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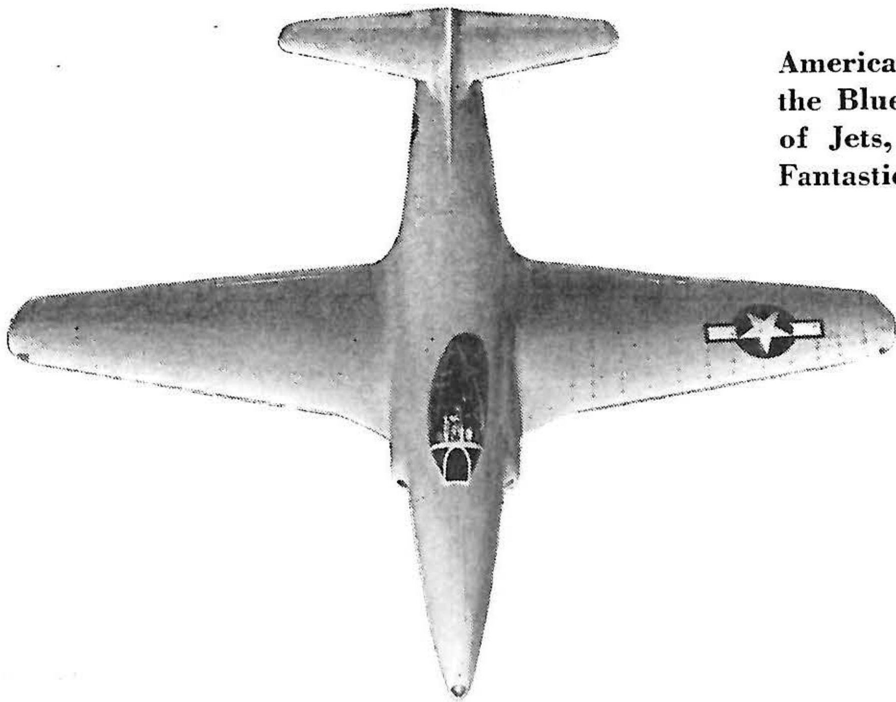
**American and British Experts Examine the Blueprints of the Future in Terms of Jets, Rockets, Atomic Engines and Fantastic Speed**



LEFT: P-80 jet fighter.

# *What is the Shape Of Wings to Come?*

**Following is the script of a two-way trans-atlantic discussion featured in the Columbia Broadcasting System series "In My Opinion." The speakers are: Reginald G. Standerwick, chief engineer of the aircraft gas turbine division, General Electric Company; and Geoffrey Smith, editorial director of Flight magazine.**

STANDERWICK:

THE speed of sound is 760 m.p.h. If I could tell what I know about the preparations going on, this broadcast would rank as one of the most exciting and lengthy ones.

Let's talk first about the thoroughbreds—the P-80 Shooting Star is the holder of the world's long-distance speed record of 2,470 miles from coast to coast here, at 584.6 m.p.h., and it's already crowding your Gloster Meteor record of 616 m.p.h.

There's the Republic P-84, with a yet undisclosed record, but it's said to be faster yet. Yesterday I peeked behind the doors of the Army Air Force's jet stable, and I tell you it's bewildering.

First, there's the lineup of bombers of the 40 class and fighters of the 80 class. All I can say is that our speeds are going right up to XZ-1, and the predictions for this plane are really fantastic. Our Army Air Force is predicting speeds to begin at 600 m.p.h., then accelerating by stages to 1,000, 1,500 and even 1,700 m.p.h. for this plane. What's more, one of our latest models will climb 20 miles high in one minute. At the end of two minutes, its speed is so fast that if the power is turned off it will soar vertically for another 20 miles without power. That's supersonic or super-something!

Now, Smith, what is Britain doing about this invasion of supersonic heights? How soon?

SMITH:

An imaginative and sensational program, Mr. Standerwick. But the fantastic speeds you quote must be for war weapons or flying missiles, as no human frame could stand such acceleration.

Now you ask my view as to whether we shall soon exceed the speed of sound.

With piloted aircraft, I would answer, not for a year or two. We have the necessary power in gas turbines, rocket propulsion and ramjets, which are going ahead amazingly fast, but aircraft design has not advanced in unison. Air compresses into a wall at transonic speeds and presents serious problems which affect control. Patiently they are being solved.

With pilotless craft it's different. We are on the threshold of 1,000 m.p.h.

As you know, rocket missiles have already far exceeded the speed of sound. The V 2 indeed attained 3,000 m.p.h. We have research establishments engaged on development of pilotless aircraft to investigate air compressibility problems at high speed. Human life is not endangered as instruments record the performance.

For example, there is the small Vickers pilotless rocket aircraft for a speed of 880 m.p.h. in level flight.

Knowledge gained will be applied to the design of piloted aircraft. With assisted take-off, ramjet planes will give a flash performance of over 1,000 m.p.h., but at tremendous fuel consumption.

