

Welcome to NCCAR's First Newsletter "CarTech"...

Welcome the first edition of the NCCAR CarTech newsletter. We hope that you will enjoy the content herein and welcome your opinions and feedback.

As befitting a first edition, I've started by introducing you to the NCCAR concept; the team, partner companies involved in the design and construction (see page 2).

2009 brings a challenging time for development of new automotive technologies and systems development. The current volatility in the automotive industry demonstrates that there is no time more important than now to change the way we engineer, build and use our cars and trucks. As NCCAR is purpose-designed to assist automotive companies and

research institutions in meeting these challenges. We hope you find this first

on our collaborative research with universities, and early views of the



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newsletter sufficiently enjoyable to look forward to the next one! Issue 2 is scheduled for publication in summer 2009 – just before we open! That issue will include features

NCCAR facilities As always, thank you for your consideration, interest and support,

Simon Cobb,
Chief Operating Officer.

NCCAR

Construction Update...

NCCAR construction is progressing well since the start of site development in September 2008. PLT Construction of Wilson, NC was awarded the task

of converting the green field site in north east North Carolina into a world class vehicle testing facility. The site requires re-profiling of 700,000 cubic yards of earth to realize the carefully designed features. Construction progress has been rapid through December. Turn



to page 3 to read comments from PLT manager, Jon Wallace.



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The NCCAR story—Inception...



Operations, Engineering &
Client Garages

The North Carolina Center for Automotive Research (NCCAR) is a new, independent, 501(c)(3), state-supported vehicle testing center in North Carolina, USA. Over the past several years, that message has been conveyed world-wide as the NCCAR project team has traveled thousands of miles and engaged hundreds of automotive professionals in refinement of the NCCAR concept and design. Many of you have been in those conversations and are quite familiar with project development. For those who aren't, here's the story ---

While discussions date back to 2001, it was in 2005 that the North Carolina General Assembly first appropriated funding for the development of an automotive testing facility in North Carolina. The intent was to demonstrate North Carolina's commitment to supporting the growth of the industry through the development of physical and intellectual infrastructure - in effect combining the innovative talents and product development interests of the automotive

industry with the research, workforce development and business development capacities of the State of North Carolina. Locating a facility encompassing 600 acres is always challenging. However, North Carolina has several advantages: it is a big state (47,718 square miles of land, 123,590 km²) with a modest population of 9.2 million; infrastructure is well-developed; large tracts of available farmland in the eastern region and a temperate climate. Ultimately, site search activities narrowed to Northampton County along Interstate 95 in the northeastern region of the state owing to many factors including: site location and configuration; utilities; air-quality attainment; highway access; proximity to urban centers, support services and amenities; the availability of ancillary development sites; and the presence of a strong business and workforce development infrastructure.

The NCCAR program accelerated when Lotus Engineering came on board as a founding partner in 2004.

Lotus Engineering Inc. was looking to access vehicle test facilities in mainland USA in addition to its Ann Arbor and Southfield facilities in Michigan and to supplement Group Lotus global facilities in UK, Germany, China and India. Lotus offered to assist in the design of the NCCAR features with a view to establishing a presence on site once NCCAR was operational.

Building a vehicle test and development center is not cheap. Initial projections were circa \$30 million. The NC General Assembly demonstrated its commitment to this initiative by agreeing to fund a multi-year staged approach. To date the total funding received from the General Assembly totals \$14.75 million. Additional funding was committed by the North Carolina Rural Center (\$292.5k); Tobacco Trust Fund (\$300k); Department of Transport (\$300k); Golden Leaf Foundation (\$1million); NC Department of Transportation (\$1.5 million) & Northampton County for the NCCAR site purchase (\$1.8 million).

NCCAR

The NCCAR Team Partners...

A project such as NCCAR requires a dedicated team of very capable and experienced organizations and people. Here is the list:

Market Research – Walbridge Aldinger (Detroit, MI), Martec (Southfield, MI), University of Michigan School of Business; Master Planning – Walbridge Aldinger; Site & Environmental Surveying – Jasper Eley Land Surveying (Jackson, NC); Permitting – Land Management Group, NC Department of Environment & Natural Resources, Army Corps of Engineers,

Northampton County; Legal – Womble Carlyle Sandridge & Rice North Carolina, Charles J. Vaughan (Woodland, NC); Accountancy & Audit – Jentry White CPA (Jackson, NC), Johnson, McLean & Company (Murfreesboro, NC); Technical Advisory – Lotus Engineering (Ann Arbor, MI), MDE International (Benton, MI); Civil Engineers – McKim & Creed (Raleigh, NC); Geo-Technical Engineers – S&ME (Raleigh, NC); Site Development Contractor – PLT Construction (Wilson,

NC); Highway Engineers – HNTB (Raleigh, NC); Road Course Engineers – Alastair McQueen (Norfolk, UK), Giffels (Southfield, MI); Architects – Kurmaskie Tolson (AKTAI, Raleigh, NC); Electric Power – Dominion Power (Richmond, VA).

