Rubber Energy

Mumbo Jumbo # 106 from the pen of the Glue Guru
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Today we shall contemplate the issue of rubber energy expenditure. Are we efficient? Do we achieve a reasonable return for our investment in rubber weight? What exactly does a good lube do?

Oddly enough the answers were set out in 1912, courtesy of *Flight*, Sept. 28., in a series of studies that remain the latest word. Here's one technical area that doesn't suffer from overcrowding.

First, our terms: Unit energy will be described as ft-lbs/lb. This means the ability to do a certain amount of work (the ft.-lbs. or numerator part) possessed by each pound (the lb. or denominator part) of rubber. In words, unit energy equals work potential per pound of rubber.

The work to be performed can be expressed as height, and in the case of slingshot gliders, or Wakefield, success or failure has much to do with getting plenty of altitude. However, rubber scale is a different game, and height alone is a poor measure of prowess. Even so, height serves well as a useful standard - the greater the unit energy, the greater the ability to stay aloft.

In a rough sort of way, tests show the value of rubber unit energy to be about 2000 ft.-lbs./lb. This means that a perfect model (no drag, no prop losses) weighing one pound, and equipped with one pound of rubber has the potential of reaching 2000 ft. of altitude. A more practical model, with say 10% of its weight given over to rubber, but still enjoying no drag or prop losses, would reach 200 ft.

If we throw in a realistic prop efficiency value of 50%, the altitude becomes 100 ft., and if we then correct for drag, we end with the usual 25 ft. or so seen in most rubber scale models.

In short, rubber unit energy values have much to do with our game. An improvement in energy translates into more performance.

Over the years, much has been said about lubrication as a means of increasing the winding turns potential of rubber. Specifically, rumors of a magic elixir "soft soap" have told of great wonders achieved in the way of increased turns without fracture

This has always seemed hard to believe. What possible difference can there be between one soap and another? Yes, we all use some sort of lube (castor oil here) and our various lubes do something useful in the way of preventing torn motors. But why would one lube be superior to others?

The 1912 study indicates that a good lube works by increasing the permissible rubber unit energy; typically from 2000 to 3000 ft.-lbs./lb. The operator realizes this improvement by putting on more winds, and does so without rubber failure. As for soft soap, it really was best of all tested, taking the energy value up to about 3600 ft.-lbs./lb.

Of course, operating at a higher rubber energy level brings in other problems. More winds mean more torque and all the difficulties of dealing with a high torque, high thrust launch. These can be ruinous.

Indeed, if a peaceful existence is desired, there is much to be said for not pushing rubber energy levels. The single best technique for NOT blowing a motor, assuming that some decent lube is being used, is to restrain turns to 75% of handbook values. Raising turns to 85% not only makes a blown motor more likely, but repeated flights at this rate turns some brands of rubber into mush i.e., torque is reduced and the model is unable to repeat flight characteristics.

Still, for the courageous few willing to eschew the peaceful 75% route, there really is convincing evidence of a potent rubber energy raiser - soft soap. As to a vendor, I suspect the 1912 supplier is gone. Regrets.