**1. What can be observed about the turbine engine’s efficiency in relation to its RPM?**

The turbines engine’s efficiency can be directly related to the RPM (rotations per minute). The relationship between the two is defined as an increase in the rotation of the turbine blades per minute, or RPM, causes an increase in the efficiency of the turbine engine. Our experimental results revealed a different scenario, with the turbine efficiency remaining fairly constant throughout all five runs which opposes the theoretical results. We worked very closely with Dr. Kassegne so the likelihood of experiencing operating error of this magnitude is unlikely. We can only assume there is something wrong with the recorded data from the computer software program. Our calculated results show that an error has taken place with either the recording of the data from the computer or human error during the experimental runs. Another place that looks to have corrupted data is the compressor efficiency. The turbine and compressor are linked together via a shaft and rotate together, so the efficiencies should be similar with regards to increasing RPM. This is also contrary to our recorded data as the compressor efficiency also decreases with increasing RPM. Our data of the various efficiencies can be seen plotted in Fig. 1.

Figure 1: Efficiencies vs. RPM of the SR-30 Turbojet engine. The Thermal, Turbine, and Compressor efficiencies are plotted against the RPM.

**2. What type of relationship (constant, linear, exponential, etc.) exists between RPM and thrust?**

The relationship between the RPM and Thrust appears to be exponential according to the Fig. 2. These are directly correlated because as you increase the work put into the system, the greater the work out becomes. Our data points, with the exception of data point 5, were fairly accurate in the correlation of the theoretical exponential line. This increase in thrust as the engine performs more work is contrary to a conventional piston engine where the efficiency range is around 40-70% for maximum thrust, whereas the max thrust of a turbojet engine ranges from 85-100% [1].

Figure 2: Thrust vs. RPM chart based on the average thrust of each run plotted against the target RPM of each run

[1] Federal Aviation Administration. *Airplane Flying Handbook*. 2nd ed. New York: Skyhorse Publishing,

2007. Print.