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AEROSPACE AMERICA

Ambition: Europa

NASA might find more than life in this moon's ocean. It could find a new strategy for exploring other worlds.

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Preventing more MH370s

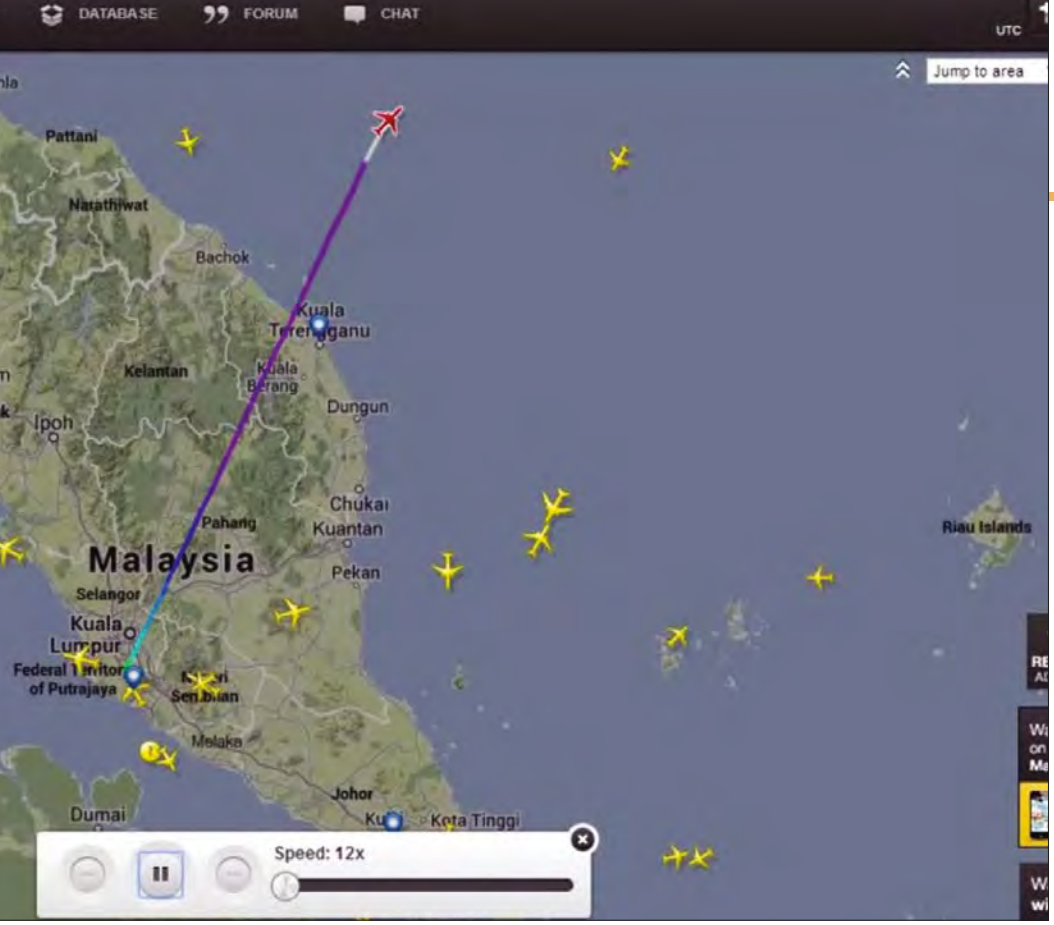
Conventional wisdom says it is too expensive to stream black box data from aircraft while they are in flight. AlulA Aerospace, a startup in Doral, Florida, says it has a strategy for affordably streaming information normally stored in the aircraft's black boxes. Founder Thomas Byrd explains the company's concept and how his team plans to bring it to market.

I was on a ski vacation in Austria in March 2014 when I saw the headlines about a missing Boeing 777.

As an amateur pilot and an aviation enthusiast, I study air disasters as a way to improve my flying skills and my understanding of aircraft technology. The lessons for MH370 never came. Hours, months and now years have gone by, and the world is still in the dark about the event that led to its disappearance. My friend, and now business partner, Jason Keasler, and I wondered: How could we lose a massive, modern jetliner in a world driven by the Internet of Things?

Inspired by MH370, Jason and I founded AlulA Aerospace. Our team is creating a streaming service that will, if a key component is certified by the FAA, feed cockpit audio and data to first responders in emergencies, while most of the time streaming live performance and weather

This Gulfsteam 4 corporate jet was fitted with a demonstration AlulA Heart antenna, inset, underneath the fuselage. Such antennas would broadcast encrypted weather or predictive maintenance data to aviation enthusiasts working with a flight tracker app service.



Malaysia Airlines Flight 370 disappeared from radars 40 minutes after taking off from Kuala Lumpur on March 8, 2014. The last contact was about 140 kilometers northeast of Kuala Terengganu.

data to airlines or contractors to improve maintenance efficiency and sharpen route planning.

As a Marine, I was taught to think outside the box to solve problems regardless of how restrictive the environment. So what is the problem that has led to our inability to solve the MH370 mystery?