Our considerable gratitude also goes to the North Carolina General Assembly; Northampton County, Department of Commerce; Department of Transportation; Office of State Budget & Management; Office of State

Construction & Northeast Economic Development Commission, NC Rural Economic Development Center, Golden Leaf Foundation, Tobacco Trust Fund Commission, US Department of Transport. The support and guidance of these organizations has been fundamental to the success of the NCCAR project, and we deeply appreciate the steadfast commitment and leadership they have provided.

NCCAR

The NCCAR story—The Features...

NCCAR test features were determined by in depth market research engaging 128 industry leaders and users in 2006. In fact, three separate studies were conducted by experienced professionals. Walbridge Aldinger of Detroit (involved in many automotive test facilities in USA, including GM and Toyota) evaluated user logistical needs. Automotive market research specialists Martec of Detroit canvassed a very broad range of industry contacts (including OEM's, suppliers, fuels & lube companies etc.). Lastly, the University of Michigan Business School evaluated interest from foreign car manufacturers and suppliers from China and India. The outcome was

a remarkably consistent message from the industry: top priority is a world class ride and handling course; second was the provision of multiple vehicle dynamics areas (VDA's) and thirdly, provide visiting users with top level office and workshop facilities so that they can operate in a confidential "home from home" environment, potentially 24/7.

Locating the top priority features (ride and handling course; vehicle dynamics area; client offices and garages) on the 630 acre NCCAR site was very easy. Primarily because there were very few options! Positioning a complex 4.6 mile (7.4 km) ride and handling course on a site with inter-

esting elevations and wetlands limited the choices. Add in an integrated VDA of 670 feet (204 m) diameter onto the 0.6 mile (1 km) main straight and maintain 100 feet (30 m) of run-off buffer for the course and the options became minimal.

The design of the 23,620 s.f. Operations/Engineering/Garage facility was refined to provide enhanced capabilities for supporting client engineering and technical teams. The objective was to create an environment in which professionals can go about their work as easily and efficiently as they might at their operational base.



“this is fun since it requires a broad range of professional skills to complete”

Jon Wallace, talks about the significance of the NCCAR project...

“The NCCAR project means three things to PLT Construction: first a new project with a new organization and a new engineering firm (McKim & Creed); secondly, this is a unique project and hence, it is fun since it requires a broad range of professional skills to complete and thirdly, a new job in these economic times is very welcome!

NCCAR site development is proceeding very well. The weather has been a major positive factor. The timing of the start of site development activities in September 2008 gave us a narrowed construction window before onset of winter weather. But, we are ahead of schedule

and moved approximately one third of the 700,000 cubic yards of soils before scaling-back in late December. The quality of the soils have proved to be much better than predicted by the initial geo-technical survey. The vast majority of soils are silty-clay that are good to work with, but are moisture sensitive. Another major factor that helped in the process was the strategic decision to start work on the drainage features at the southern end of the site. This resulted in a site that has all the drainage and storm water control measures in place right from the start. The benefit is that we are able to drain the soils as

development moves northwards.

PLT has been in business for 12 years. We are deliberately sized to be easily managed with minimal overheads. Our key to success and the really important asset is our staff, rather than the plant or equipment. There are approximately thirty PLT staff on site full-time at NCCAR, plus at least twenty sub-contractors.

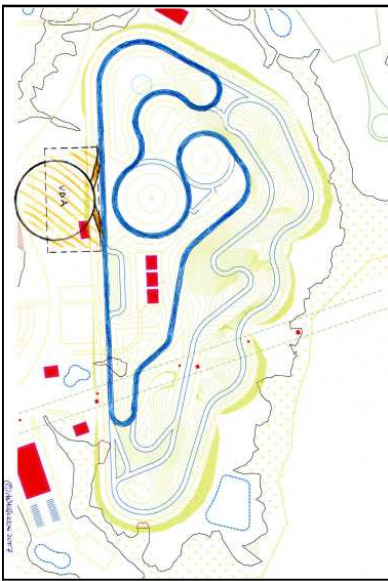
We are proud to be a part of the NCCAR project. We've had the opportunity to work with a solid professional team of engineers and project managers and we believe this will be a very successful project -- not just for PLT --- but for the State of North Carolina.”



