A **Performance Comparison of Two Distinctly Different Indoor Scale Monoplanes**

By Jim Daley

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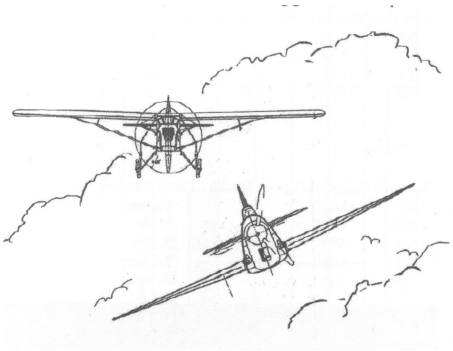
A few articles have appeared in the indoor/outdoor free flight literature that rate the potential flight time for various rubber powered scale aircraft. These predictions usually do not consider FAC scale rules, particularly regarding retractable landing gear and bonus points.



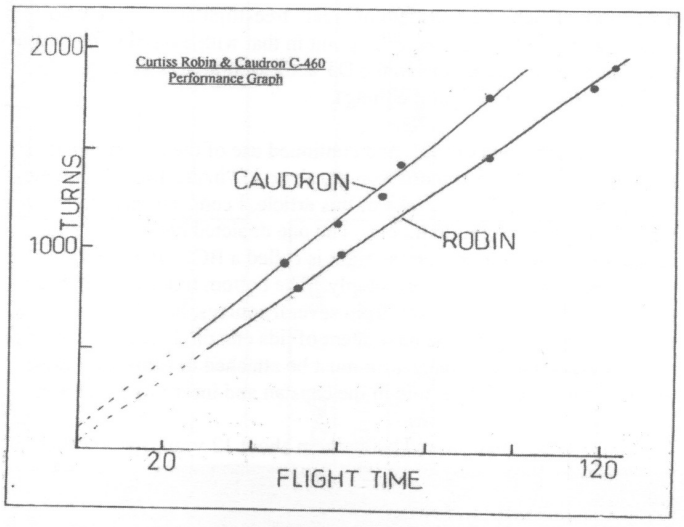
The two ships that are compared here show high performance "figures of merit" in most studies. They are the Curtiss Robin & Caudron C- 460 Racer. The Caudron is usually rated slightly higher, probably because of it's long nose, good tail moment and clean lines. The Robin has good proportions as well, but is at the other end of the spectrum regarding streamlining. The Robin does have one very important performance enhancing feature: an under-cambered wing.
Now, lets look at both of my ships in detail. Other than the outward appearance the two models are quite similar in the characteristics, which make flight comparisons possible. The following table includes the values that critically affect performance:

	Curtiss Robin	Caudron Racer
Wing loading Gr/sq.in.:	0.253	0.240
Wing span-inches:	24.5	23.3
Wing area-sq. inches:	91.88	100.72
Empty Weight- Grams:	20.2	21.0
Motor Weight:	14.98 %	14.97 %
Motor Loop Dimensions:	24.5 x ~ .110 in.	24.7 x ~.112 in
Distance Between. Hooks:	10.2-in	12.1 in
Plan / Kit	Golden Age	Megow's

Vital in these tests is the energy storage capacity of each motor and the characteristics of the propellers. As can be seen in the quantities above, the motors are nearly identical, but more importantly, the percentage motor weights, within the errors of measurement, are the same for both ships. The propellers for both models are identical 7.2 inch plastic jobs as supplied in Golden Age kits. Each prop was smoothed and balanced, the pitch remaining unaltered.

The tests are simple: measure the flight duration as a function of motor winds (turns) for both models and plot the data; Both craft are superbly behaved, flying well almost immediately in the first trimming sessions. The rubber used is from the same batch and was measured by the supplier to have unusually high energy storage capacity. The tests were performed in the Glastonbury gym during two flying sessions with flight measurements of both models on each occasion.

The graph on this page shows the Robin to be the better performer at all winding values tried and more importantly, the highest site-limited duration. Again, looking at the graph, we see that flight times are linearly proportional to turns and the best fit straight lines through the data points intersect the "turns" axis slightly above the zero point. In practice the Robin uses most of the turns while the Caudron typically has more turns left. These observations are consistent with the graph.



It is clear from these experiments that the low wing bonus points are pretty well founded, but may want a little tweaking upwards. (Just heard a big cheer from the low wing flyers.) This may be especially true in a highly competitive field where flights are in the 90-120 second range.

Because both models have similar wing loadings, dimensions and percentage motor weights of equal value, I must conclude that the Robin is more efficient (higher lift to drag ratio) than the clean, gear up Caudron Racer. In an outdoor contest with a 15% motor rule I would give the Robin (design) the better chance of victory. In defense of the Caudron, the motor is probably not optimized for maximum indoor duration (Glastonbury) as the distance between hooks will allow a longer loop (greater than] 5% of empty weight) thus a higher energy storage for a similar launch torque. More experiments are needed to see if this will really increase the flight time. Stay Tuned.

FAC Editorial: Stay tuned indeed! I hope our intrepid experimenter continued with his research, and that someone can come up with a copy of it for us. I would guess that not many eyebrows will be raised by the assertion that high wing cabin monoplanes have an advantage in Free Flight. It's still interesting to see an engineering approach to the question. This article was sent to us by an FACer who wanted to make the point that a low wing model with retracts is still at a disadvantage to a high wing model with the wheels hanging in the breeze. Probably true, sometimes, but a single experiment with just two models seems like a pretty weak data pool, and the extra drag produced by that undercart at indoor flying speeds is nigh on negligible. The models used here have some remarkable similarities, but they leave some important questions still open. How much difference did that undercambered wing make? And the extra inch of wingspan and additional wing area? It would be a better experiment if there was one model with a wing that could swap positions, and an undercart that could be traded for an identical blob of ballast, but that will have to wait for someone with more scientific curiosity than I have. It seems that "all else being equal" rarely happens in Free Flight.