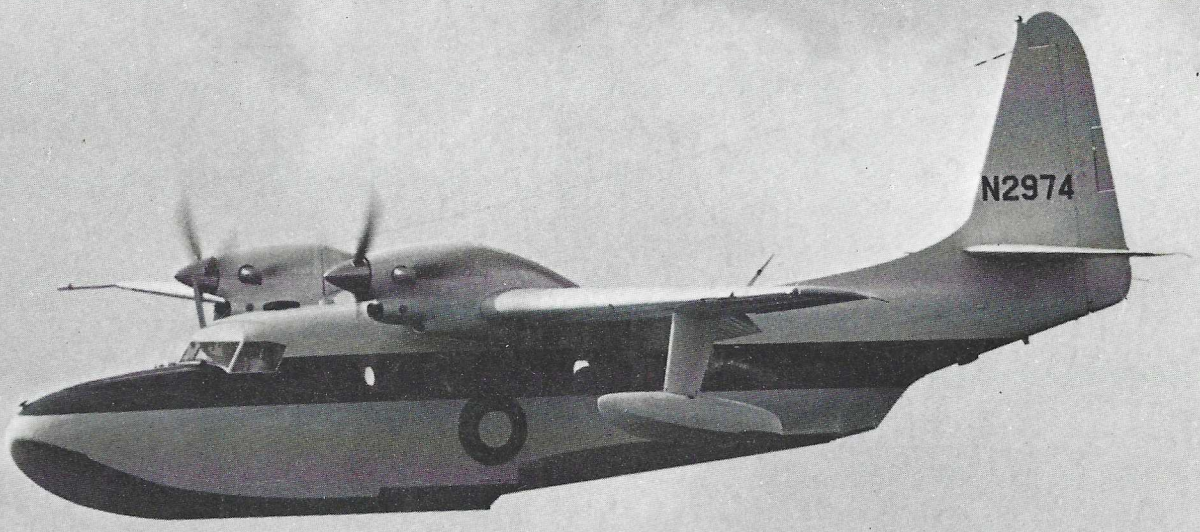
SHELL AVIATION NEWS

409·1972



SHELL AVIATION NEWS

Editor: H. Scanlan Production Editor: D. R. Hooper USA Editor: G. E. Meany

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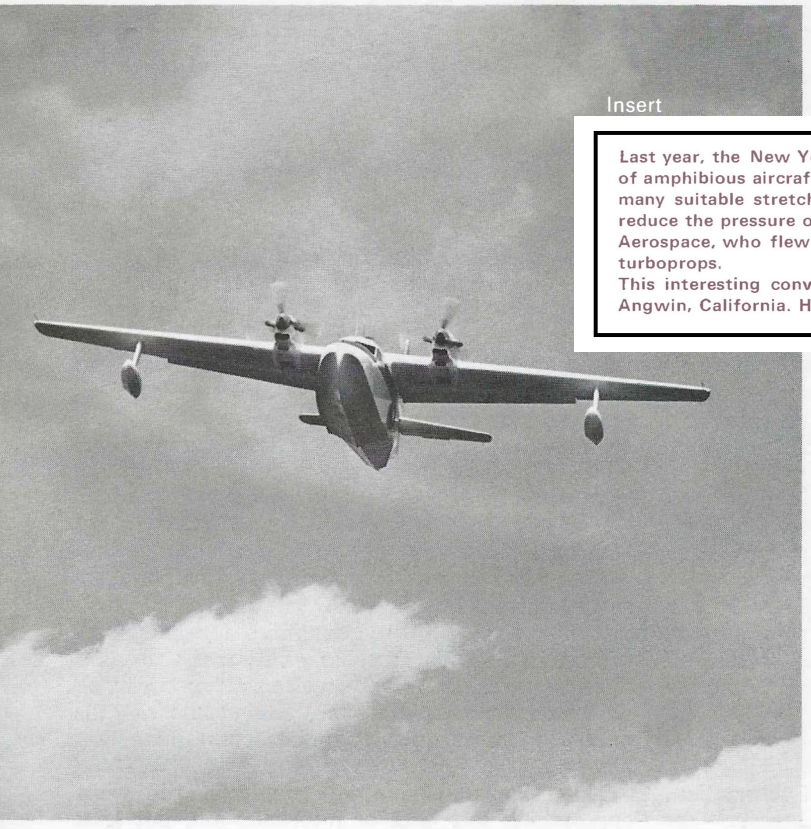
PHOTOGRAPHS

Above: *RLD, the Netherlands Airworthiness Authorities, have certified Fokker-VFW's F.28 Fellowship for operation from unpaved runways. This follows experience with the aircraft in unpaved airfield operations worldwide. Certification flying included performance measurements and assessment of safety and reliability when operating from gravel runways with aborted take-offs and landings, which were carried out in Iceland. The only modification required was to the cover of the lower anti-collision light.*
Here, the F.28 takes off from a compacted sand strip in the desert near Illizi, Algeria.