NCCAR Phase 1A Construction status, January 12, 2009



The NCCAR Story—Designing a Ride & Handling Course...



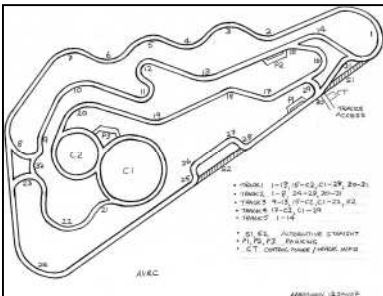
Alastair McQueen (recently retired from Lotus UK) was commissioned to undertake the NCCAR ride and handling course design in 2006. Alastair has worked in vehicle dynamics and testing at Lotus for 42 years and has considerable experience of vehicle test facilities and race tracks around the world (around 57 in total). Alastair's passionate belief is that there is not one "perfect" vehicle test facility anywhere. His knowledge and experience has been applied to the design of what is intended to be the premium ride and handling course (read his story on page 5). The industry benchmark is, of course, the Nurburgring in Germany, as used every

year by most premium brands to demonstrate worldwide credibility. NCCAR is designed to provide driver technical challenge, vehicle destabilization, safety and facility esthetics but without some of the issues of Nurburgring (limited run-off; safety; public oversight; travel distance for non-European users). Key characteristics are the twin turning circles of 450 & 650 feet in diameter (137 m & 198 m); 30 feet (9 m) of elevation change; 40 feet wide (12 m); five separate bidirectional courses.

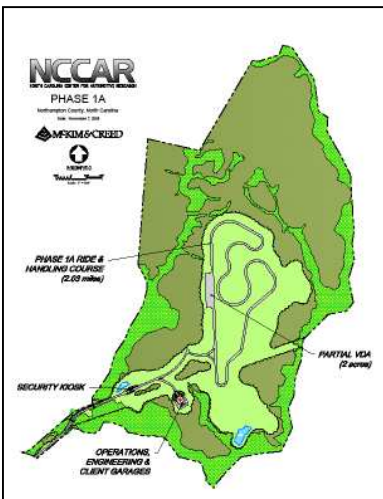
the assembled course and dimensional data. Conversion into AutoCAD was done by NC State University undergraduate Ethan Marshall and then transferred to track design specialists Giffels (of Southfield, Michigan) to produce the blends, fine details of camber and drainage features etc.

Once the design and positioning of the ride and handling course was completed, the project team focused on the other Phase 1A features. The 670 feet diameter VDA was integrated with the main straight of the ride & handling course and sized to facilitate high speed entry maneuvers such as the NHTSA "fishhook" roll-over test.

The design was produced by Alistair in the time-honored "cut and paste" card templates method, followed by composite photographs of



The NCCAR Story—The Details of Construction...



McKim & Creed and S&ME (both of Raleigh, NC) worked on the site development design and geo-technical surveying, respectively. The critical stage was to overlay the course, VDA, building pads and roadways onto the site topographical data. The objective being to balance the "cut and fill" of the earthworks and ensure appropriate clearance to all utilities. The final "zero elevation" of the mile main straight was finally fixed at 124.85 feet (above sea level) resulting in 770,000 cubic yards of earthworks, with only 1% surplus of stockpiled soils.

schematic to the left, are funded and under construction. This results in a 2 mile (3.2 km) ride and handling course (the western section of the full 4.6 mile course), a partial VDA of 670 x 128 feet and the engineering building with 6 client garages (1,000 sq ft, 93 m² each). Site clearing has also been limited to the Phase 1A area, but with soil positioned for Phase 1B features.

from the storm-water management systems at the southern point. Funding for Phase 1B construction will be addressed by the North Carolina General Assembly in the current 2009 session.

During the NCCAR design and construction stages, the team have developed a comprehensive web site (www.nccar.us). We invite you to follow our progress by visiting that site. We have also established a considerable number of industry contacts, many of whom have provided very valuable advice on technical design aspects and operational protocols. Our appreciation to GM Performance Division, Chrysler, Ford, Hyundai, Honda America, Volvo Trucks, Firestone Bridgestone, FIA, and Driving Safety International for their generous assistance.



