

**BRAKES.** Both aircraft manufacturers and their partners are hard at work on “more electric” aircraft. Messier-Bugatti is a pioneer in this trend, especially as supplier of the electric brakes for Boeing’s new 787 Dreamliner.

## BRAKING: THE ELECTRICAL REVOLUTION



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**B**ecause of obvious safety concerns, the aviation industry tends to favor proven solutions. So it’s only natural that innovations are only introduced when they’re sure, and reserved to major technology breakthroughs – which will be the case this summer with the initial flight tests of the Boeing 787

Dreamliner, featuring electrically-actuated brakes. This breakthrough technology was developed by Messier-Bugatti, already a pioneer in innovative braking solutions. For instance, back in 1985 Messier-Bugatti introduced carbon brakes on production jetliners, the Airbus A300-600 and the A310-300. But whether made of steel

or carbon, commercial airliners have always used a hydraulic system to “step on the brakes”. The breakthrough on the 787 is that these carbon brakes are now actuated electrically.

The electric brake on the 787 reflects the gradual transition to electrical systems on aircraft, designed to eliminate all other forms of energy, especially hydraulic (except for the chemical energy of the jet engines, of course, which also generate the electricity needed by the aircraft’s systems). There are a host of advantages in using electricity. For the aircraft as a whole, eliminating the hydraulic systems means considerable weight savings. Electrical systems also mean simplified assembly for the manufacturers. Operators will enjoy significant advantages, starting with better dispatch reliability. Electrical control also means that certain components can be controlled independently, and can take over for other components to provide higher overall performance. Eliminating hydraulics also eliminates the risk of leaks, and the associated risk of fires. Maintenance of electric brakes is easier and less costly, since servicing can be performed on the aircraft, without having to remove assemblies. Brake wear can be monitored directly in the cockpit, through an electronic system.

### MRO

#### SUPPORT NETWORK FOR AIRLINES

The first airlines to have ordered the Messier-Bugatti electric brake for their 787s are Air China, China Eastern, Hainan Airlines, Ethiopian Airlines and Royal Air Maroc. To ensure optimum product support, Messier-Bugatti is bolstering its global organization, with EBAC repair centers in Singapore, Seattle and of course in France, which will be headquarters for the network.

### VIEWPOINT



YVES GALLAND  
PRESIDENT OF BOEING FRANCE

#### How would you characterize the industrial challenge offered by the Boeing 787, a program on which several Safran companies are working?

The 787 was created in partnership with the airlines to meet the requirements of a changing global market: point-to-point passenger transportation, offering greater comfort, with an aircraft providing substantial operating savings and lower environmental impact. The 787 meets this industrial challenge by using composites for reduced weight, lower maintenance costs, more electrical systems, and a brand-new interior design.

#### Why did Boeing choose electric brakes?

The 787 is the “most electric” aircraft on the market. In particular, it’s the first commercial plane to use electric brakes, which offer advantages in terms of weight, robustness and economy – all features that meet the specific requirements of the 787.

#### Is working with a partner like Messier-Bugatti so early in the process something new for Boeing?

What’s really new is our audacious strategy of choosing the “best of industry”. Meeting this industrial challenge means that we have to work with the best partners in the world, in this case Messier-Dowty, Messier-Bugatti and Labinal from the Safran Group. Only a partnership formed well upstream, with highly demanding specifications for our partners, enables us to design an aircraft that represents a true technological revolution.

### Chosen by Boeing in 2004

“We started work on the electric brake around 2000, on our own initiative,” notes François Tarel, head of the wheels and brakes business at Messier-Bugatti. Four years after first being chosen by Boeing as a carbon brake supplier and earning their trust, in November 2004 Messier-Bugatti was selected by Boeing to design, develop and manufacture the 787’s wheels and brakes: two nose wheels, eight wheels and brakes for the main landing gear. “From that moment, we focused our work in two directions,” continues Tarel. “First, to develop the electric brake for the 787, and second to continue improving the technology, for applications on other aircraft.”

The contract with Boeing covered the design and manufacture of the brakes, as well as the design and construction of the associated control units (electrical braking actuator

controller, or EBAC), making Messier-Bugatti a veritable systems integrator. According to Tarel, “Messier-Bugatti applied its systems engineering expertise by participating in the initial aircraft design phase.”

### Early design involvement

The design of wheels and brakes in conjunction with the aircraft design is a first for Messier-Bugatti, which worked closely with Boeing as well as its fellow suppliers. Each brake is controlled by an EBAC, the electronic unit which is installed in the plane’s avionics bay and is highly integrated to interface with the other systems on the aircraft. Messier-Bugatti’s role is to optimize the EBAC-brake system and integrate it with the other systems.

For the EBAC Messier-Bugatti teamed up with fellow Safran company Sagem Défense Sécurité, a specialist in electronics. They faced a three-

### FOCUS

#### THE ADVANTAGES OF ELECTRIC BRAKES

##### For Boeing

- ▶ Weight savings
- ▶ Faster aircraft assembly

##### For airlines

- ▶ Reduced maintenance costs (no line purges required for servicing, modular design, etc.).
- ▶ Monitoring brake wear from the cockpit.
- ▶ Operational availability (an electric brake failure does not automatically require grounding the plane, unlike a hydraulic failure). A compensation mechanism links the actuators and the self-diagnostics system to maintain system efficiency.
- ▶ No more hydraulic leaks, thus no fire risk.

pronged technical challenge: optimize the use of electrical energy; design a system capable of meeting electromagnetic compatibility requirements; and make the motors for the electric brake as compact as possible. “We set up an engineering team in Seattle to facilitate our work and oversee program management,” adds Tarel.

Today, the 787 electric brake is nearing the end of development. The wheels have now been qualified. The brakes and EBAC are being delivered in June, the end of the qualification phase. The first certification test flight is slated for the end of August, kicking off the flight testing program that will continue until the middle of 2008, when the 787 is scheduled to enter service. The start of revenue service will confirm the application of this technology breakthrough, signaling a new standard in aircraft braking. ■

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