Front Cover: *Shapely lines belong to Fred Frakes' turboprop conversion of the Grumman Mallard amphibian, seen here on final approach to East River, New York City. The aircraft was taking part in a feasibility study of city-centre flying boat services. Re-engining with PT6A-27 turbines results in an extra ton of useful load and a 40 mph increase in the cruising speed. Photograph by Howard Levy, who also took most of those on pages 12-15.*

Back Cover: *A process that will selectively remove encapsulating material from electrical assemblies without damaging them has been introduced by the Amphenol Sams Division of Bunker Ramo, California. The process, known as 'Access', could produce large savings in the aircraft industry, where a large percentage of electrical equipment is potted to protect it against the environment. At present, such equipment is impossible to repair or modify, and is usually scrapped.*
The photograph shows a cable harness termination encapsulated in polyurethane, and the same harness after the 'Access' process. Complete accessibility is now possible, with no damage to insulation, jacketing, insert, metal parts or plating.



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Author taxies downwind (*below*) along the Washington Channel, Washington, D.C., and seconds later (*right*) gets Turbo-Mallard on the step for take-off to New York

Last year, the New York City Department of Marine and Avi tion began an investigation into the use of amphibious aircraft for commuter transport in the densey travelled Northeast Corridor. There are many suitable stretches of water near the New England towns, and such an operation could well reduce the pressure on landplane Stolports as presently conceived. The project has involved Grumman Aerospace, who flew trials for the New York City authorit es with a Mallard re-engined with PT6 turboprops.
This interesting conversion was carried out by J. FRED FRAKES, President of Frakes Aviation Inc., Angwin, California. Here he discusses the engineering and handling of the modified aircraft.

Turbo-M

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The Grumman Mallard was produced in the late 1940s by the Grumman Aircraft Engineering Corporation of Bethpage, Long Island, New York. Most of the original 59 airplanes that were built were bought and flown as corporate aircraft. Many of those planes are still operated by their original owners. The Mallard, as originally conceived and designed, was to have an average empty weight of 9400 lb and a gross weight of 12,750 lb. In actuality, most of them had an empty weight of around 9600 lb leaving a useful load of 3150 lb.

The water handling characteristics of the Mallard were as nearly perfect as could be expected of any aircraft. Likewise, the flight characteristics of the aircraft were superb. I really never knew of a pilot who flew the Mallard who did not think it was the finest aircraft he had ever flown. There was one drawback, however, and that was the useful load. A crew of two and ten passengers left only 185 gallons of fuel or barely a three-hour range with no baggage. Many pilots dreamed of ways of getting the empty weight down. Few pilots complained about the performance, even with one engine out. The Pratt and Whitney 1340s really left nothing to be desired as far as reliability went.

Potential

As I flew my Grumman Widgeon, I looked at the pictures of Mallards and dreamed of the day I might own one. That dream was finally realized in 1961. I flew this aircraft all over Alaska, but the problem of useful load was constantly on my mind. When I saw the first model of the Pratt and Whitney Small Turbine, my enthusiasm began to grow. I am sure this thought was in the minds of many pilots of the Grumman Mallard.

In 1964 I sold my Mallard to Mr. Ray Peterson of Northern Consolidated Airlines, who arranged to put one of the early Pratt and Whitney PT6 turbines on the right side of N2974 and fly a test-bed program of about 50 hours, then remove the turbine and reinstal the R1340. Enough credit has not been given Ray Peterson, who is now president of Wein Consolidated Airlines of Anchorage, Alaska, for his

allard

tion began an investigation into the use travelled Northeast Corridor. There are wns, and such an operation could well eived. The project has involved Grumman es with a Mallard re-engined with PT6

