What Can Affect Your Float Performance?

By J.J. Frey, SPA #194
Photo courtesy of EDO Corporation.

One of the questions that seems to repeat itself in the float business is what affect does different bottom designs, manufacturing techniques and exotic lubricants have on the performance of floats. In fact, I once had an individual show up in my office with a scale-model float. He had taken his wife's otter coat and extracted the hairs and glued them individually back on the bottom of the float. His reasoning was that if you ever watched an otter swim, it is his fur coat that makes for his spectacular water performance. I bet he got a spectacular performance out of his wife when she realized that he had shaved her coat and glued it on the floats!

In fact, another incident we had was when somebody got to my boss and convinced him that if you were to put a potato grater-type lining on the bottom of a float, it would generate ball bearings of air that would definitely improve the float's takeoff performance. In fact, before the evaluation of this program was over, we probably spent approximately $30,000 to $40,000 running a 150 up and down the bay. While it did change the ride characteristics, it did not improve the performance. If anything, there was a slight increase in drag.

A day doesn't go by that we do not hear from somebody who has a serious suggestion to improve float performance, and while many of them sound very appealing, we have generally found that if the float is properly designed, none of these enhancement items will improve performance. We are listing below our comments with regard to some of the wonderful devices that have been proposed for performance enhancement and what our comments are concerning these devices:

One...

As we have discussed in previous articles, all float performance is a compromise and a concave float would certainly offer better performance than a deep-V float. Somewhere in between is the compromise that offers the best performance. If you remember, a number of years ago there was a float manufacturer who produced a composite float with a concave bottom and while the takeoff performance was improved in some conditions, the loads that were introduced into the struts, fittings and airframe were so high, that eventually failures developed. Efforts were made to try to reduce the loads by incorporating springs, shock struts, etc., but now the float became so complex and many other problems were introduced so the design never proved to be successful. You must remember that water in motions clings to and exerts a suction on convex surfaces when they come in contact with it, especially at high speeds.

Two...

A number of years ago, the American Cup yachts were hyping a new riblet tape that was stuck on the bottom and had a feeling very similar to a shark skin. After the races were completed, and the American yacht won, there was great promotion in the seaplane industry as to how this tape would improve the performance of the floats. In fact, I remember having the opportunity to fly it once in Minnesota on a 206 and the owner suggested that I be very careful in landing his aircraft on a three or four-mile lake because this wonderful tape makes the float so slippery that there might be some questions as to whether we could stop the float before we came to the end of the lake.

I remember making the approach to the lake with the owner telling me to use my best short-field techniques and by the time we touched down, I was absolutely sure that we would be in the bushes two or three miles away because of this new wonderful product. In reality, we were not able to see any change in either the takeoff or landing characteristics in the float, and the tape introduced other problems that were far more detrimental than any improvements that were seen on either takeoff or landing. I believe that the American Cup personnel made a statement that the tape made a six-second improvement in a three- to four-hour race. If the race was four hours long, that would be a total of 14,400 seconds. It would certainly be very difficult to see how a six-second improvement in a four-hour race could make any difference in approximately a 20-to-30-second landing or takeoff. I believe the tape is no longer offered as a performance enhancer to the seaplane world, and the reasons are obvious.

Three ...

Just today, an individual called who was thinking about rebottoming his floats. While his aircraft was not a very good performer, he was hoping to fly it to lakes that were approximately 5,000 feet in altitude. His question was if I have to take the bottoms off anyway, how much will I improve my performance by flush-riveting the bottom of the float that is in contact with the water when the aircraft is in a planing condition. It certainly sounds like a possibility to improve the float performance, but I do remember talking to some individuals who were with the EDO Corporation in the 1940s and 50s and a considerable effort was made to study the performance improvement of a flush-riveted float versus a standard brazen-head rivet. After much evaluation, it was finally decided, that, if anything, the performance was slightly worse for the flush-riveted float as compared to the standard float with the brazen-head rivet. It seems that the small, convexed head of the rivet actually created a small amount of turbulence in the water and helped to break any suction that was created by the float bottom. One of the other problems that you must consider when you use a flush rivet is that there is a considerable amount of labor involved and there is a possibility that the float could develop a leak at the rivet.

Four ...

One of the more interesting projects that we at EDO have experimented with to improve float performance was to develop a single hydrofoil configuration. This work was done by the aerodynamic and hydrodynamic branch of EDO Corporation. Our goal was to improve the takeoff and landing performance of a Cessna 150 on floats. The floats were equipped with EDO 88A-1650 floats, and the hydrofoil was positioned to preclude any adverse

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effects on the pitching characteristics or pilot takeoff routine. Unporting speed was chosen to give the pilot sufficient aerodynamic control while planing on the foil. The final configuration was flown at 1700 lbs with a power off stall speed of 49 miles per hour and a get away speed (lift off the water) of 51 miles per hour. In this configuration, the wing would lift approximately 962 lbs, and the foil would develop 738 lbs. We had great hopes for this program that we could get load reduction and improved performance by utilization of a foil and a considerably cheaper float design because no hydrodynamic improvements would have to be incorporated into the bottom. The program was not very successful in that the entry speeds became very critical and if you were to touchdown at a couple of miles per hour faster than the stall speed, aircraft would be tossed back up into the air with little or no control surface inputs. In fact, it was felt that the ride could become so hairy that the program was never pursued.

If you go back to the early 1900s, when seaplanes were first developed, and follow the progression of the hull (flying boats) and seaplanes (floats) that were studied by all the major countries of the world and review the work that was done by the Germans, Russians, British and US government, you would find that almost all conceivable bottom combinations have been tried. My opinion is that the water flying community will not get a major breakthrough in float design in the near future.

Editor's Note: J.J. Frey is Vice President of EDO Float Corporation and is SPA President