

Drivetrain Research

An Idea Whose Time is Overdue

The popular perception today is that technological advancement is an engine running almost out of control. New products and processes are developing faster than we can keep up with them, as anyone who has had a new computer system crash into obsolescence practically before it's out of the box can tell you. But that's not the case everywhere. Transmission technology, for example.

The drivetrain, perhaps because it doesn't lend itself to exciting film footage or glitzy electronic presentation, has been neglected.

Yes, some exceptions do exist. Thanks in part to research done during the military buildup of the 80s, the main propulsion gears of the U.S. Navy's surface and undersea fleet are now hardened and ground rather than shaved and *then* hardened. The Advanced Rotorcraft Transmission (ATR) program brought some developments which were integrated into the Comanche main transmission at Sikorsky, and McDonnell Douglas Helicopter Systems continues some of its ATR research.

But the fact is that the performance capabilities of

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rotorcraft have been steadily and significantly upgraded while the basic power transmissions remain relatively unchanged. I wonder whether we are not now approaching the "ragged edge"—a time when power transmissions are unable to cope adequately with the newly enhanced performance capabilities of the rest of the rotorcraft.

In one sense transmission technology has been the victim of its own success. Transmissions designed in the previous decades had such a large safety factor built into them that no major changes were believed necessary to carry the increased load and enhanced performance specifications. It was easy to neglect them because they grabbed attention only when they failed. By building better-than-required transmissions, designers and manufacturers have, unfortunately, deflected all the limelight away from transmissions—leaving themselves in the dark!

The problem now is, just at the moment when that ragged edge is on the horizon, political and economic times have changed. If no major innovations were evident when the defense budget, which funded much of the research, was "fat," what is to happen during the current and future "lean" years?

Safety issues aside, neglect in this area will cost us dearly. For example, we face vigorous and renewed overseas competition from a very

determined and unified European helicopter industry. United States rotorcraft manufacturers will have to square off against the "Eurocopter" consortium on every potential sale in Europe and elsewhere. McDonnell Douglas recently won a significant contract against the "Eurocopter" with its pending sale of Apaches to the Netherlands. On the other hand, the government of Abu Dhabi has just ordered a dozen Eurocopters.

Aerospace is not the only place where the technological status quo could hurt us badly. The respite presently enjoyed by the automotive and off-highway vehicle sector because of the soaring yen rate cannot last forever. When the yen comes back, say to the 110 to the dollar level, can the Big Three or Caterpillar compete head-on with the Toyotas and the Komatsus? Higher power density drivetrains that are quieter and more reliable could be important to success in such a head-on competition.

Rest assured, someone is working on developing lighter, quieter and more reliable transmissions right now. It's just that they're not working on them in the U.S.

Unlike consumer electronics, power train development is not an area we can leave to someone else. The implications for both our defense and civilian economy are too important. Much more than national pride is at stake. There is also an economic

imperative. Jobs, both civilian and military, defense preparedness and user safety are all under the gun if the status quo continues.

The good news is we're not starting from quite ground zero. Several university-based centers, using government funds, are doing research in this technology sector. The National Center for Advanced Drivetrain Technologies here at Penn State, the Instrumented Factory (INFAC) for gear manufacturing at the IIT Research Institute (IITRI) and the Gear Center at Ohio State University all have programs in place.

But these are only the beginning. More work needs to be done. Industry needs to aggressively interact with these research institutions to reap the most benefits from their work. And we need to remind our legislators that in the rush to downsize the military, we don't throw the baby out with the bath water.

The drivetrain industry is capable of overcoming years of neglect. It has the potential to be the best and most advanced in the world. But if we want to be leaders and not followers, *now* is the time to act. ☉

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