EAA HOMEBUILT AIRCRAFT COUNCIL REPORT, OCTOBER, 2007

TEST-FLIGHT CARD, BEST GLIDE SPEED

*Our last test flight allowed us to develop the Best rate of Climb (Vy) and the Best Angle of Climb (Vx) for our RV-9A. And the previous test flight provided our Indicated Air-speed to Calibrated Air-speed correction figures. Now with our newborn knowledge of these data, we can establish the **Best Glide Speed** for our aircraft.*

The **Best Glide Speed** can be described as the least altitude lost per distance traveled. If we loose power, and set up our best glide speed, it will give us the greatest horizontal distance that we can travel and hopefully our best chance of selecting an appropriate off-airport landing site should it become necessary.

We will work with three parameters; time, distance, and indicated airspeed (KIAS), and determine the loss in altitude over a set distance in a set time period. The test is simple, and the reduction of the data involves several simple steps to provide a useful single airspeed for our best glide distance.

Methodology:

We start with three target airspeeds. We use Vy, Vy minus 10 KPH, and Vy plus 10 KPH. (We could use Vy, Vy – 10% and Vy + 10% for an aircraft with a narrower speed range.) We have established Vy at 82 KIAS from our previous test. So our target speeds will be 72, 82 and 92 KIAS.

To fly the test, we climb to a safe height of 5000 AGL and after establishing slow flight, (cooling the engine after our climb) we apply carb. heat and close the throttle. As our airspeed bleeds off, we established a glide speed pegged at 72 KIAS. Once established, we mark off the altitude at the start of one minute and again after one minute of glide. Then we immediately increase the downward pitch angle to give us a pegged 82 KIAS glide speed and repeat the altitude lost over an exact minute. Finally we peg 92 KIAS airspeed, again recording the altitude lost in one minute.

To improve the accuracy of our tests, we repeat them, but this time we start with 92, then the 82, and finally the 72 KIAS. Because our glide rate, (read altitude lost over distance traveled) will depend upon the weight of our aircraft, we take into account the fuel burn. So if we match the first of a test run with the last, and the last with the first in the second test run, we mitigate this weight-introduced error to a significant degree.

The flight-test data collected is as follows:

TEST RUN #1		**TEST RUN #2**	
KIAS	**ALTITUDE LOST**	**KIAS**	**ALTITUDE LOST**
72	650’	92	900’
82	700’	82	750’
92	800’	72	675’

When we average the altitude loss for the target airspeeds we get:

KIAS	ALTITUDE LOSS (Ave.)
72	662.5 ‘
82	725’
92	850’

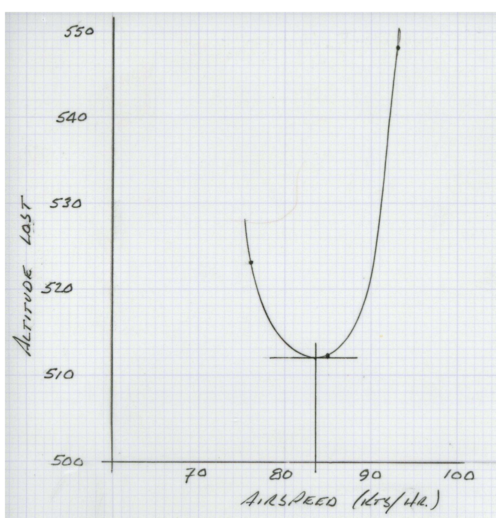
But wait a minute; these airspeeds include instrument errors as we found in our IAS calibration flight test. So from data obtained in this previous ‘calibration’ test, we can develop the corrected (KCAS) values for our current test. Also with the corrected airspeed values, we can determine the exact distance (in feet) traveled at the target airspeeds in one minute. Since one nautical mile per hour equals 101.269 feet per minute, we can develop the following spreadsheet:

KIAS	Correction Factor	KCAS	Distance (Ft./min.)
72	+4	76	7694
82	+3	85	8608
92	+1	93	9418

From this we calculate the altitude loss per mile of distance traveled.

KCAS	Altitude Lost/Nautical Mile	
76	523	(662.5 x 6076/7694)
85	512	(725 x 6076/8608)
93	548	(850 x 6076/9418)

We are left with two parameters that we can graph; ‘altitude lost’ vs ‘airspeed’. The graph turns out like this:



From this graph, we can see that the least altitude lost (520') in a given distance of one mile occurs at 83.5 KCAS. We convert this back to our KIAS from our previous test-flight chart, where the error of 3 KMPH is now subtracted to give us our **Best Glide Speed** of 80.5 KIAS. We will record this number in our Pilot Operating Handbook. This is almost the same number as our Best rate of Climb (Vy) of 82 KIAS. (These values should be very nearly the same since this would indicate the most efficient wing L/D airspeed.)

We can gain one additional important piece of information. Since at 80 KIAS we will loose 444 feet of altitude for each mile of distance traveled, for every 1000 ft. of altitude we drop, we can glide 2.25 (1000/444) statute miles. Remember, however, this figure is based on ambient temperature and pressure conditions, as well as the aircraft's weight at the time of the test. Keeping this in mind though, it can still be a useful guide.

It would be interesting to run these tests again, under 25% power, simulating a feathered or stopped propeller. (You will glide farther in this instance then with a turning propeller acting as an air-brake.) In an emergency, perhaps any added advantage gained by a stopped or feathered propeller might simply be considered a mitigating 'plus' to the pilot's 'pucker factor'.

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