On the 'Wing... #141

Boeing ATT "SuperFrog"

A tailless multi-engined military transport from America's premiere aircraft manufacturer is an enticing project in small scale for electric power or in large scale for the slope.

Boeing's ATT (Advanced Theater Transport), nicknamed SuperFrog, was designed in response to the USAF Air Mobility Master Plan. It has a slightly smaller span and length than the C-130 Hercules, and hence a smaller footprint, yet is able to carry two to four times the cargo over a greater range.

The SuperFrog is also a tilt-wing aircraft. The wing rotates during take-off and landing so the engines are oriented in a more vertical direction. The combination of propeller thrust from four 10,000 HP engines and wing lift augmented by the propeller slipstream will enable a fully loaded SuperFrog carrying 30 tons of material to take off and land in less than 600 feet. Landing speed is estimated to be 40 m.p.h.

The forward speed during take off and landing is so low, Boeing engineers determined that a horizontal stabilizer would be ineffective. During cruise, the wing is self-stabilizing through various trim and control surfaces, and a horizontal stabilizer is not required. Because of complex flight control laws, the full size aircraft will incorporate computer based control systems. Eliminating the unnecessary horizontal surface, however, will cut material and production costs, and drag, by 10%. These substantial savings mean a less expensive aircraft with better performance.

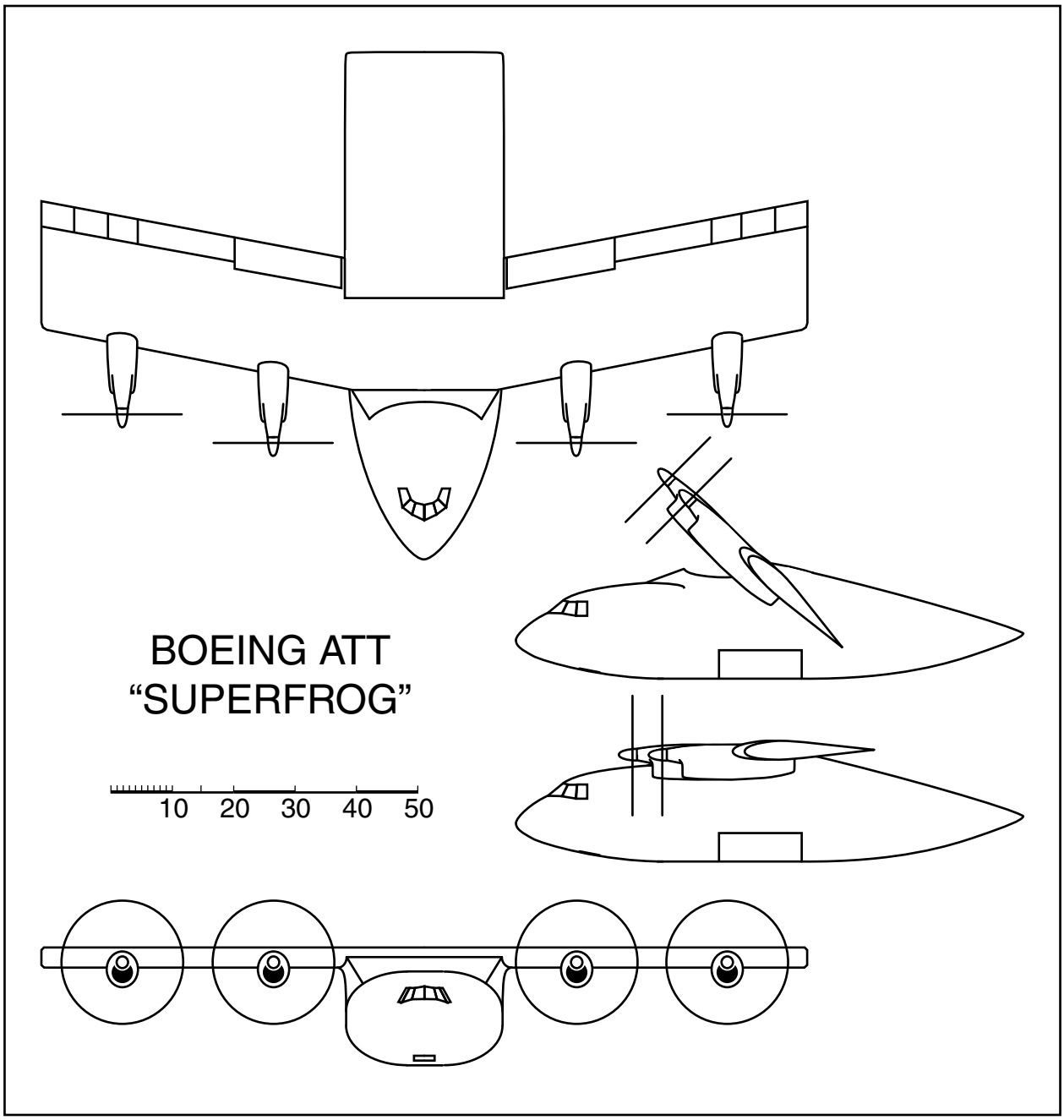
There are at least two rivals to the Boeing design. Lockheed Martin's USB (Upper Surface Blowing) utilizes the Coanda effect to improve performance. Artists' renderings show an angular swept wing with a wide root chord, *a la* the B-2, and a V-tail which has the two surfaces separated by an unusually wide aft fuselage. Airbus' entry is designated A400M. It utilizes turboprops on an airframe which is similar in shape to the C-141 and C-5. This aircraft has no short field capability.

