MIT/Draper Laboratory

P66 THROTTLE LOOP PRESENTATION

I. INTRODUCTION - Larson

A. Historical Notes

B. Outline of Presentation

II. STUDY OF THROTTLE EXCITATION SOURCES - Klumpp

A. Description of IMUBOB

B. Discovery of error in sumulation of engine time constant

C. Comparison of Apollo 12 data with digital simulation results using corrected engine time constant

III. STABILITY STUDY

A. Description of System - Kalan

B. Description of How System was Designed to Operate - Kalan

C. Cause of Marginal Stability in Apollo 11 & Apollo 12 - Kalan

D. Optimization of TTN, LAG, and TROD

1) Z Transform Predictions using Simplified Model - Kalan

2) Simulation Results - Klumpp

E. Sensitivity Study for Optimized System.

1) Z transform Predictions for Errors in LAG, THRUST/BIT, and Changes in Engine Time Constant - Kalan

2) Simulation Results for Large Throttle Changes - Klumpp

F. Selected Results using more Advanced Z Transform Model - Klumpp

G. Summary - Klumpp