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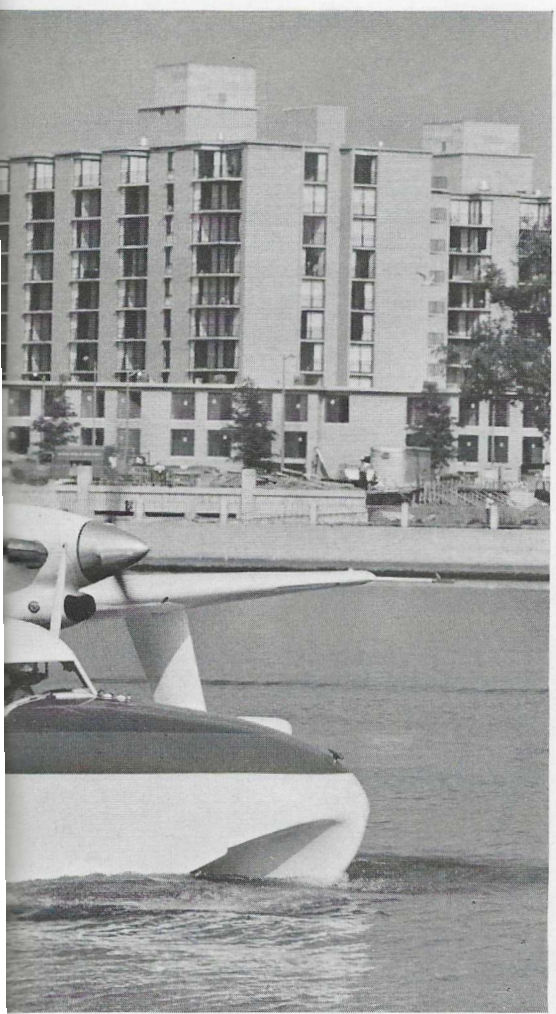


foresight in running this test bed program. It proved several very important factors:

- Water ingestion in the turbine would not be a problem.
- Corrosion in the turbine was not an insurmountable problem.
- That as soon as the PT6 engine should have sufficient horsepower, it would make an ideal installation in the Grumman Mallard.

1 April, 1968 I bought N2974 back from Wein Consolidated Airlines (Northern Consolidated and Wein Alaska had merged) for the express purpose of insta'ling PT6A-27 engines. The Grumman Mallard was an ideal aircraft for conversion. With the R1340s installed, the airplane was nose heavy and required most of the radio gear in the aft section for weight and balance purposes. When the 1340s were removed and the PT6 engines installed, the radio equipment was transferred to the bow of the aircraft and the weight and balance problems were effectively solved.

Engine installation dictated that the thrust line would have to be raised 8.5 inches. The propeller arc was brought forward 5.5 inches. The angle of incidence was originally five degrees positive. It was dropped to one degree positive. The propeller blade length was reduced from 101 inches to 96 inches—the end result being that with the aircraft sitting on the water the propeller tips had approximately an additional foot of clearance. All of these factors add up on the positive side. Whereas originally propeller erosion was a serious problem, with the Frakes Turbo Mallard there is virtually no water erosion problem.

As for stability and control, the conversion detracted in no way from the original design. The only control modification required was the extension of the elevator trim tab. The V_{mo} is 240 mph, with the normal operating range from 84.7 mph to 240 mph. The maximum design maneuvering speed remains 147 mph with the flaps operating range to 136 mph. The landing gear speed remains 150 mph. The minimum control speed (critical propeller windmilling in low pitch, the other engine at take-off power) is 90.5 mph. The aircraft's best angle of climb is established at 105 mph, whereas the best rate of climb is at 110 mph.

We have installed an automatic propeller feathering system which is designed to be in operation from the start of the take-off run to 400 ft altitude. In the case of engine failure, the propeller will automatically feather with a net positive thrust throughout the feathering cycle. It is impossible for the second propeller to autofeather even if the engine should fail.

The aircraft is also equipped with beta lights warning the pilot that he has moved the power control levers past the stop and that his propeller blades have, in fact, reached a 12 degree angle.