A 7% scale model of the SuperFrog has already undergone wind tunnel testing, and a model of the same scale is to begin flight testing some time this year. Maiden flight of the Superfrog is to be before 2010, with deployment in the 2011-2021 regime.

For the modeler, the SuperFrog opens some interesting possibilities — one could construct a large scale model for slope flying or go with electric power.

Bigger flies better, so for slope flying we'd tend toward a span of at least eight feet. At 1/15 scale, the span would be 8.25 feet. Each wing panel would then be well under four feet in length, and the fuselage, though stout (nearly 1.5 feet wide), would be just over 5.4 feet long. Cutting the fuselage in two at a point just behind the wing would allow the model to be transported in a small car.

The alternative, electric power, need not be expensive. Four Speed 400 motors driving four bladed props through in-line gearboxes would very well match a span of say 54 inches or so and a flying



Dimension	Lockheed C-130H "Hercules"	Boeing ATT "SuperFrog"
Span	132.5 ft.	123.8 ft.
Length	97.8 ft.	81.6 ft.
Powerplants	4 x 4,500 HP turboprops	4 x 10,000 HP turboprops
Cruise speed	370 m.p.h. max.	485 m.p.h.
Range	2,365 miles	3,000 miles

weight of 60 ounces. A 9x6 4-blade prop should work well with a Speed 400 7.2 volt motor and a 2:1 gearbox. On fourteen 1700SCR cells, and with the motors wired two parallel/two series, the draw is 10.5 amps per motor. Such a setup would give roughly six minutes of flight time. If all motors are wired in parallel, decrease the cell count to 12. This setup gives much lower flight times.

It should be kept in mind that propellers on the port side should rotate counterclockwise as viewed from the rear, while those on the starboard should rotate clockwise. There is certainly sufficient room in the fuselage for batteries and radio gear! The inventive experimenter could try the tilt-wing concept by rotating the wings using a retract servo for power and the wing rod as an axle.

We heartily encourage any *RCSD* readers tackling either of the two projects we've outlined here to share their experiences.

Special thanks to Carlo Godel and Mark Nankivil for their assistance in gathering information for this article. Carlo, a member of the nurflugel.com e-mail list, was able to take an artist's rendering of the SuperFrog which we e-mailed to him and turn it into a 3-view. Mark helped us determine a suitable powerplant, gearbox, battery and prop combinations for the suggested electric version. Now, if we can just get him to build one...

Ideas and suggestions for future "On the 'Wing..." columns are eagerly anticipated. We can always be contacted at P.O. Box 975, Olalla WA 98359-0975, or through e-mail at <bsquared@b2streamlines.com>.

———————

References:

Sweetman, Bill. Load Warriors. *Popular Science.* July 1999, pp. 52-55.

Wilson, J. R. ATT: moving slowly toward shorter landings. *Aerospace America*. February 2000, pp. 22-23.