

# Southern Aurora – WSC 2005

## Report of team activities:

The core members of the Hamilton based group made the decision to compete in the 2005 World Solar Car Challenge (WSC) shortly after competing in the 2003 WSC in October of 2003.

Firm planning commenced in the 2nd quarter of 2004 with the agreement to take over the lighter and more efficient array from Aurora 101, in return for a cash contribution to enable Aurora Melbourne to construct a new array for the 101 car.

It was reported that there was in the region of \$8,000 of Hamilton group funds in the main Aurora account and this was transferred to Aurora as a down payment for the new array and it was indicated that a further \$6,000 would be required from Southern Aurora. A bank account in the name of Southern Aurora was opened in December of 2004.

Fundraising for Southern Aurora commenced with a successful application to the Helen and Geoff Handbury Fellowships Program. Sponsorship funding from various other corporate sources was obtained and the group also raised money by manufacturing a test rig base for a company as a commercial venture. A total of some \$22,000 was raised, of which \$6,250 was transferred to Aurora for the 101 project.

In the 2nd quarter of 2005, members of the Hamilton group spent many weekends in Melbourne assisting the Aurora group in the construction of their new array in time for the Suzuka race in August and the old 101 array was transferred to Hamilton. From then onwards the serious work of preparing the Hamilton car, Aurora 99 could commence.

There was much to do and we had some delays because of providing the Hamilton car for driver training at the Hamilton go cart track, prior to Suzuka. There was a commitment to RMIT to display the car at their Melbourne city campus open day and an agreement with a local sponsor to display the car at the Hamilton Sheepvention.

It had been hoped that we could have new carbon wheels to replace the aging steel ones but there were not the funds to buy these and not sufficient time to try and construct them.

Work continued on the car with various structural changes to make a good fit between the original base and the ex 101 array.

It was determined late in the programme that we would have access to the more efficient lithium polymer batteries from the 101 car after Suzuka and structural and wiring modifications were made for this.

A new switching arrangement was installed to replace the unreliable rotary switch previously used and various fuses were installed or replaced.

Repairs were made to damaged trackers and the associated wiring.

New plugs and sockets were fitted to the array

A new canopy was made together with a new latching system.

New ventilation ducting was made and a cover with extraction fans was made for the trackers and associated components.

A new power supply was fitted for the 12volt circuit.

Ten of the array panels had to be installed, sealed, support ribs were added and wiring into the umbilical was completed.

At the same time the tool trailer wheel bearings were replaced and adjustments made to the car trailer alignment.

Team members worked hard and long during the last few weeks leading up to WSC although we were unable to complete the car and carry out the planned testing of the all the electric systems and in particular the data monitoring and telemetry, prior to departure for Darwin.

Whilst we had and still have the RMIT possum shed available to us, there is no doubt that we owe many thanks to Jack McArthur for the use of his shed and facilities for working on the car.

We had been unable to obtain sponsor provided vehicles except for one car supplied by RMIT and three team members generously provided the use of their own personal vehicles which enabled the trip to go ahead.

With 4 new students on the team plus one from RMIT Melbourne, we relied heavily on pre race telemetry training support from previous students, notably Damien McArthur and Michael Van Dooran.

## **World Solar Car Challenge Event**

The 3,650km trip to Darwin was completed comfortably in 4-1/2 days during which time the team mixed well and got to know each other. After arrival in Darwin and setting up camp at the Shady Glen camping park the team set up the car and workshop in the number 3 pit garage at the Darwin Hidden Valley race circuit.

Work continued on the car until we were able to start testing and driver training. It became evident early on that the motor was running "roughly". An alternate motor and controller were tried but these made no difference. Assistance from the 101 team finally determined that a broken lead to one of the terminals on the motor controller. This was repaired and the motor ran more smoothly than ever before.

With little time to spare the 2 new drivers gained good track experience and we were ready "just in time" for the scrutineering, final grid position qualifying, the stability and brake testing.

All completed and we were on the start line in 9<sup>th</sup> position at 6 am on Sunday morning, 25<sup>th</sup> September.

The drivers and the support teams and the students performed very well in the various jobs that we had to do. Progress was slow during the first day because of traffic from Darwin, delays at road works 7 some stops for telemetry issues.

The second day started well although there were occasional breaks in the telemetry the average speed was higher.

The third day we suffered a tyre puncture early in the day. Were then travelling well until a driver started to report feeling electric shocks through the metal parts of the controls. These were insulated with tape and we continued on through the second checkpoint of the day in Alice Springs, during part of this time we even had a driver wearing rubber gloves.

