

Jefferson Jyrodynes, Inc. Newsletter
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Purpose of this Newsletter

This newsletter is now issued irregularly to keep everyone who's interested posted on the construction progress of the full-sized prototype of the Jefferson Jyrodyne. My new full-time job working as VP of engineering for a company in biofuels has been eating up an awful lot of energy, so the jyrodyne development work has slowed down considerably since last October. I figured the first six months on the job would be pretty intense, and then after that I could get back onto the jyrodyne. It looks like it is working out that way. I heard this week (May 23rd) that my old firm I left in August is about to go belly up, so it was a good time to jump!

Fourth Wing

Construction on the fourth and last wing has started, with the flap currently being built first. Like the first one, this one is all carbon. My building skills continue to improve; this one has a very straight trailing edge, unlike the first one!



Canard

The X-Plane testing has doubled the span of the canard. Since this will contain fuel tanks, it has been left to last to work on.

T-Tail Construction

The last three shorter sections of the T tail will be done after the last wing is completed.

Side-fins

These will be the last major airframe parts to be fabricated, and from the X-Plane testing; will need to be only about 1/2 the size as the original design. (Compare the X-plane shots of the revised jyrodyne below with the above photo to see what I mean.....)

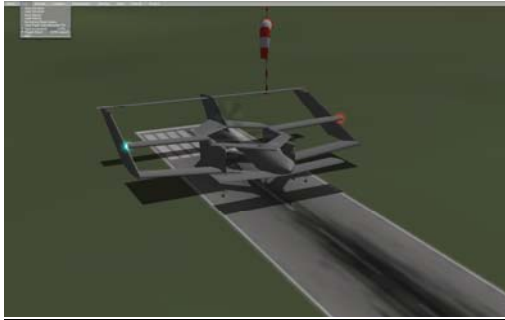
Bell mouth Progress

The bell mouth assembly continues to require lots of work. The eight upper curved sections are being mated to the graphite ring truss with aluminum columns. These will help turn the bell mouth into more like a full torus.



The construction method for the 2nd bell mouth will use a considerably different approach; it will be built in one piece on a jig.

X-Planes 9. 22 Simulation



The simulator has allowed a lot of jyrodyne flying to be done to see how it will handle when real flying starts. X-planes can be run either like an R/C simulator, or as an aircraft where you are in the cockpit.

The X-Planes simulator was tested further using a model of the PA-28-235 Piper Dakota, testing stalls, versus the real thing. Both stalled at about 58 knots under identical conditions, so there was not one knot of difference between the real aircraft and the simulated one.



Piper Dakota working instrument panel w/radios

Jyrodyne stalls done in X-Plane tend to be a non-event down to something under 20 mph with full flaps at light weights, where it will roll off on one wing and drop the nose. The canard induces

a very flat, mush-like stall mechanism. Recovery is conventional with a 50-100 foot height loss. With any VTOL power in, the stall drops down to about 10 mph. With full VTOL power, the only stall to worry about is a backing up(!) stall at over 10 mph, where a tilted downward tail is pushed down further by the following wind, and it drops down too far for VTOL recovery. (You really have to work at this to induce this sort of stall, which of course never happens in a conventional airplane!)

In the real jyrodyne, it is expected that there will be more nose-up experienced during the add-in of VTOL power. The unusual airflow profiles occurring during this time are not expected to be accurately simulated by X-Planes.

Jyrodyne takeoffs

VTOL takeoffs are about as expected; with a rise off in VTOL mode, tilt forward, then over a one to two second duration, power is fed in the tractor propeller as wing lift displaces VTOL lift. The wing lift does seem to begin to have a significant effect at about 10 mph, rather than the 20 mph originally expected. Typical forward runs in ground effect before transitioning to a steep climb are about 25 feet. You can clear 20' in 50'. True straight vertical lifts to 50' or more will probably require more than the 210 hp currently available, unless there is a 10+ mph wind. Of course, this depends on the aircraft weight.



Landings have been eye-openers. Typically, a conventional approach is made with full flaps at 40 mph, idle power, with a high flare at about 30 feet started 200 feet before the touchdown point. Then as the speed drops below 30 mph and the jyrodyne starts to settle, power is slowly added to the rotor. The stall horn alerts you to bleed in extra power, while the angle-of-attack indicator flickers in and out of red. When the horn goes off, you bleed in power. Gradually, the speed bleeds off to zero as the tail touches down first, and then the nose is a light bounce. It is a lot easier to land than I thought it would be, with one exception.....

Landing on the top of a high rise heliport is trickier than landing on the ground, and requires considerably more practice. It takes about 20 more horsepower to do the landings with the same safety factor as a VTOL landing on the ground. It also has pointed out the requirement to be able to see vertically downward when in the last seconds of final approach for landing, which was not really necessary when landing on the ground. It demonstrates that the floor, where the rudders and clutch pedal are, will need to be transparent.

Precision Instrument Approaches (ILS)

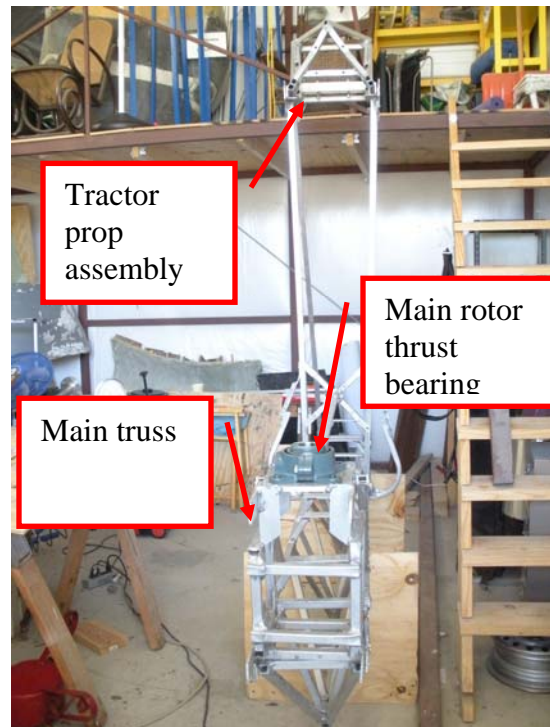
These are at major airports and allow landings with as little as a 200 foot ceiling and less than a mile visibility. The exceptionally slow landing speed for the jyrodyne will allow safe ILS landings to much lower minimums and range visibility, on the order of 75 feet and 200 yards. Work remains to be done investigating the procedures for helicopter ILS approaches, particularly for point landings.

Angle of Attack (AOA) meter for RANS

An angle of attack sensor was built to be used with the Voyager glass panel in the RANS S6-E. The simulation test landings show that an AOA meter in the cockpit is essential for good VTOL landings.

Drive Train Assembly

Assembly of the drive train has continued slowly at the hangar. The main drive train truss has been mated to the tractor propeller assembly. Fitting and bracket development has been tedious.



Rotor

Some tools have been acquired to cut the center hole in the rotor to mate to the 90 degree angle gearbox, but the two have not been mated yet.