Increased work capacity

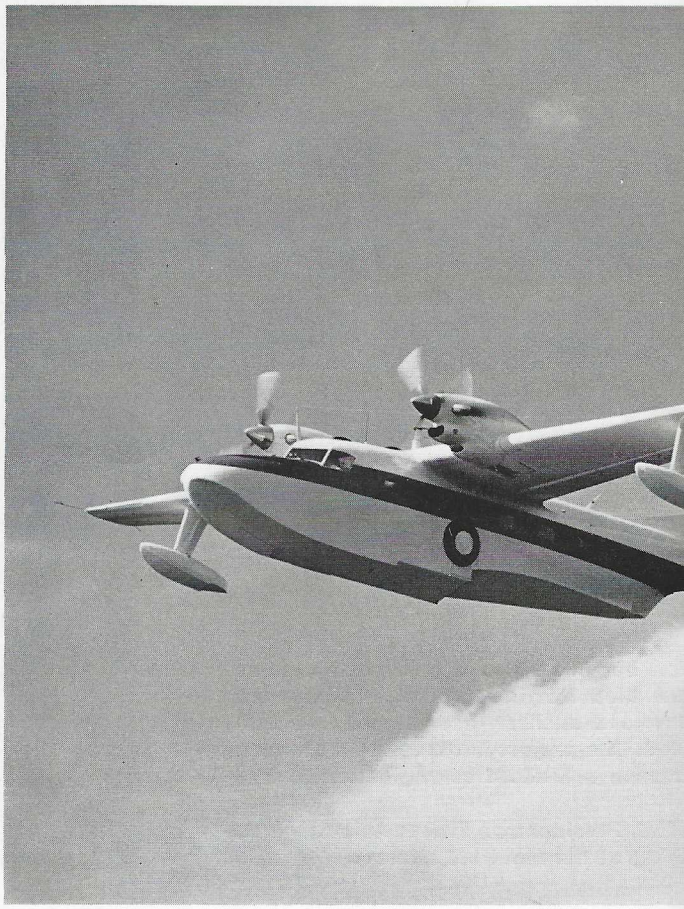
The converted Frakes Turbo Mallard is grossed at 13,500 lb if fuel is put in the aft compartments of the wing floats. If the customer desires to gross the aircraft at 14,000 lb, it is necessary to instal additional auxiliary fuel tanks in the wings, their capacity being 166 gallons. These tanks weigh 100 lb, giving a net useful load gain of 400 lb. The zero fuel weight of the aircraft, without the auxiliary wing fuel tanks or pneumatic de-icing boots, is 11,450 lb. With the boots or auxiliary wing tanks installed, the zero fuel weight will be 11,650 lb.

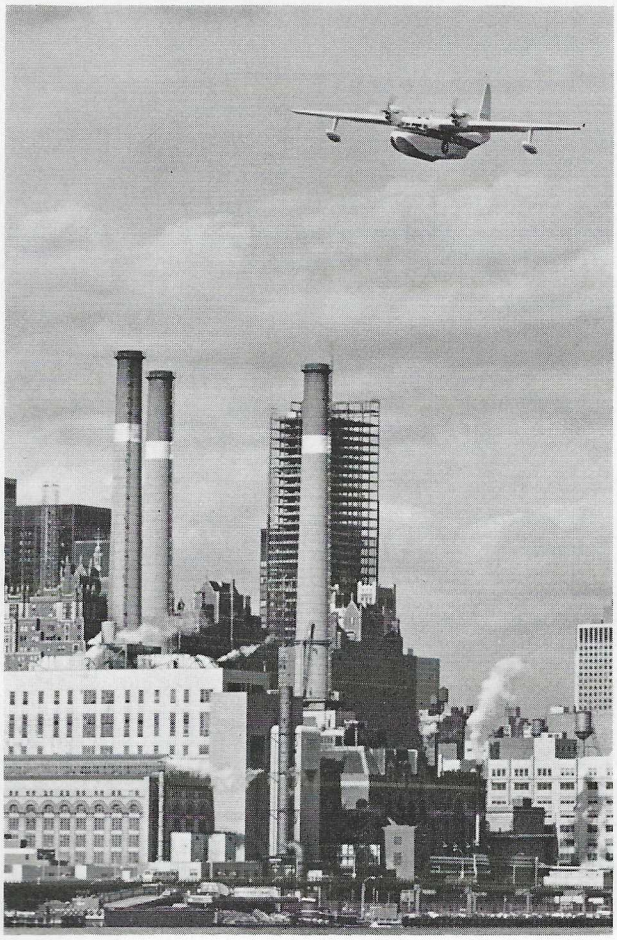
The empty weight of the converted aircraft normally runs from 8500 lb to 8700 lb. This gives the Turbo Mallard a useful load of 5000 to 5500 lb. A maximum fuel load of 4500 lb is possible. This, of course, would only allow a crew of two and three passengers plus 88 lb baggage. The range would be six hours and 45 minutes for 1440 miles at normal cruise, with 45 minutes or 160 miles reserve left.

For a more realistic situation, let us revert to the original crew of two and ten passengers. Instead of only three hours range for 540 miles with no baggage, you would now have a crew of two and ten passengers plus 480 lb baggage and five hours range for 1065 miles.

To sum it all up in round figures, we have given the Mallard owner an extra ton of useful load, increased his cruising speed by 40 miles per hour, cut his direct operating costs and added at least 15 years more life to the finest amphibian ever built.

What more could a man want?





Turbo-Mallard

RIGHT: Area Navigation equipment, for flight in the crowded Northeast Corridor, contrasts with more traditional gear—docking and mooring lines

BELOW: Turbo-Mallard, looking more than usually elegant in a gloss white scheme, approaches over New York's Brooklyn Bridge for a touchdown on the East River. Amphibian's strikingly low noise level and ease of handling through air and water traffic drew widespread comment