

Tom Cawley, Lab Director  
The Pennsylvania State University  
Applied Research Laboratory  
North Atherton Street  
State College, PA 16801

August 30, 2013

Robert Fulton, III  
Compact Contractors for America, LLC  
2640 W3275N  
Cedar City, UT 84721

Mr. Robert Fulton:

Congratulations. I believe we are the first to produce power from a powdered algae derived fuel in an aircraft or aero-derivative engine.

I have good news about the co-firing test of TBF and JetA in the SG-18.

I ran the engine twice in the co-firing mode today. Started on JetA and adjusted the throttle to get 17,000rpm. The idle position is different because we've removed two out of ten JetA burners to accommodate the TBF sprayers.

I introduced the TBF from a fluidized bed through the two added fuel sprayers at approximately 10:00 and 2:00 in the burner ring.

I delivered a total of around 0.45 lb of TBF in two separate firings. The first firing delivered a total of around 0.2 lb TBF at a rate of around 15 lb/hr. The second firing delivered a total of around 0.25 lb at an average rate of around 25 lb/hr. The peak TBF mass flow rate was probably around 40 lb/hr but I was concerned about pulsatile flow at that flow rate. I was afraid of plugging the fuel sprayers with the surging flow so I reduced the fuel flow to smooth out the pulsations.

The engine performed extremely well with the TBF co-firing. At the same JetA throttle position, the TBF generated an increase in RPM of around 2,000 and an exhaust temperature increase of around 100C. These are modest but considering the small flow rate they are not discouraging.

The engine vibrations measured at top-dead-center at the compressor end of the casing indicated no negative effects of TBF combustion. The turbine blades are spotless on the front and the back. No other engine components exhibited any evidence of algae combustion products. Also, no smoke was evident during TBF co-firing. The now familiar smell of TBF combustion was the only observable.

As you might expect, the video data is not very revealing...just some speed modulations with no visible smoke. I will get this to you in a day or two.

Thanks  
Tom Cawley  
Director Applied Research Laboratory  
Penn State University