- ◇ VDA Layout Development
- ◇ Ride & Handling Course
- ◇ Phase 1A Design Scheme

The site is and will remain bordered by natural wetlands and woodlands, offering both confidentiality and exceptional natural beauty, whilst being located only 1.5 miles from US Interstate 95.

In terms of construction in progress, the Phase 1A features, as detailed in the

The site development Contract was awarded to PLT Construction of Wilson, NC in August 2008 with clearance activities starting immediately (see Project Manager, Jon Wallace's comments on page 3). Progress to date is ahead of schedule due to better than expected soil conditions (including moisture levels) plus good weather. The aerial photograph from January 2009 on page 3 shows the development working northwards

Life of a Test Driver (& NCCAR Designer)...Alastair McQueen

Alastair McQueen was born in Duns, Scotland, where he qualified as a motor vehicle technician after a six year apprenticeship.

In 1966, he moved to Lotus Cars in Norfolk, England, where for the next 42 years he was engaged in all aspects of vehicle build, quality control, vehicle development, particularly chassis and suspension, test driving and driver training in all vehicle types, from high performance sports cars to trucks and buses, both on and off road.

During this long association with Lotus, Alastair became chief test driver and chief driving instructor, carrying out vehicle development, test driving and extensive driver training programmes for Lotus Engineering clients in Japan, South Korea, China, USA, Europe and in the UK. He also has considerable media experience, having had responsibility for the Lotus Press Car fleet, demonstration driving, filming and photography.

These activities gave the opportunity to experience some 57 different test and race tracks, Proving Grounds and environments where a considerable amount of knowledge was gained in track features and design. In 1999, Alastair redesigned the Lotus test track at Hethel in England, incorporating features which enhances the functionality and usefulness of the facility.

The opportunity to design the NCCAR ride and handling track facility arose in 2006, and the features incorporated are based on the extensive knowledge and experience gained from a

hands-on, practical approach over many years.

“My association with Lotus over the last 42 years has given me the opportunity to experience a unique working involvement in the testing and development of some of the world’s most exciting cars, not just Lotus products, but a wide range of vehicles in many different environments.

Test driving to develop and prove vehicle dynamics and performance was always interesting to me, especially when components failed, such as brakes, suspension, steering, wheels and tyres. Vehicle rollovers are to be avoided if possible, but they did occur, fortunately without injury.

Winter testing in Sweden was one of my favourite activities, the whole time spent in car control at and beyond the limit of tyre grip. It was there that I made the discovery that ABS on the Lotus Esprit did not operate when going backwards at high speed, downhill. In that case, nudging the rear corner of the car into the roadside snow bank rotated the car into the correct direction and a degree of control was achieved.

In contrast, hot weather testing was carried out in southern Italy on a circular banked track at NARDO. The track is about eight miles in circumference so very high speeds can be maintained, just the place for high speed problems. ABS had to be proved from maximum speed on the Lotus Esprit and the first time I carried out a full emergency stop, jumping on the brake pedal at 180 miles per hour, certainly generated a slightly increased heart

rate, especially at NARDO where the car is never in a straight line. Another interesting event at NARDO was again in a V8 Esprit, flat out at 180mph, when the engine decided to comprehensively explode. Fortunately the oil failed to reach the rear tyres so I was spared the challenge of very high speed car control.

Almost as interesting, and sometimes just as hazardous as test driving, were the people I met over the years, especially those with whom I carried out driver training. Most European people are similar, culturally, and English is spoken by most, but those from Asia provided a whole new experience for me.

Driver training at all levels, including training of Instructors, produced some of the most entertaining and scary experiences of my career. Always remember, when in an inverted situation, to place your hand on the roof interior before releasing the seat belt. This basic technique was not followed one day when driver training in Korea. The driver had managed to park the car the wrong way up and as we sat hanging from the seat belts, he released his belt and tested his crash helmet against the roof.

Linguistic and cultural differences stretched teaching communication to the limit, and when instructions have to be given to the driver via an interpreter, seated in the rear, then the opportunity for misunderstanding is immense. By comparison, track design is quite safe, really.

Retiring from in-car instructing in July 2008 has greatly increased my chances of survival and I retain my close association with Lotus through consultancy and technical advice for driver training.”



“I carried out a full emergency stop, jumping on the brake pedal at 180mph.....”



Alastair McQueen:

- ◇ At Lotus, Hethel, UK
- ◇ Cold Testing, Sweden
- ◇ Lotus 340R, Hethel Track
- ◇ Ready for Driver Training
- ◇ Elise at Speed (left)



An Interview with NCCAR Board Member (& former Chevrolet Chief Engineer), Dave Hansen...

