Floating into the future

Lockheed Martin's P-791 prototype airship sits on the tarmac following its initial flight in 2006. Lockheed and several other aerospace companies see modern airships as a low-carbon future for the cargo industry. Photo courtesy Lockheed Martin.

May 3, 2011

A safer generation of airships is trying to usher in a low-carbon future for air cargo. The initial target: Developing markets - China, Africa, northern Canada - where transportation infrastructure is nonexistent.

By Bruce Dorminey

The notion that airships represent the future of air cargo is being revived by a new generation of entrepreneurs some 75 years after a catastrophic fireball brought the industry to a screeching halt.

We may always carry freight in the bellies of passenger jets. But in a fully mature hybrid market, airships should replace the rest of the fixed-wing cargo fleet.

- Barry Prentice, University of Manitoba

Far safer than the Hindenburg, whose tragic 1937 docking remains an icon of aerospace gone wrong, these modern airships are a hybrid of lighter-than-air and fixed-wing aircraft. They can loft enormous payloads without requiring the acres of tarmac or miles of roadway necessary for conventional air and truck transport. And they do so at a fraction of the fuel and cost of aircraft.

Airships "give you access and much larger payloads at much lower costs," said Peter DeRobertis, project leader for commercial hybrid air vehicles at Lockheed Martin's Aeronautics and Skunk Works division in Fort Worth, Texas. "It's also a green aircraft; you're not polluting."
Today's airships could conceivably be used to transport everything from ripe pineapples to heavy industrial equipment direct to the customer. Shippers, for example, could roll tractors, backhoes, and road graders onto a 50-ton hybrid vehicle at a factory and roll them off at the job site, easing logistics and cost.

A handful of companies have prototypes under development. Lockheed has an airship in the works dubbed SkyTug that should be commercially available by late 2013 with a range of 1,000 nautical miles and a 20-ton payload. The 50-ton Skyfreighter is expected to follow in late 2014.

The industry's future is initially aimed at leapfrogging the conventional cargo transport infrastructure, freighting goods where highways and airports don't exist - Canada's frozen north; China's western frontier; remote parts of Africa, Asia, and South America. No airships are commercially available for cargo transport there yet. But once established on the frontiers, experts say their versatility, cost and fuel advantages should allow airships to penetrate mature freight markets like the United States.

'Hard to justify any roads'

Optimistic entrepreneurs have made similar predictions before, however. Germany-based Cargolifter AG burned through some $500 million without building so much as a prototype before it went belly-up in 2002.

But today's technology is much improved from earlier, flawed approaches. And the potential market is vast.

In northern Canada, for instance, some 4 million square miles of real estate lie north of rail lines and all-weather highways, and warming winters are making seasonally-constructed ice roads less reliable. Historically, ice roads were open three months during the winter. Today, they barely see 30 days of operation per season.

If all the engines quit, it won't come down like an aluminum tube. If it has to ditch, it can land right on the water.
"The cost of building all-weather gravel roads in northern Manitoba is $1 million per kilometer," said Barry Prentice, a transport economist at the University of Manitoba. As permafrost melts and drains away, the road slumps - an increasing problem in the rapidly warming Arctic and sub-Arctic. "If transport airships were available, then it would be hard to justify any roads."

The world has changed radically since the era of the Hindenburg; today's satellite weather forecasts, GPS-tracking, radar, computer-controlled avionics and in-flight management systems have paved the way for this new wave of hybrid airships.

New aerodynamics and structural design, as well as advanced materials technology and advanced engine design have made for more durable airships capable of longer, more autonomous flights.

"Now you don't need a mooring mast or a ground crew," said Lockheed's DeRobertis. "With the addition of the air-cushioned landing system, you can land anywhere. The onboard computer tells the aircraft what to do and it does it."

The Hindenburg was carrying flammable hydrogen in part because the U.S. government had banned the export of helium to Nazi Germany. Today's airships carry helium.

"And if all the engines quit, it won't come down like an aluminum tube," said Gil Costin, chief executive officer of Millennium Airship in Bremerton, Wash., which hopes to have a fleet of airships in service by 2020. "So the risk of losing cargo in a bad scenario is greatly mitigated by using this aircraft. If it has to ditch, it can land right on the water."

Rearranging trade

Numerous flaws doomed Cargolifter, added Costin. Like the Hindenburg, guy wires had to steady the ship while cargo was offloaded; though it never landed, the aircraft needed considerable facilities on the ground to deliver goods. "Operationally, Cargolifter went totally against what we in the hybrid airship business are trying to do - that is, alleviate the need for airship infrastructure wherever the cargo is to be offloaded," he said.

While sanguine about airship's ultimate prospects, University of Manitoba's Prentice cautioned that a fair amount of growing lies ahead of the industry. But that growth could rearrange international trade. "Canada is not buying tomatoes from Cuba now, but with an airship, they could fly right over the U.S. directly into Canada," he added.

"We may always carry freight in the bellies of passenger jets," Prentice said. "But in a fully mature hybrid market, airships should replace the rest of the fixed-wing cargo fleet."