

**THE INSTITUTE OF ELECTRICAL/ELECTRONICS ENGINEERS
AND
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
National Capital Land Transportation Committee
Invite You To Our Monthly Luncheon Meeting
Tuesday December 9, 2008, 11:30 am**



Speaker: Gerry Arnold, P.E., C. Eng., M I Mech E
Associate
Booz Allen Hamilton
Washington, DC

Topic: Ceramic Railroad Wheels

Place: American Public Transportation Association
Conference Room - 11th Floor
1666 K Street, NW, Washington, DC
Red Line: Farragut North (K Street Exit)
Orange/Blue Lines: Farragut West (17th Street Exit)

Date/Time Tuesday December 9, 2008, 11:30 am

Lunch: \$15 cash at the door.

Reservations: Ken Briers ken.briers@parsons.com 202-775-3397
Karl Berger karl.berger@dcm-va.com 703-803-7917

(Reservations by 4:00 PM Friday December 5)



ABOUT THE SPEAKER:

Gerald (Gerry) Arnold has accumulated 20 years in railway research and development and 20 years at the railway 'sharp end' with authorities, for the most part on railway vehicles. He holds a degree in mechanical engineering, is a member of the Institute of Mechanical Engineers, and is a chartered engineer and a professional engineer.

He worked on two high speed trains:

1. The Advanced Passenger Train (APT) 150 mph tilting suspension, where the press called its engineers 'Railway Boffins'. The APT is now known as 'The Ill Fated APT', but it has lots of enthusiasts in hyperspace on the Internet.
2. The Eurostar 185 mph London /Paris/Brussels train, a TGV design currently moving millions of people through the Channel Tunnel.

Gerry worked at British Rail R & D Center at Derby UK and with AAR at Pueblo Colorado.

His attempt to break free of the railway environment some years ago by taking up teacher training in the UK failed spectacularly, and he was awarded a certificate of failure to prove it. He has decided not to duplicate the experience by a second try.

He is currently employed as an Associate with Booz Allen Hamilton on rail vehicles in the Washington DC area.

ABOUT THE TOPIC:

Ball or roller bearings have much in common with a railway wheel running on a rail. Both have high Hertzian stresses and are subject to rolling contact fatigue. Silicon Nitride (Si₃N₄), a Technical Ceramic, has now firmly established itself in the engineering marketplace as part of hybrid bearings where the rolling elements are silicon nitride and the races are steel. Our speaker explores the possibility of a Silicon Nitride/steel rail combination and finds that, because Silicon Nitride has a higher Modulus of Elasticity, it is not suitable as a direct replacement on existing systems because it would produce a smaller contact patch and greater contact stress.

The low toughness of Silicon Nitride in comparison to steel could be an obstacle to its general railway use, however, it could be made into a composite material in the same manner as Carbon Reinforced Silicon Carbide (C/SiC) as used in brake discs. There is a possibility that, under the right conditions, Silicon Nitride could return very low wear rates because of its extreme hardness, and its excellent resistance to rolling contact fatigue as noted in hybrid bearings. This could give a wheel high mileage, without the need to remove fatigued material by controlled wear or by turning.

A promising future application for the material is a cable-hauled system, where the predicted lower adhesion between Silicon Nitride and a steel rail is not a problem and the wheels are not required to be conductive.

NEED MORE INFORMATION? CALL AN OFFICER!

Chairman: Karl Berger, P.E. Karl.berger@dcm-va.com 703-803-7917
Vice Chairman: Martin Schroeder, P.E. mschroeder@apta.com 202-496-4885
Secretary-Treasurer: Ken Briers ken.briers@parsons.com 202-775-3397



FUTURE MEETINGS:

**January 13, February 10, March 10, April 14,
May 12, June 9**

**See more about the Land Transportation
Committee at our website:**

<http://www.ieee.org/dc-ltc>

**IEEE/ASME National Capital
Land Transportation Committee
SPECIAL NOTES:**

- **Membership in the ASME or IEEE is not required. There are no dues.**
- **Guests are always welcome; bring an associate !**
- **Tell us of other associates to be placed on the meeting announcement list! Give us their names and e-mail addresses.**
- **We are always looking for programmatic development; your suggestions please!**

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Centreville, VA 20120



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