



To: Star Mazda Championship Teams and Drivers

From: Gary Rodrigues / Star Mazda Race Cars

Date: November 26, 2008

Re: Mechanical updates available for 2009

When we introduced the current Star Mazda 'Pro' car in 2004, we projected a 5-year life span for the car and guaranteed that any upgrades made during that time would be bolt-on and applicable to all the cars. By any comparison, the cars have turned out to be extremely robust, reliable and relatively inexpensive to operate.

Now, with the production of new 2009 cars proceeding, Star will make available the same upgrades that will appear on these new cars, but can be retro-fitted to the existing cars. This memo to the teams is intended only as an overview; specifics, part numbers and prices will be communicated to you when everything has passed final pre-production testing. That should be in the next few days for some parts, a little longer for a few others.

It is our intention to have all these parts available to teams before the IMSA/Star Mazda Championship test at Sebring January 26 – 28. Technical experts from the Star Mazda Championship, as well as engineers from Ohlins, Quartermaster and other technical partners involved in the upgrade program will be on hand to bring teams, engineers and drivers up to speed as quickly as possible.

Teams are urged to attend this test; if that is not possible, you should consider sending a qualified technical representative who can understand and report this information back to the relevant members of your team.

Items 1 – 3 on the list below are performance-related, and will make the Star Mazda Championship race car faster, more reliable and make it easier for the driver and his/her engineer to hit the 'sweet spot' on the setup. Items 4 – 7 are 'maintenance' and 'ease of adjustment' items that will not materially affect the performance of the car. Item 8 refers to engine updates that will be part of the periodic rebuild process.

This is obviously not the financial environment in which to make wholesale and gratuitous changes – nor have we. In most cases the changes were a result of requests from teams and engineers over the past several seasons. In some cases, changes were necessary due to a supplier no longer manufacturing parts we have used, or, in some instances, engineering changes in parts supplied to us by Mazda.

In every case we have worked long and hard to make the upgrades as efficient and cost-effective as possible. In some cases, items like wings, which were not repairable previously, can now be repaired. And in the case of shock absorbers, not only are they less expensive, but are more effective and easier to work with in setting up the car.

Pro Mazda 2009 Update Package

1. **Aerodynamic package:** New front and rear wings made from carbon fiber have been created to address many issues with the original wings. The new wings are manufactured in a way that produces higher quality parts and has much tighter quality control. In the event of damage on track, these wings will be able to be repaired in many instances which was not the case with the prior design. The new wing package has a broad adjustment range that will allow a significant drag reduction on the low side of the range or a small downforce increase on the high side of the adjustment. We have concentrated specifically on producing an aerodynamic package that reduces pitch sensitivity, increases cooling capacity, is user friendly and introduces no bad traits to a car that has a history of great racing. This includes raising the nose wing up about an inch to reduce damage from curbing and to increase cooling to the engine, thereby helping to prolong engine life and reliability. In addition, the rear wing has been reduced from four elements to three, thereby lowering cost. Availability of spares will be improved.
2. **Damper package:** After 5 years on the Star Pro Mazda racecar, Ohlins is discontinuing their single tube damper, and we are switching to the TTX36. This is the more affordable version of the TTX dampers found at the highest level of motorsports. There will be low-speed compression and rebound adjustments available. The external adjustments provide a large tuning window and minimal 'cross-talk'. The design of these dampers is more robust than the previous damper and will reduce maintenance costs. And because the original shock absorbers had to be built up individually from parts, whereas the new shocks are production models, the cost of these new shock absorbers is about 25% lower.
3. **Suspension Rockers:** Originally, this car was raced on bias ply tires, and these specifications served the car well. With the switch to radial tires and a different damper package, though, we have identified areas where we can improve the overall performance of the car by varying the motion ratios and rising rate characteristics of the suspension system. These rockers will also incorporate multiple anti-roll bar drop link mounting points to increase their tuning ranges.
4. **Front Toe Adjusters:** The front toe-links have been modified to accept an adjuster which will make adjusting the racecar alignment easier and more precise.
5. **Pushrod Ride Height Adjusters:** Similar to the front toe-link adjusters, these will also provide the race teams with a better adjustment mechanism. Whether the adjustments are made on pit lane or the setup pad, this will allow quicker tuning and more repeatable adjustments.
6. **Rear Upper Camber Block:** This suspension piece design is being modified to address a number of issues with the current design. It will allow an increase in possible camber adjustment. It will provide a greater adjustment window to account for rear bump steer and increase the articulation range of the upper ball joint.

7. Battery Box: The new battery box is going to be tub mounted as opposed to sidepod mounted. This will make it less prone to damage in case of an off-track situation and reduce the chance of damage to the rest of the electrical system possible with the original design.

8. Engine Upgrades: Most updates to the engine are optional "running changes" due to manufacturing changes by Mazda. Dyno testing has shown little if any outright performance change. Parts are also available to teams who wish to update their engine specifications immediately. Changes will include a new intake manifold with new injector nozzles producing a much improved spray pattern that should increase both fuel economy and engine reliability.

An improved clutch mechanism with design changes to remedy the occasional clutch failures we have had during the 2008 season will be permitted.

There will also be changes to the engine mapping to make 'hot re-starts' easier and more dependable, allowing the driver to get going again after an on-track spin or incident without needing a push or tow truck. The new maps (one for the current motor configuration, and another for the new manifold and injectors) will also increase the rev limit by 300 rpm, to 8,600 rpm, which will reduce cycling the intake valve and make the 'short' stack of gears more widely applicable to the circuits run by our series.