As to British aircraft, today our fastest pursuit plane is the Meteor, which holds the world's record at 616 m.p.h., and during tests exceeded 1,000 km.p.h. With two Derwent jet units producing 8,000 lb. thrust it has a phenomenal rate of climb—30,000 ft. in three minutes.

**Up Everest 180 Seconds**

Imagine reaching the top of Everest, the world's highest mountain, in 180 seconds.

We are wholeheartedly committed to gas turbines. We have in regular production jets developing 5,000 lb. thrust. At 600 m.p.h. this is equivalent to a piston engine of 16,000 h.p. driving a propeller which at that speed would have an estimated efficiency of 50%. Eight horsepower per lb. weight is almost unbelievable.

Now I should like to ask you, Mr. Standerwick, when do you in the United States expect to have jet propelled passenger planes in the air?

STANDERWICK:

Commercial planes will follow the bomber class, and that's where the experience gained by our 40 class is expected to pay off. I refer to the XB-43 Douglas Bomber, which is powered by two General Electric J35 gas turbine engines, giving a total thrust of 8,000 lb., or the Flying Wing XB-49 Northrop, which is similar to the B-35 Flying Wing, except that it will have eight of our J-35 engines producing 32,000 lb. thrust.

**I also expect the C-99 Consolidated Vultee will be converted to jets before very long. This plane is capable of carrying 400 soldiers or 335 patients. Actually it can take up a medium tank and its entire crew.**

As to the appearance of these planes; as speeds increase the wings

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will become thinner and sharper in design. They'll be swept back or even swept forward, with or without tails. In fact, I think it's highly possible that the fuselage will take on the appearance of a high-velocity bullet to cut the sonic wall into the high speeds and altitudes. Fortunately, we will be fully prepared with suitable engines for high power and supersonic operation. I predict that before long, engines of five, ten, twenty or even fifty thousand pounds thrust will be the order of the day.

And what do you have to report along these lines, Mr. Smith?

SMITH:

Some new type aircraft that will interest you are a Saunders Roe fighter flying boat with two Metro-Vick axial flow turbo-jets (See story this issue—Ed.), an improved Vickers Spiteful with the Rolls-Royce Nene of 5,000 lb. thrust, a flying wing by Armstrong Whitworth with two Nene turbo-jets, others with wings of arrowhead or boomerang form.

As to large transports we feel there has been too much easy optimism about speed. Commercially to reap the advantages offered by jet propulsion, it is imperative to fly very high and very fast, say, 50,000 ft. and 500 m.p.h. This entails reliable pressure cabins and improved aerodynamic design. The larger the aircraft, the greater the difficulties. Thus the pure jet airliners must await further technical progress. In the interim, turbines driving airscrews will power our Phase I airliners.

**Speed Brings Problems**

Today, with piston engines, operating schedules are around 250-300 m.p.h. at 20,000 ft. To add 150 m.p.h. to present economic cruising speeds will be an accomplishment, and that is taking a realistic rather than a fanciful view.

Weather conditions are more stable in the stratosphere, but at lower altitudes passengers flying at, say, 500 m.p.h. in turbulent air would be distinctly uncomfortable. Ultra fast speeds at low heights may have to be ruled out except on fighters and bombers.

You will have heard of our Lancastrian 14-seater airliner propelled by two Nene jets and two Merlin piston engines. It first flew last August. This 50-50 aircraft of 62,570 lb. has already demonstrated to hundreds of passengers that turbines are far smoother and far quieter than piston engines. It is a revelation. On the two jets alone it will cruise at 260 m.p.h. at 10,000 ft., and at 330 m.p.h. with all four engines.

Next year Britain will have in the air a four-jet Tudor liner with an estimated cruising speed of 400 m.p.h., and it will be followed by several commercial liners with turbo-propellers. Our most ambitious project is the Bristol 167 weighing 145 tons, destined for the London-New York non-stop service; a Queen Elizabeth of the air to carry 132 passengers. It will have eight turbines geared in pairs, driving contra-rotating propellers. Each turbine and airscrew will operate independently of its companion, if desired. This leviathan of 230-ft. span will be in service by 1950, but prototypes will be flying long before that.

*—Charles E. Brown photograph.*

World speed record holder, the Gloster Meteor IV.

Then there is the 123-ft. span Handley Page Hermes with four Bristol Theseus turbo-props. Designed to carry 63 passengers, its all-up weight is 42 tons. A new de Havilland type will have four Ghost turbine jets, each of 5,000 lb. thrust. A Miles Marathon 18-seater has Armstrong Siddeley Mamba turbo-prop units. There are also in the design stage aircraft with six turbines.

As to reliability the R. A. F. recently fixed the period between overhauls of Rolls-Royce jet engines at 270 hours. Even at a modest average of 400 m.p.h. this is equivalent to a distance of four times round the world. Successful metallurgical research is the secret.

Turbine powers continue to grow. We are developing units up to 10,000 lb. thrust. Current military types have centrifugal compressors but for commercial operation the accent is on axial flow compressors. These enable higher compression ratios and the slim proportions permit enclosure within the wing.

