORY OF SUCCESSFUL PRODUCT USAGE, ATL AGAIN, MAKES **NO** WARRANTY WHATSOEVER REGARDING ITS PRODUCTS' SAFETY OR APPLICABILITY FOR ALL OR ANY PURPOSES. FURTHER, ATL DISCLAIMS ANY LIABILITY IN TORT FOR DAMAGES, DIRECT OR CONSEQUENTIAL INCLUDING PERSONAL INJURIES RESULTING FROM A MALFUNCTION OR FROM A DEFECT IN DESIGN, MATERIAL, WORKMANSHIP OR MANUFACTURE WHETHER CAUSED BY NEGLIGENCE ON THE PART OF ATL OR OTHERWISE. BY USING ATL EQUIPMENT OR COMPONENTS, OR ALLOWING IT TO BE USED BY OTHERS, THE BUYER AND USER WAIVE ANY LIABILITY OF ATL FOR PERSONAL INJURIES OR OTHER DAMAGES ARISING FROM SUCH USE. THE ABOVE SHALL APPLY TO ALL PRODUCTS ATL FURNISHES WHETHER OR NOT DESIGNED, MANUFACTURED, IMPORTED, WAREHOUSED, DISTRIBUTED OR SOLD BY ATL.

23. FACTORY SAFETY SUPPORT – Gasoline and racing fuels are highly flammable and subject to sudden ignition and/or explosion. Before every competition event, be certain to carefully inspect all ATL equipment for proper installation, function and freedom from leaks. Should any questions arise, ATL is available to assist with technical advice, replacement parts or product service:

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PLAY IT SAFE! DON'T TAKE CHANCES WITH FLAMMABLE FUELS!