

# TOP products for 2005

*Aerospace Engineering presents some of the highest-rated product offerings from industry suppliers as determined by our readers over the past year.*

## OPOC engine

FEV engineers have developed a concept diesel opposed-piston, opposed-cylinder (OPOC) engine that can use diesel fuel or JP8, a military jet fuel.

The engine uses an electrically assisted turbocharger supplied by **Advanced Propulsion Technologies** and combines the features of an opposed-piston, two-crankshaft diesel aircraft engine and an opposed-cylinder boxer engine.

Typical components such as the cylinder head, valves, and camshafts are eliminated in the OPOC design for enhanced scalability. The engine is configured such that all forces act on the crankshaft and not on the main bearings of the crankcase. Because of fewer components, the 275-lb engine is likely to have a lower production cost than a conventional internal-combustion engine. Applications include unmanned aerial vehicles and unmanned ground vehicles.



*For more information, circle 101*

## Composite material

DSM Somos' NanoFormT 15120 is a composite stereolithography (SL) material that incorporates non-crystalline nano-particle technology for improved performance, including high stiffness and heat resistance.

Heat deflection temperatures of more than 500°F make it suitable for aerospace applications. Other product benefits include improved dimensional stability, low shrink, and low coefficient of thermal linear expansion. The material is processed like unreinforced liquid SL resins and requires no mixing or special handling.

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## Carbon-fiber heater

The Flexible Carbon Fiber Heater from **Method Development Co.** provides greater mechanical reliability and offers a wider range of options than conventional polymer thick-film etched copper flexible heaters. Aeronautical deicing systems are among the technology's applications. The technology uses stranded carbon fiber and employs Sonicrimp sonic welding technology for electrical termination. Seven-micron carbon-fiber strands are configured into a flat form, which is sealed in a 3-mil Mylar or Kapton jacket. The heaters are less susceptible to increased resistance or cracked traces than traditional flat flex heaters when subjected to repetitive flexes or certain crease bending specifications.

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## Seam-sealing tape

**Tyco Plastics & Adhesives** introduces an aerospace tape for seam sealing and repair in aircraft cargo compartments.

Polyken 296FR was designed for use on covering pins and rivets needing high adhesion and flame resistance. The product's adhesion-to-cargo liner rating is 30 oz/in. The tape does not contain polybrominated biphenyl ethers and features a construction that minimizes adhesive residue when the tape is removed. A glass cloth design resists flame penetration, and improved adhesion properties eliminate lifting and curling. When unwound, repositionable Polyken 296FR hangs straight and resists curling during application. The product does not wrinkle when applied. The acrylic adhesive cures in 24 h. Width sizes of 1, 2, 3, and 4 in are available.

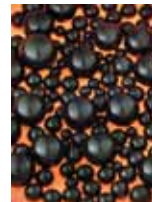
*For more information, circle 104*



## Ceramic balls

CERBEC balls from **Saint-Gobain Advanced Ceramics** are used in hybrid bearings for applications including aerospace instrumentation, electric motors, centrifugal pumps, and robotics. The ceramic balls offer advantages over steel balls via their combination of lower thermal expansion, higher hardness, higher stiffness, lighter weight, increased corrosion resistance, and higher electrical resistance that increases performance and decreases total operating costs. Generally, products using hybrid bearings offer decreased lube degradation and less wear, yielding longer bearing life, higher operating speeds for increased productivity, and reduced product downtime with less maintenance, according to the company.

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## High-strength fasteners

**SPS Technologies** offers fasteners made from SPS MP98T superalloy, which offers improved strength and corrosion resistance. The MP98T fasteners feature a minimum tensile strength of 180 ksi. Suitable for aerospace engine and airframe applications, the alloy also resists embrittlement in high-pressure hydrogen environments, such as rocket motors using liquid hydrogen for fuel. MP98T bolts are offered in various configurations and in sizes up to 1.75 in and larger. Nuts also have been manufactured.

