[redacted]

May [redacted], 1955

Dear Kelly

With reference to our discussion on the subject of "lighter fluid" I have gone into this thinking further with our people and find that to obtain the BTU per gallon equivalent to JP4 standards would require a return to high Reid vapor pressure of 2 to 3 lbs. plus high aromatic content. Obviously we cannot accept the high Reid vapor pressure for this project without tank pressurization so if we eliminate this characteristic of the fuel I am advised that we might regain only about 1% in BTU per gallon by the use of high aromatic compounds. High aromatic compounds here are used in a very general sense to refer to Shell sample #2 which we tested, identified as F-142 which had approximately 15% by volume of the high aromatic as compared to 3% of the fuel #1 identified here as F-142. This #2 sample with the high aromatics, however, had very adverse characteristics as far as so-called "coking" by which we mean primarily deposits within the manifold and nozzles in the burner area. This characteristic could be very damaging in limiting engine operation to a matter of a relatively few "hours" since the deposits restrict and thus adversely affect the distribution of fuel to the burner nozzles. This "coking" will be a problem particularly peculiar to high altitude flight where the total fuel flow is low but the temperatures are maintained high which produces an ideal baking environment.

Under these circumstances we can only recommend the use of the Shell fuel as we have it now prepared pending, however, more actual full scale running which we hope to be able to accomplish soon.

One other factor which concerns us is that with the fuel oil cooler ahead of the engine pump and the filter, we may be introducing a pressure drop through the system that could effect the ability of our engine pump to deliver full output under take-off conditions. Our fuel pumps are designed with the objective of maintaining full engine output under altitude conditions of 8,000 ft. with 2 psi pressure drop through the line with a fuel inlet temperature of 100°F maximum. Perhaps in this application we would not have to consider take-off under this high an altitude condition and this would be a favorable factor. I have asked Elmer to check into the estimated pressure drop through the system as now designed. In addition our fuel pumps and controls are based upon the use of fuel at a maximum temperature of 110°F and higher values could effect control metering characteristics since the fuel is through the control. We have had a maximum of 225°F to avoid this coking situation and actually with this special fuel even this would not be the top limit. However, it is my impression that for our particular operating conditions the low fuel flow means relatively little use out of the fuel oil cooler and we will be dependent primarily on the air oil cooler.

Sincerely, PLC

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