

Bob Griffiths



Bob Griffiths is the president of SAMPE Europe. As a mechanical engineering graduate of Southampton University, he joined Rolls Royce Motor Car Division and later moved to Westland Helicopters, which became GKN Aerospace, where he specialized in composite materials. In recent years he has worked as a consultant, in composites-related business development.

Global and Nano Realities

Two distinct and different messages came from the SAMPE International Conference in Long Beach (May 12-16). First, the industry showed real signs of becoming a truly international enterprise — something the aerospace composites community has long tried to convince itself that it already is. In reality, countries and companies often act in very parochial ways, sometimes for clever political reasons and sometimes because they simply prefer to deal with someone in their own time zones who speak the same languages. Two new programmes may help break those old habits.

Alan Penton, SAMPE's president and a retired Boeing manager, highlighted that Boeing had selected for its partners on the Sonic Cruiser four companies from Japan, two from the United States and one each from Italy and Australia. Additionally, Tom Burbage, the general manager of the JSF programme at Lockheed Martin, emphasised the role of international development partners Britain and Canada, soon to be followed by Norway, Denmark, Holland, Italy and, perhaps, Australia. While investment does not guarantee production work (this will be awarded later on "Best Value" criteria), these announcements set forth much more than the usual offset activities linked to foreign sales, and they appear to signal the start of a truly international industry. Let's hope that the politicians do not degrade the idealistic way on which these two programmes have embarked.

Although such internationalism will lead to many long-term benefits, there will be much need for change. The SAMPE Executive has already started to address the issue of how we support a membership spread out over many countries, in all major regions of the world. All industry organisations and companies will need to do the same or perish.

The second landmark message was delivered at SAMPE's Nanocomposites Forum, led by Prof. Richard Smalley, the Nobel Prize laureate. A brilliant scientist, he also has that rare ability to inspire interest in his subject and stretch one's imagination. I have read papers on the subject before but never realised that nanotubes were more than just a finer and

better version of carbon fibres. To summarise my understanding of the presentation:

- Carbon nanotubes are single-molecule tubes rather than as if very thin graphitic sheets were wrapped seamlessly into a cylinder with a diameter of only a few nanometers. The ends are closed, and they can currently be made in lengths up to about one millimeter. They are related to fullerenes or "buckyballs."
- From a study of the bond strengths of all known elements it can be predicted that nanotubes are the strongest material that will ever be made, from any substance.
- They are many times stronger and stiffer than the best carbon fibres.
- Currently they can only be made in a tangled mass of mixed types, but concepts for growing straight fibres from bundles of short tubes are being developed.
- As well as being structural materials they have, to a mechanical engineer such as myself, what appear to be almost magical properties: They have an electrical resistance that is independent of length. They also can be excited to glow in the dark and they can act like a semiconductor.
- There are lots of other things happening such as "POSS" particles, nanoclays and nanofibres that have more immediate availability and applications.

Significant manufacturing challenges remain before nanotubes can make it out of the laboratory and into structural composites or other products. Current production processes are extremely expensive and cannot create tubes with uniform properties, much less the longer fibers or ropes needed for advanced composites. Once those problems are solved, there is still the question of how to incorporate nanotubes into a matrix. Even accepting that it may be many years before these materials are available in commercial quality and quantity, I am surprised nobody is shouting from the rooftops what will happen to aircraft wing and suspension bridge design when these obstacles are surmounted. It may not be too early to start thinking about how we would do some of the more mundane things when the physicists have finished their work. This should include selecting a compatible matrix, the handling of such small fibres, parts fabrication, NDT and the certification of structures made from nanomaterials.

Many articles have been written on how we should attract the best graduates into our industry. I think nanotechnology will give composites a much needed revolutionary appeal: New structures will be smaller and lighter than ever before and smart CFRP structures will be truly smart, without embedded fibreoptics or other sensors. We may even be able to illuminate bridges and aircraft without the use of electric bulbs and copper wire!