NCCAR: Give our readers a summary of your automotive career highlights?

DH: "Worked on the 'line' to earn money for college; upon graduation with an engineering degree, spent twelve years in GM's product development area at Pontiac (worked on the first closed loop fuel system and catalytic converter applications), four years in quality and manufacturing and then jumped over to marketing; lucky enough to spend some time with Dr Edwards Deming. Had the privilege to lead the fourth generation Camaro/Firebird team before assuming the Chief Engineer's responsibility at Chevrolet. Then assumed leadership of the Chevrolet Marketing / Brand Management Team for the truck portfolio before moving to become General Manager of GM's Fleet & Commercial Group for the US with responsibility for about 25% of GM's new vehicle sales. Spent considerable time not only traveling the U.S. but also working on projects in Korea, Japan and Europe."

NCCAR: What is the best vehicle you have ever driven and why?

DH: "This is a difficult decision as I have passion for the vehicles I worked on at GM – especially some of the "big block" projects and I love to drive my "rodded" 1946 red Chevy pick-up truck. But my favourite is the Elvis pink 1959 Cadillac convertible because it represents one of the pinnacles of automotive design in the USA and other people just absolutely smile when they see this car; unfortunately I sold it recently and I'm looking for a replacement in bet-

ter condition."

NCCAR: You have been in the auto industry for a considerable time – is this current situation the most challenging?

DH: "Never have we experienced the confluence of challenges facing the industry today in terms of a market downturn (17+ million units a year to around 10.5 million units), lack of working capital, legacy costs for the domestic manufacturers as well as a global economic crisis."

NCCAR: What do you think will happen to the US auto industry?

DH: "Although the domestic industry still sells more than 50% of the vehicles in the US and GM remains the top producer in the world, the handwriting is on the wall. The domestics will have to continue to downsize in the short term to bring capacity in line with the depressed demand and government assistance is required to provide working capital and restructuring loans. Objective, third-party studies indicate there is now parity in terms of cost, quality and design but the legacy costs remain an issue in the U.S. open market economy. It's probably time for a national agenda to address the future of manufacturing in the U.S. in terms of contribution to GDP and how we plan to rebuild our economic strength."

NCCAR: How do think the current industry issues (financial, technical, legal) will affect the US and global auto industry

maps?

DH: "The industry generally adapts well to gradual changes in these arenas and has demonstrated an innate ability to satisfy local consumer and governmental needs to generate profitable sales. Examples here are diesel power-trains in small European cars as well as how quickly the domestic and transplants in N.A. geared up to meet the demand for SUVs. Today's challenges were rather abrupt in terms of the loss of financing as well as shift away from these large SUVs and full size trucks in N.A."

NCCAR: What does the North Carolina Center for Automotive Research (NCCAR) mean to you?

DH: "Personally it's an opportunity to 'give back' to the automotive community that has supported me and my family for over 40 years. I believe we can create jobs as well as improve the community around NCCAR by demonstrating this is a viable and growing economic development area of the country."

NCCAR: Can you predict how private transportation will change in next 25 years?

DH: "The industry will continue to react to the needs of the consumers including their environmental and energy agenda. In the near term we will see more hybrid offerings quickly followed by short range electric battery powered cars. The jury is still out on ethanol and if the federal gov't adopts this as a priority, then we will see a strong focus on ethanol as occurred in Brazil. The fuel cell development will continue and provides the ulti-



**NCCAR Board Member
Dave Hansen**

"Personally it's an opportunity to 'give back' to the automotive community....."

mate solution to our energy and environmental needs."

NCCAR: What skill sets do you think future generations of automotive engineers will need?

DH: "More of a balance of traditional engineering skills but coupled with a working knowledge of the always evolving digital design and development tools and materials."

The NCCAR Story—The Path Forward...

Phase 1A of the NCCAR project will become operational in September 2009. Upon opening, NCCAR will be hosting two clients for immediate research programs. One is public - the National Science Foundation GOALI collaborative program to develop driver assistance tools for impaired/elderly drivers (NS

State University, New Jersey Institute of Technology, Lotus & NCCAR). The second program is client confidential.

Precise timing and events for the NCCAR opening schedule are yet to be formally defined, but it will certainly include previews for key clients and some quite interesting vehicles!

Watch the NCCAR website for updates!

www.nccar.us

Or contact Simon Cobb, Chief Operating Officer, NCCAR:

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“NCCAR is strategically designed to offer a world class environment for future vehicle and component test and development”

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