Whilst setting up camp for the night a more detailed examination of the electrical system was conducted by the team and with assistance from Stephen Bicknell who had joined us. It was then that a power leak from within the motor was discovered. It was determined that this was not be repairable as we did not have either a spare motor or the special equipment required to dismantle the motor. With great regret it was then decided that, for safety reasons, we would not be able to continue running the car.

The team was naturally very disappointed that this occurred, as we were confident that we could have finished well up the field in the final results. The car was put into the trailer and over the next 3 days the team continued on to the finish in Adelaide to meet up with the other competitors.

Daily performance for the 3 days was as follows:

Day	Hours	Stop at	Km for day	Speed for day	Km total	Avg speed running
1	8.5	Larrimah	497	58.5	497	58.5
2	8.0	Park bay	550	68.8	1,047	63.5
3	8.5	Alice Springs	489	57.5	1,536	61.4

If we had been able to continue with this performance and with the weather staying fine we should have finished in the afternoon of Friday which would have been a good result.

To complete the commitments to Sponsors and supporters for the WSC 2005 project we are to display the car at a transport industry maintenance conference in November and also at an open day at Portland Aluminium on 15<sup>th</sup> Oct 2006

Other events include Sheepvention, RACV Human Powered Vehicle event in Maryborough, Heywood Wood, Wine and Roses festival, SE Field Day Lucindale and other events where resources and time allow for (remember we are a volunteer not-for-profit group)

## **The Motor:**

The motor was taken to Melbourne by Shane for disassembly at the Aurora workshop, together with Stephen Bicknell. Prior to disassembly testing still indicated that there was a power leakage from the motor, as had been found at Alice Springs.

When the motor was stripped, no specific damage was found but there was a significant amount of dirt and contamination and this was cleaned up prior to re assembly and some insulators replaced. After re assembly the motor was tested and there were no indications of external power leakage.

The vehicle then performed faultlessly at 24 hour event Ford Proving Ground at the You Yangs in Dec 2005 where it covered over 1700km in great style.

## The Future:

### So where to from here?

By the time we had reached Adelaide, the team was already discussing competing in the 2007 WSC, namely the Adventurer class. For details of 2007 event see [www.wsc.org.au](http://www.wsc.org.au)

With only a few changes the car could certainly be run competitively with the current range of WSC mid fielders.

The main high capital cost items required will be replacement wheels as the current steel wheels are distorted which causes the brake discs run out of true and changing tyres is a time consuming job. There has been discussion about whether replacement wheels should be carbon or Aluminium Alloy. This still has to be decided.

The trackers are still suspect and may need replacement or repairs.

There will be entry fees for the event and funding for the actual trip.

An estimate of funding requirements for 2007 event are

2007 Entry Fee for WSC	\$3,500
Manufacture of wheels	\$3,000
2007 compliance requirements	\$2,000
<b>Fuel for support vehicles</b>	<b>\$7,000</b>
Electrical/Mechanical upgrades	\$2,000
Telemetry and data acquisition	\$2,000
Provision for support vehicles	\$2,500
Accommodation for team	nil - paid for by the participants

### **\$22,000 Funding required, biggest unknown is fuel for support vehicles**

There will be approx. \$1,500 left in the bank account after all WSC 2005 expenditure has been finalised and the GST reconciled.

Note that the amount shown as being required, is a similar amount to that required and raised for WSC 2005.

Note also that this does not allow for any significant updates to the array, motor controller or other parts of the main electrical system.

The issue of support vehicles for a WSC team will again have to be addressed. Unless significant corporate sponsorship involving vehicle supply, such as that secured by the Aurora Melbourne team, can be obtained, then it may again require that team members supply vehicles.

## **Recommendations:**

The group should establish a formal committee so that important decisions on administrative and technical issues can have some form of documented agreement.

We are part of Aurora Vehicle Association (AVA), and ownership of the car remains with that group. Therefore any significant decisions need to be taken with the general approval of AVA.

Enter the WSC 2007 event in October 2007

A team manager/leader will be required to coordinate the following:

- Administration of finances and documentation
- Coordination of team members and activities
- Promotion of team activities to obtain sponsorship funding
- Inspiration and motivation of the team to have the car ready for WSC 2007 or whatever project is decided on.

The loosely established policy so far has been to involve at least 4 local students and the 2005 group involving some students with a parent worked well. For 2007 it is unlikely that any of the 2005 students will be available and recruitment of some replacement team members will be required.

Bob Cadden 14 October 2005

Updated Steve Martinich 24 Aug 2006