

SKIGULL 1

Burt Rutan does it again from an Impossible Specification

By Henry M. Holden



Rutan's 47th aircraft creation, is a Trimaran-hulled aircraft designed to land on water, snow, ice, and other unprepared surfaces without having to make physical changes to its configuration. (FB)

LEGENDARY AIRCRAFT designer, Burt Rutan, the recipient of two Collier Trophies, has designed 46 revolutionary airplanes with five on permanent display in the US National Air and Space Museum in Washington, DC.

Rutan, designer of iconic homebuilt aircraft such as the VariEze and Long-EZ, also is the visionary behind the groundbreaking Voyager and SpaceShipOne, has a new design!

But Rutan has been talking for a long time about personal aircraft that would not be tied to airports. At the Experimental Aircraft Association's AirVenture, in Oshkosh, Wisconsin, last July, he revealed a few details of the SkiGull. Rutan normally does not give hints to a new design until after its first flight, but he brought a PowerPoint of the design to AirVenture.

The aircraft was almost complete in July 2015, and Rutan wanted to fly it to AirVenture, but addressing some of the typical challenges associated with any new design, and the need for a structured flight test programme, Rutan decided not to fly it to AirVenture.

SkiGull, Rutan's 47th aircraft creation, is a trimaran-hulled aircraft designed to land on water, snow, ice, and other unprepared surfaces without having to make physical changes to its configuration. That alone is a ground-breaking achievement.

FIRST FLIGHT

On Tuesday, November 24, 2015, Rutan's amphibian he calls the SkiGull, made its first flight in Coeur d'Alene, Idaho. According to the "Looking Up, Way Up: The Burt Rutan Story"

Facebook page, the flight lasted nearly an hour and a half, and test pilot Glenn Smith reported that the airplane was "responsive, predictable, and fun."

Rutan said, "The flight was just in time, since we got our first North Idaho snow storm just hours afterwards."

Of the first flight Rutan added, "The aggressive test card included all the basic stability and control flight tests with the cruise configuration and with flap down and skis extended. All manoeuvres on the card were performed on this first flight. Speeds for first flight were limited to less than 80 knots and altitude to less than 8 000 feet."

RETIREMENT

After retiring in 2011 from Scaled Composites, Rutan did not start on any new designs. He wondered if he had the resolve to design and build another aircraft. But then there was his creative spirit...

He then spent two years doing preliminary designs on what would become the SkiGull. Rutan, working out of his garage in Coeur d'Alene, Idaho, claims this airplane will be his last project.

AntennaFILMS, which created an award-winning television documentary about SpaceShipOne, is producing a feature length documentary titled, "Looking Up, Way Up! The Burt Rutan Story," that will include extensive coverage of Rutan's SkiGull.

Rutan says that there are shortcomings in seaplanes. "Shock absorption, and major configuration changes required to operate on various surfaces. Seaplanes are noisy, they lack

range and are inefficient. There are also the corrosive effects of water, particularly salt water."

Rutan addressed those issues with a number of innovative solutions. He created two skis that use a pneumatic extension and retraction system from the tri-hulled sponsons. "The skis allow the aircraft to take off with less effort than a standard seaplane," Rutan said.

The pneumatic extension and retraction system also provides shock absorption on the water, a feature missing from all current seaplane designs. Rutan addressed the noise issue with a quieter engine and an improved propeller design.

"Imagine an aircraft able to land in large swells near any ocean shoreline, ride the waves to the beach, from where you could hike in for lunch and gas," said Rutan. "Since it uses car/boat gas it will rarely go to an airport. Imagine also going to snow fields anywhere there is around 120 metres of relatively smooth snow, or to a dirt patch right at Puma Punku, or any part of the Amazon, including the tiny rivers that feed it. Imagine doing an eight-month exploration trip around the world without ever going to an airport."

COLD WAR DESIGN

Rutan's design, while completely original, has some roots in the Cold War. The hydro-ski was Cold War innovation in marine aircraft. The US Navy's first attempt to use skis was on the supersonic Convair Sea Dart fighter. In retrospect it is astonishing that anyone thought it would work.

The takeoff speed was 125 knots, at a time when the world's water speed record was 150 knots, and more than one man died in the process of getting it there. The Sea Dart, although unsuccessful, was not the only hydro-ski aircraft of the 1950s. There were attempts by other countries including the former Soviet Union at a hydro-ski aircraft, but none was successful.

FINAL DESIGN

The product of those 12-hour days in the garage of his Idaho home may prove to be an extraordinary final chapter in Rutan's outstanding career.

"A composite airframe, assembled without the use of metal fasteners solves the water corrosion problem and, all metal parts of the airplane are replaceable should corrosion become an issue," said Rutan.

Rutan, 71, appears in a trailer for the film, *Looking Up, Way Up! The Burt Rutan Story*, and offered hints at the design and expected capabilities: a 170-knot cruise speed, two seats (one for Rutan and one for his wife, Tonya), and enough range to fly from Hawaii to California (at least 2 000 nautical miles) without ferry tanks.

