

Wax Based Hybrid Fuel Formulas

Documented below are the two main wax-based hybrid fuel formulas researched by Alpha Hybrids from 2003 to 2007. Approximately 100 static firings and 20 flights were performed during this time period to characterize the performance. The firings were in 54mm to 98mm motors with nitrous oxide as the oxidizer.

Formula A

80% Parrafin Wax
18% Hot melt hot glue
2% Lampblack

This formula is very easy to mix and cast. It regresses less than plain wax yet an ISP of 201 was seen in a 75mm motor. Graphite pre and post combustion chambers of approximately one motor diameter were used to attain this ISP. This formula was also spin cast directly into the liners. Best results for spin casting were obtained at 750 RPM. Spinning at too high of a rate may cause the lampblack to separate out. It is more flexible and less prone to cracking than Formula B.

Formula B

50% Parrafin Wax
50% Asphalt or Gilsonite

In initial testing plug asphalt was used for this formula. Near the end of development powdered Gilsonite was used. A noticeable performance difference was not seen. This formula is also easy to cast and sees nearly equal performance as Formual A. The main drawback is the brittle nature of the fuel. Once cast and cooled the fuel can crack when dropped or even after time. For this reason Formula A is preferred.