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TZ SMART Devices™ - Powerful Technology for the Aerospace Industry

Over the past decade billions of people have connected themselves to the Internet via the computer and more recently, mobile devices. Today, that communication revolution — the most pervasive technology event on earth — is extending to objects as well as people. The Internet is transforming from the Internet of People to the Internet of Things (IoT). The future ubiquitous IoT — also known as the Cyber Physical System — will make it possible for virtually any object around us to exchange information and work in synergy to significantly improve the efficiency of our businesses, the security of our assets and the quality of our lives.

Telezygology, Inc. (TZ) has developed enabling technology that makes the exchange and synergy between objects a reality. The first patents were lodged by TZ in this space in 1998 — more than a decade ago. Today, with over 180 patent applications in process, the distributed intelligence of TZ SMART Devices™ and SMART Systems™ in the context of the Internet of Things has made TZ technology even more relevant and more vital to new business strategies that are changing the global commercial landscape. And most recently, those new business strategies include the product development and new business strategies of aerospace manufacturers.

Powerful Invention. Diverse Aerospace Application

TZ currently markets a range of SMART Device™ systems comprising hardware and software solutions to the IT, telecommunications and corporate sectors that collectively enable the remote protection, management, control, monitoring of critical assets. Recently, TZ company established its TZ Aerospace Asset Maintainability business division to commercialize a range of SMART Device™ aircraft latching and fastening systems that meet the aerospace industry's needs for security and systems integration and management.

In the modern aviation industry, mechanical devices have been the mainstay of how an aircraft and most of its components are fastened, latched and locked and typically these devices were

manipulated manually. Until now —because TZ, as the leading IP and technology developer of addressable SMA (shape memory alloy) actuated SMARt Devices, is turning the world of mechanical aerospace devices and systems upside down.

In addition to the eternal drivers of weight and safety and the aerospace industry's relentless efforts to improve on these factors, three new influencers are emerging in aerospace that speak directly to the use of TZ technology:

- Prevention of innocent or intentional tampering of aircraft hatches, storage areas and other secure areas to address a major sub-set of airplane safety today
- Easier reconfiguration of interior designs and fittings for cabinet and galleys to more quickly and efficiently customize aircraft for changes in seasonal passenger patterns and to satisfy changing needs for onboard infotainment and personal technologies.
- More rapid refurbishment of aircraft to reduce costs and reduce loss of in-air time
- Faster ground maintenance checks to ensure quick turnaround of aircraft and optimal on-time departure and arrival scores

TZ SMARt Devices™ Cyber Physical Systems — low weight and robust locking and fastening device systems that incorporate web-enabled embedded intelligence, integrated sensing and switching, and are remotely controlled by software command — will authorize access, release components, monitor conditions and keep a log of what has happened — in effect, automating traditional systems.

These TZ-enabled systems offer aerospace component manufacturers highly differentiated, new product offerings, new business models, improved business processes, enhanced safety and reduced costs.

The IQ of TZ SMARt Devices™

The simplest stated concept behind TZ SMARt Device™ technology is that rather than using a physical connection between a tool and a fastening device — like a conventional screwdriver and screw or conventional key and lock — TZ uses a remote signal that activates an actuator, which in turn manipulates the mechanical device to lock or unlock. By taking the intelligence away from the operator manipulating the tool to the fastening device itself, TZ completely changes the dynamics of design, assembly and maintenance.

In the instance of the TZ SMARt Devices™, actuation is via a unique means using smart materials such as shape memory alloy. Shape memory alloy (SMA) is a unique material in that it

changes shape in response to an external stimulus such as heat but "remembers" their original shape when the stimulus is removed, returning reliably to their pre-deformed shape. In addition, the SMA actuation is a lightweight, solid-state alternative to conventional actuators such as hydraulic, pneumatic, and motor-based systems. Naturally, this advanced material is well suited to the aviation industry and indeed is already used in many applications as well as proliferating other cutting-edge industries.

TZ SMARt Devices™ get their "brains" from an embedded system that consists of a microprocessor, an energy switch, and sensors that monitor fastener status. Guided by proprietary firmware, this embedded system performs two important functions: It switches energy to the Device's actuating mechanism, and it links these SMARt Devices™ to a much broader network of devices, controllers and other smart mechanisms via remote communication.

Communication is another of the key attributes this technology can offer the aviation market. TZ's SMARt Device™ makes a big leap from traditional mechanical latching and locking to SMARt Devices™ capable of delivering the same functions but also capable of communicating with other smart systems at the same time with its advantage of remote remotely activation and control.