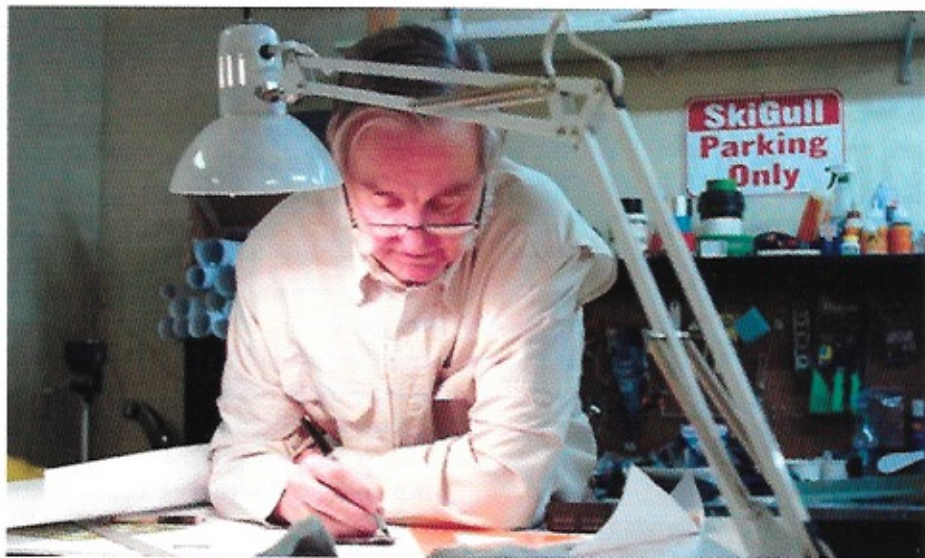
Retractable skis will allow it to land in rough water, and a Rotax engine able to run on automotive gasoline will give the airplane the capability to travel into remote regions without requiring an airport.

Rutan's design also includes two electric motors that each drive a 685 mm folding propeller (an assembly made from off-the-shelf parts) that can provide forward and reverse thrust to manoeuvre the SkiGull during docking or beaching.

"Those electric motors (powered by batteries designed for radio controlled airplanes) can keep the SkiGull airborne for a short period, adding another layer of safety in case the main engine fails during takeoff," said Rutan.

UNIQUE FEATURE

"The SkiGull, with its electric docking system,



Burt Rutan spent hundreds of hours at the drafting table getting the design perfect.

can fly about eight miles, which greatly reduces the risk of an engine failure," Rutan said. "Every other seaplane has to crash straight forward when an engine fails early in the climb, a SkiGull can fly back to downwind, and land on the lake, or into the wind. The docking system also gives it an extra 150 lb. thrust, for that over-gross water takeoff when heading for Hawaii."

The SkiGull will be able to fold its 13.4-metre wingspan (with removal of 1.5-metre wingtip panels) and is small enough to fit in a one-car garage. It can be towed behind a vehicle with the addition of three 635 mm components.

The retractable ski system is designed to pneumatically deploy at 15 knots during water takeoff, and support the aircraft's weight down to 10 knots during a water landing. The ski struts have a unique shock-absorbing features that allow the aircraft to safely land on rough water, as well as hard surfaces that would otherwise damage them.

"The skis and the tri-hull have been tested at full scale on Lake Coeur d'Alene, validating performance and safety of the system," Rutan said. Two small wheels on the skis allow for operation on traditional runways.

More range and efficiency were inspired by Rutan's experience designing the Voyager and

the Globalflyer both of which flew around the world unrefueled and nonstop. The SkiGull's wings bear strong resemblance to those airplanes.

SECOND RETIREMENT

"While I do plan to continue designing new airplanes, the SkiGull is the very last airplane that I will be personally involved in building," said Rutan. "I built SkiGull in my garage starting 20 months ago and it was a gruelling exercise for an old guy in his 70s.

"I will not again expose myself of the challenge of laying up sticky composites, sanding foam and carbon fibre, staying up at night to monitor oven cures, etc. I plan to enjoy this new airplane in retirement, including its unique capabilities that combine STOL from all surfaces with ocean crossing range.

"It has a huge baggage compartment, so Tonya and I might even load it up for golf trips." (Rutan had to quit golf two years ago to build SkiGull).

According to Rutan, the SkiGull should solve the shortcomings of an amphibian, and augment the performance of a light seaplane. "So we developed it from an impossible specification" he said. →



Left: The skis and the tri-hull have been tested at full scale on Lake Coeur d'Alene, validating performance and safety of the system. (Photo: Mike Kincaid)



Centre: Burt Rutan giving his PowerPoint presentation in AirVenture in July 2015. (FB) Right: The US Navy's first attempt to use skis was on the supersonic Convair Sea Dart



fighter. There were attempts by other countries including the former Soviet Union at a hydro-ski aircraft, but none was successful. (Photo: Henry M. Holden)