

## MATERIAL STORES HEAT TO PROTECT FLIGHT RECORDERS

Recent plane crashes have highlighted the importance of flight recorders, devices contained in so-called “black boxes” that help officials determine the cause of airplane accidents. These boxes must withstand the destructive heat of a crash, protecting the recorders from serious damage. The Federal Aviation Administration (FAA) recently doubled the performance requirements of these black boxes, raising their required time of heat protection from 30 to 60 minutes.

Hayes & Associates (San Diego, CA) has developed new material for black boxes to protect flight recorders from thermal damage. Previous boxes manufactured and distributed by Smiths Industries used alloy-based heat sinks to absorb heat. Hayes’ new technology replaced these expensive, toxic heat sinks with smaller, cheaper, and less toxic material. In this application, the new heat sink improves cooling effects up to 400 percent and reduces manufacturing costs by 83 percent. After acquiring a license, Smiths Industries incorporated Hayes’ material into its Voice and Data Recorder™ product line, which consists of Cockpit Voice Recorders, Flight Data Recorders, and combined recorders for commercial and military aircraft.

This thermal storage technology, called Composite Fabric Endothermic Material, can easily be retrofitted in current black-box designs. This flexibility can reduce or eliminate the airline industry’s reengineering costs to address black-box requirements. Currently, Smiths Industries is working with Hayes to enhance the material’s thermal performance to meet the FAA’s 60-minute requirement. Hayes originally developed the material for BMDO’s Laser Shield project for temperature control in aerospace vehicles.

Hayes & Associates’ multilayer material also can be tailored to do the opposite—first store and then slowly release heat over a prolonged period. For example, in a licensing deal with Pepsico, Hayes has developed a material for Pizza Hut to heat carts that sell pizza away from the stores, delivering the food at 140°F to 180°F, even after the food has sat in the cart for hours. Pizza Hut uses the material in thermal plates heated with the pizza in the oven; carts bearing the thermal plates warm the pizza until delivery to factories, sporting events, and cafeterias.

Rigid or flexible, Hayes’ material molds into cups, plates, and panels. It could even be applied to clothing; when people go out in the snow, they could first zap their gloves in the microwave, so the gloves—and the wearers’ hands—will stay warm.

### ABOUT THE TECHNOLOGY

The multilayer materials consist of an inner region of thermally active material sandwiched between protective outer layers of plastic or metal. The inner section may contain a polymer that undergoes a thermochemical reaction or phase change to absorb and release heat at a critical temperature. The key aspects of Hayes’ patented technology include (1) active materials that retain large amounts of heat and (2) the ability to tailor the material to temperature and time-at-temperature requirements.

When heated, the temperature of the composite material increases to the critical point; the material holds this temperature while continuing to absorb heat until saturation. At that point, the temperature may still increase further. On cooling, the reverse trend occurs, with the temperature falling rapidly to the critical point and remaining there for an extended period until the internal thermochemical processes are exhausted.

. . . a thermal storage material that protects aircraft flight recorders from destructive heat in plane crashes.

HAYES’ NEW MATERIAL IS FINDING HOT MARKETS IN FLIGHT RECORDER PROTECTION AND FOOD DELIVERY OPERATIONS.



■ Smiths Industries’ Voice and Data Recorder™ products, pictured above, are more resilient to heat using Hayes’ thermal storage material.