Sensing capabilities mean that the TZ Smart™ device is able to capture data, analyze it and run logic algorithms to figure out what is happening to itself and the external environment through temperature, humidity, vibration or whatever sensing inputs are linked in to it.

The Opportunity for Improved Security

TZ SMARt Devices™ technology offers an unprecedented amount of security, meaning that latches cannot be interfered with. When the aerospace manufacturer introduces technologies that are intelligent and effectively networked, it can offer authorizations for specific engineers or members of staff in the form of a swipe card or a pin code, for example. The security advantage of a TZ-equipped aircraft versus one equipped with traditional methods is therefore undeniable. It is as different as a door equipped with an electronic security access system and one with no lock at all. In the case of overhead lockers, passengers wouldn't be able to open them as they please as the pilot would be able to secure the interior of the aircraft with the flick of a switch, particularly in a situation where the aircraft is experiencing turbulence.

Given the number of accidents that have occurred when overhead bins have inadvertently been left open — causing chaos and even injuries in flight — being able to confirm that all overhead bins are secure and locked on the flight deck would be a real benefit for both crew and

passenger safety. Electronically locking trolleys and pet crates and kennels improve security, reduce workload on crew and improve safety.

The Opportunity for Rapid Reconfiguration

One of the other notable advantages to the technology is that TZ-equipped aircraft has the potential to revolutionize how we currently reconfigure aircraft, from accessing critical components to securing compartments to changing out seats. The ability to quickly change an aircraft's seating configuration is a significant economic benefit to operators. For instance, business class and premium economy can quickly and more easily be reconfigured to increase or decrease seating for seasonal traffic. Rapid reconfiguration of monuments and galleys extend the aircraft's viability into new flight sector requirements. And because the TZ SMARt Devices™ are networked into the system, reconfiguration tasks are automatically controlled and audited during the change process.

The Opportunity to Streamline Maintenance and Service

In terms of the time taken for maintenance procedures, TZ SMARt Devices™ helps the industry achieve significant timesavings because the Devices effectively automate the procedural and workflow elements. For example, TZ SMARt Device™ systems provide a complete audit trail of information and system actions eliminating the normal manual systems that are currently used — for example, manual paper-based tracking is replaced with automated real-time tracking and monitoring.

And because TZ SMARt Devices™ have integrated sensing capability – they are able to capture information about their local environment — a capability that will be extremely important in the future in terms of predictive maintenance. In other words, predicting that something is about to go wrong before failure occurs.

TZ SMARt Devices™ will also prove their worth if the aircraft assembly ever needs service. Because SMARt Devices™ are addressable and have a unique identification means they can be individually controlled in accordance with a software program that drives assembly logic. In this case, the assembly process is de-skilled, the software controls access and logs the assembly/ disassembly and service procedures and monitors the process to comply with procedures.

Freedom of Design

One of the other major hurdles facing the integration of any new technology in the aerospace industry is gaining the confidence of engineers. Naturally, questions are always raised about something new and different in the industry. A TZ SMARt Device™ is still a mechanical device in terms of meeting traditional engineering and performance criteria that matter to design engineers. So its performance won't differ from conventional mechanisms. But with the added intelligence, TZ SMARt Devices really do change things.

TZ SMARt Devices™ promise additional design freedom because tool access and assembly sequence often dictate the fastener locations as much as joint strength does. With this newfound freedom, it will be easier to place a joint anywhere one is required. The TZ SMARt Devices, because of their built-in actuation, can also eliminate some of the tolerance or orientation issues associated with assembly tools.

TZ SMARt Devices™ also should not present any packaging difficulties, despite their on board electronics. Because they easily tap into another component's existing wiring and electronics. TZ SMARt Devices™ can attain much smaller sizes than conventional mechanical latches and fasteners — in part because they overcome traditional spacing constraints and in part because smart materials will allow them to be smaller.

Seeking Partnership

TZ's new technology platform could be the launch pad to a new generation of application solutions that will bring fundamental changes to the way aircraft are designed, serviced and adapted to meet market requirements. One of the biggest challenges in the aerospace market is the certification and compliance approval process. While TZ has a number of commercial offerings on the market today and several of our SMARt Devices™ have been tested in accordance with aerospace requirements, the company still needs to work through the formal certification process. Accordingly, TZ is seeking partnership with a tier supplier with the capability and expertise to support this effort.

If you're interested in learning more about TZ, its technology and TZ SMARt Device™ application in the aerospace market, please visit www.aam.tz.net or call (415) 369 0977 to arrange a live demonstration of the TZ SMARt Device™ diverse applications.

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