If you ask an industry expert about MH370, he or she may argue that its disappearance was a statistical anomaly: Planes do not disappear. In reality, planes do disappear each and every night. Over the North Atlantic region that my wife and I crossed on our way home, over 2,500 aircraft drop from air traffic control screens for hours each night. They reappear once they are in range of radars on the other side of the ocean. Most airliners today do not have radios capable of streaming voice and flight data, because emergencies are rare and investing in them is largely unjustified. The one existing radio that does stream data in emergencies costs more than most customers would be willing to spend on a single-purpose device. Our strategy to solve this problem calls for developing an FAA certified multipurpose digital radio, called the AlulA Heart.

Each AlulA Heart will have a capability of transmitting voice and data by satellite communications in SOS mode, but most of the time will transmit flight data and the basic telemetry data the FAA has mandated all airliners in U.S.-controlled airspace to broadcast by 2020. The AlulA Heart will cost several times less than single purpose emergency radios currently on the market, and about the same as other radios capable of transmitting this automatic dependent surveillance-broadcast, or ADS-B, data.

Another innovation is the ability for the AlulA Heart to serve multiple purposes simultaneously. We'll use satellite communications for the SOS mode and to cover gaps, but most of the time the AlulA Heart will transmit predictive maintenance data using crowd-sourced aircraft data receivers via a flight tracking app provider, or FTA. We are currently negotiating a key partnership with one of these FTAs. We believe this strategy will entice the airline industry to stream data in real time, not just for emergencies but also for a variety of needs. In fact, we see many demand signals for data streaming.

Search and rescue agencies want the ability to respond to emergencies immediately. We plan to accomplish this by providing them with highly accurate position information of a distressed aircraft's last known position regardless of the location of the incident. Additionally, with the SOS mode, investigative agencies will receive black-box data in near-real time, rather than waiting for the physical recovery of the recorders. The MH370 recorders are still missing, and in the case of the Air France Flight 447 crash in the Atlantic Ocean off Brazil in 2009, investigators needed 23 months to find the wreckage and to retrieve the recorders.

Demand signals include more than accidents and investigations. Airlines want predictive maintenance data in real time to improve operational efficiencies. Many airlines are assisted by automated systems that define routes for hundreds of aircraft flying thousands of routes. This process becomes very complicated when aircraft unexpectedly require maintenance, or weather impedes scheduling. Live data will directly plug into these systems, and allow more fluid and accurate decision-making. Aircraft, engine and component manufacturers have been pleading for the ability to capture this data affordably in real time in order to get the most out of their predictive maintenance programs, in which they are already investing millions of dollars.

Our partnership with an FTA will

solve that affordability issue. Today, the FTAs — Flight Aware; FlightRadar24 and PlaneFinder.net — offer live views of most flights around the world. You can literally see an incoming flight live on a map and its projected arrival time. Following MH370, I was curious as to how the FTAs received this data. For some time now, the world has been shifting to a modernized air traffic control network. The U.S. portion of this network is the FAA's NextGen air transportation system, which includes the ADS-B 2020 mandate. Some aircraft are already sending ADS-B transmissions, and aircraft enthusiasts on the ground have been placing small antennas in their windows to capture this data as a hobby. Each FTA aggregates the hobbyist data and posts a live world map of aircraft in flight. In just a few short years, the FTAs have tapped into the ADS-B broadcasts to form the most extensive land-based aircraft data communications network ever seen.

Aboard each of our customers' aircraft will be an AlulA Heart in the equipment bay or perhaps in a variety of other locations on corporate jets. The AlulA Heart will weigh no more than 4.5 kilograms, and it will be no larger than your average briefcase. Each will transmit encrypted flight data over the FTA network so that only authorized users can decode it. Voice will only be sent over the satcom SOS mode. What Weather Underground has done for meteorology, we believe we are doing for the aviation industry. The data exists. The network exists. Data rates can now be cheap enough for airliners to be willing to immediately act and buy into this service.

We are rapidly prototyping and seeking FAA certification for the AlulA Heart. It will retrieve data en route to the aircraft's black boxes and stream the encrypted data into the global network of crowd-sourced receivers. The AlulA Heart will supplement existing systems, rather than replace any of them.