Another phase of development is the compounded engine wherein a two-stroke Diesel engine is interposed between the compressor and turbine in order to burn the fuel more efficiently at a higher ratio of compression. Extreme economy, as low as .32 lb. per h.p. hour offers the possibility of ranges of over 7,000 miles where high speed is not the main objective.

To sum up, the short-term policy on commercial aircraft is axial flow turbine-driven propellers for medium speed and medium altitude. The long-term policy is to revert to pure turbine jets for speeds of 500 m.p.h. and upward at 50,000 ft. and

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The Republic Thunderjet, P-84, is a leading American contender for speed honors.

## Wings to Come

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higher. Such progress awaits the advent of suitable air frames which may be flying wings or tailless craft with swept-back wings, embodying boundary layer control, and inevitably pressurization for the cabins.

Now, Mr. Standerwick, what is your view of aircraft of the future?

STANDERWICK:

You know, I'd be a fool to predict anything for the distant future, unless I was thoroughly sold on one thing—it is that young scientists and engineers today have the training and the daring to continue the search for the natural laws by which Divine Providence planned that the whole universe shall be guided.

I am sure they'll advance this air age along the following lines: they'll expand the research facilities of our National Advisory Committee for aeronautics, for it is there that untiring efforts will be made to produce the design data for aircraft of the future. I mentioned those 50,000 lb. thrust engines. I believe that two of these would be ample power for an airplane with gross weight of around 400,000 lb.

In about 20 seconds such an aircraft would develop 110 m.p.h., with a take-off of about half a mile or so. I'd expect the plane to have a wing span of between 350 and 400 ft. ft. Wings very likely would be swept back, but I rather expect it would have the semblance of a tail. Outside on wings, there are probably two ramjets or athodyds to take over when speeds are increased to 600 m.p.h. where they should be fairly efficient.

For high-speed air transportation, I foresee a supersonic de luxe service of smaller planes, soaring up to 1,000 m.p.h. in the stratosphere to get out of this heavy atmosphere of ours. Even at 3,500 m.p.h. the low friction would not cause these aircraft to burn up. "If," however, this is the flying condition we will meet up there 100 miles above the earth, experiments here with rocket propulsion definitely indicate the future use of this type of power, as we go onward and upward in the conquest of time and space.

I think we must also consider future developments in the atomic field. Here almost anything is possible, as recent military experience dramatically demonstrated. When we have harnessed atomic energy to the aircraft of the future, we hope today's ever-present factor of the fuel load will be replaced by a radically increased payload, thus revolutionizing once again the civilizing influence of the airplane, which first flew at Kittyhawk, North Carolina, less than 50 years ago.

The airplane of today and tomorrow is attracting the finest brains and the greatest teamwork of the century among engineers and scientists. I sincerely hope this vital teamwork will be extended to the international field, for surely as you and I speak to each other across the broad Atlantic tonight, this age of speed will shrink the world to the point that nations too must work harmoniously together, and in doing so, learn each other's way of life in mutual understanding. Pooling scientific knowledge everywhere is one of the final stepping stones to the ultimate goal of one world living in peace.

## Lightplanes in the Bush

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Canuck on skis since last September. He has flown about 120 hours so far this winter, having made frequent trips to his home in Toronto, also to Ottawa and Montreal, as well as covering the company's timber area by air.

Referring to his aircraft, Mr. Hope told Canadian Aviation:

"I bought it in place of a car. I am absolutely sold on it. It is the real answer to transportation in this country. I have found it to be a sound financial investment as well as great fun."

Winter operation of the aircraft has offered no serious problems, Mr. Hope reports. In very cold weather he uses heat from a blow torch passed through stovepipe leading under the engine nacelle for the warm-up.

Cardboard baffles in the air intake grill and felt lagging around the oil tank have proved successful in maintaining proper oil temperature.

Fully loaded on skis the Canuck gets off in about 100 yards under average conditions, becomes airborne in about 125 feet with pilot only and no load. Take-off performance varies widely, of course, with snow and wind conditions.

Mr. Hope learned to fly at North Bay last summer and obtained his private license with his own aircraft at Ottawa in the fall. He has found the 400-mile range of the Canuck ample for getting around the country. He keeps a drum of gas at the mill and reports that refuelling depots are located conveniently throughout the country. Cost of fuel per mile is much less than for automobile or boat in the north, he says.

When equipped with floats as well as skis, his plane will have cost approximately $5,000 in initial outlay, this flying lumberman estimates. He calculates his per-hour cost of operation at $3.22 as follows:

| | |
|---|---|
| Gas (4 gal./hr.) | $1.20 |
| Oil (1/12 qt.) | .02 |
| Major overhaul | .40 |
| Depreciation | 1.10 |
| Insurance* | .50 |
| TOTAL | $3.22 |

*Public liability and property damage only.

No allowance is made for running maintenance as he keeps the engine in tune using his own equipment and facilities.

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