*For more information, circle 106*



### Marking machine

**Technomark's** Multi 4 marking machine uses electromagnetically controlled micro-impact marking techniques to mark figures, letters, logos, special characters, and data-matrix of varying heights and depths with up to 1000 possible settings and with no splitting of material. Any surface can be engraved, including treated or untreated steel, aluminum, stainless steel, copper, bronze, brass, plastics, wood, or ceramics. The system comes in four versions: fixed bench-top, portable, mixed, and integrated for automatic marking in production lines. The character fonts used comply with aeronautical standards.



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### Dynamic force sensors

Piezoelectric force sensors from the Force/Torque Division of **PCB Piezotronics** measure dynamic force in compression, tension, and impact modes. They have the necessary response and endurance to follow fast-rising, short-duration force events such as crimping, stamping, punching, forming, and drop and impact testing. Sensor types offered include ring, three-component ring, link, impact, penetration, and strain styles. ICP and charge output versions are available; signal conditioning is also offered. Applications include tensile and fatigue testing, press force and machine process monitoring, package drop testing, force-limited vibration testing, penetration testing, and modal analysis.



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### Terrain awareness

**Garmin International's** GPSMAP 296 is a portable aviation device that delivers topographic mapping and terrain advisory alerting in color. Its 256-color, high-resolution (480 x 320 pixels), thin-film transistor transfective display helps pilots view and interpret navigation data in most lighting conditions. Features include terrain cautions and alerts, sectional chart-like topographic data, a built-in obstacle database of the U.S., and a transparent navigation arc view for course, speed, and distance information. The unit also provides USB data-transfer, faster processing speed over previous versions, and a rechargeable lithium-ion battery pack.



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### Angular accelerometer

**Endevco's** Model 7302BM4 angular accelerometer provides measurement of rotational or torsional acceleration. Applications include measurement of irregularities in shaft and drivetrain rotation for machine and turbine monitoring, and measurement of rotational body accelerations of anthropomorphic crash-test dummies under impact. The accelerometer is fluid-damped to optimize frequency and phase response within a 0 to 250°F range. It offers a stable frequency



response from 0 to 1600 Hz and provides a linear output up to 50,000 rad/s<sup>2</sup>. Nominal sensitivity is 5.0 mV per krad/s<sup>2</sup> with 10-V dc excitation voltage.

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### Protective barrier bags

Moisture barrier bags from **Protective Packaging** protect sensitive equipment, machinery, and products—ranging from helicopters and jet engines to ball bearings—from moisture, damaging vapors, or humidity. Users may choose from several moisture-barrier materials including Mylar, Tyvek, Kraft, vinyl, foil, and composites. Benefits of the materials include high puncture and tear resistance, anti-static qualities, and vapor corrosion inhibitors.



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### Mediating connector

The Spherolinder from **g<sup>2</sup> Engineering** is a patented mediating connector that replaces the sphere in a repeatable kinematic mount and retains the geometrical relations that make the mount function correctly while eliminating the point contacts between the connectors and their mating surfaces. The mounting scheme works under loads up to 100 times larger than conventional mounts can carry. Applications include precision attachment of airborne components to an airframe and for improved maintenance turn-around and minimized ground time of the aircraft. The Spherolinder is fabricated in a variety of materials, including stainless steel, tungsten carbide, high-temperature ceramics, and engineering plastics.



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### Tri-axis accelerometer

**Kionix's** KXM52 tri-axis accelerometer comes in a dual flat no-lead package, and the 14-land package is surface-mountable and lead-free, and incorporates the same proven sensor and application-specific integrated circuit technology of its predecessors, yet is six times smaller than a standard 16-pin over-molded small-outline integrated circuit. Its analog output signal is proportional to acceleration and can be factory programmed to operate over a range of ±2 to 5 g. It is suited for use in inertial measurement units for inertial navigation.



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### Current transducers

**American Aerospace Controls' 929 Series** of bidirectional current transducers accurately follow extremely fast dc and/or ac current waveforms. The units consume 80 to 270 mW during operation, and provide a response to complex current waveforms from dc to 350 kHz. Accuracy is ±1.0% full scale over the temperature range -40 to +185°F. The compact, flame-retardant package measures 1.9 x 3.3 x 1.9 in and has a mass of 6 oz.



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