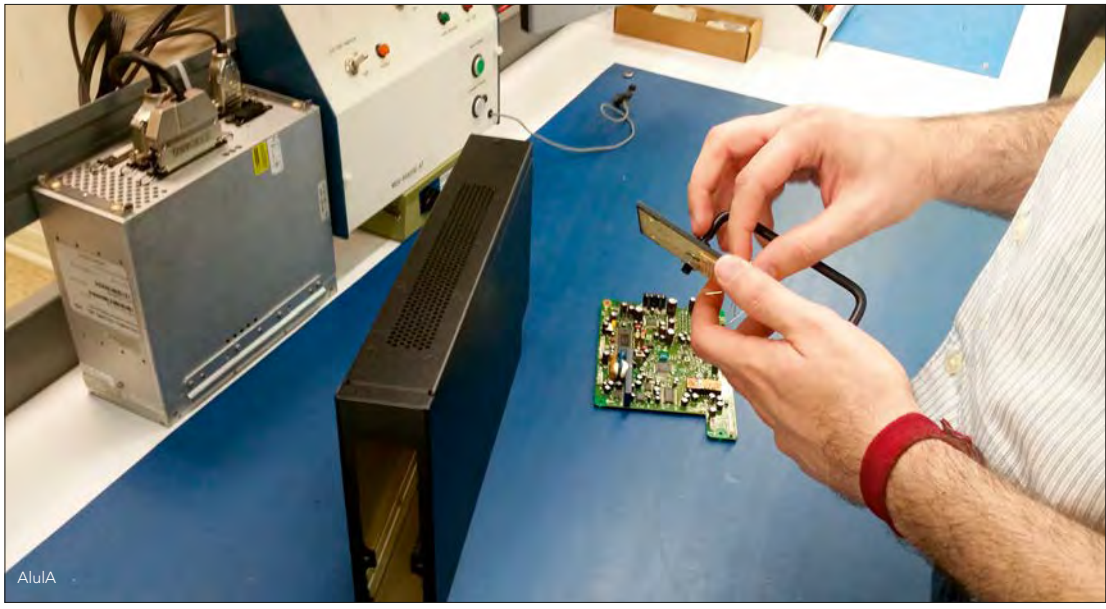
In normal mode, the AlulA Heart will continually stream data to fill the needs of various airlines, aircraft manufacturers and scientific agencies using the FTA network as a low-cost foundation. A sudden change in altitude or airspeed or other sensor exceedance would trigger the SOS mode in which data and cockpit audio would be transmitted via satcom. Additionally, the airline operator or authorities such as the FAA or FBI can remotely activate SOS mode.

Also while in normal mode, the AlulA heart will shift to an alternate broadcast method when the aircraft crosses over a remote region where crowd-sourced receivers are not present. To fill coverage gaps, data could be daisy chained by linking to other AlulA Heart-enabled aircraft; it could be transmitted via satellite communication; or it could be integrated into the in-flight Wi-Fi. The AlulA Heart hardware design will be inherently versatile to meet the sole purpose of getting the data into the hands of those who want or need it as quickly and as affordably as possible. This allows the AlulA system to be highly adaptable to fit the needs of its customers simultaneously.

Each AlulA Heart will constantly transmit detailed aircraft and engine sensor performance data to our future operations center. Customers will subscribe to receive this data so they can get a jump on an aircraft's specific maintenance needs before the plane lands. Fewer surprises mean more on-time departures. The industry (namely aircraft and engine manufacturers) has estimated the potential savings from predictive maintenance to be about 30 to 40 percent annually. This equates to nearly $1.2 billion dollars every year for an airline the size of American Airlines, since maintenance often rivals fuel as the highest overhead cost for carriers. We are also excited to provide meteorological agencies with the turbulence, wind speed, temperature and icing readings gathered by airliners in flight. With an AlulA Heart aboard, every plane becomes a collector of live weather data. This will lead to more efficient and comfortable routing for all.

Simply put: Our SOS capability is why we matter, charging for data and enabling predictive maintenance is how we will make our money and why the airlines will finally buy into this capability.

April was an encouraging month



AlulA is working with partner companies to reduce the size of the circuitry for its Alula Heart digital radio, which is waiting for its first customer.

for us. We won the top prize in the graduate-student category of the University of Miami's Business Plan Competition. We were also invited to showcase at eMerge Americas technology forum in Miami. CNBC included us on its list of "8 hot global start-ups to watch in 2016."

We are now about to undertake our greatest challenge. We must meet the FAA's strict certification requirements for installing a new piece of radio equipment on a passenger aircraft. We plan to begin environmental certification testing of the AlulA Heart in September. We are building two test radios and have contracted with an FAA-licensed designated engineering representative. It should take us about three to six months to earn a supplemental type certificate for the AlulA Heart. Once we pass environmental ground testing, we will be permitted to modify an aircraft for a series of demonstration flights to test the functionality of the AlulA Heart, as well as the function of the ADS-B.

We also understand that pilots, unions and crash investigative agencies around the world will want assurance that flight data recordings will not be leaked or accidentally transmitted by the AlulA Heart. These recordings will only be made public as a result of legal procedures for doing so. We will avoid this issue by encrypting the data. Cockpit voice recordings will only be broadcast via satcom in SOS mode. When the data is routed through one of our future FTA partners, an enthusiast who relays the data will not be able to read or see the data the end user deems as confidential. They can only automatically relay it, just as they do today with the basic flight information that airliners are already transmitting via ADS-B.

Cybersecurity is also of utmost importance, and a ground-up design priority. Within the aircraft, the AlulA Heart device will be an isolated system.

In the months and years ahead, the crowd-sourced network that already exists will only get better with added incentives for the enthusiasts. We aim to work with them to disrupt an archaic system of retrieving black boxes after crashes so that the air-travel industry can be fully connected to the modern, digital world.

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U.S. Marine Capt. Thomas Byrd is assigned to U.S. Southern Command in Doral, Florida. He is trained in Marine aviation and joint strategic intelligence planning and will leave active duty later this year.