Prev-X66-17257

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Mr. D. C. Hutchison, Chief
Technical Information Division

DATE: June 7, 1967

FROM : Dr. F. Kalil
Mission Analysis Office

SUBJECT: Release of all Reports by Hughes Aircraft Company on Contract NAS5-9637

With the concurrence of Dr. F. O. Vonbun, Chief, Mission Analysis Office, I am herewith authorizing you to release all reports by the Hughes Aircraft Company on Contract NAS5-9637, in accordance with the attached Document Release Form.

STRANNUMBERS Publicly AVAILABLE

In addition to a final report scheduled to be published in FY 1968, the Hughes Aircraft Company publishes a progress report quarterly. Six quarterly progress reports have been published to date. These reports bear the general title, "Parametric Analysis of Microwave and Laser Systems for Communication and Tracking." According to Article II of the Contract, the Technical Information Division receives four copies of the reports on this Contract.

All Repts. by Hughes except 6 on this contract

Also, please act on the request in the attached letter.

F. Kalil
Ford Kalil
Staff Member
Mission Analysis Office

Enclosures

507-FK:hs
052.05.27

Facility Note
Blanket File

CR-74989

6th QR-N67-31305-NASA CR-85873 -P67-82

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

5010-108

Extra Page

Limits - Transmitter and Receiver Aperture. After the transmitter and receiver aperture limits are reached all additional funds will be alloted to laser power. Then,

$$\Delta R = \sqrt{\frac{K_{\lambda_{OPT}} (C_{tm})^{2/\alpha} (C_{rm})^{2/\alpha}}{(K_t K_r)^{2/\alpha} K_p \left[-\ln 2(P_{e,s})_{MIN}\right] \left[(B_s)_{MAX}\right]} (C_T - C_{TF} - C_\xi)^{1/2}}$$

for any α, range increases as the 1/2 power of system cost, where

$C_\xi = C_{tM}$ if the receiver aperture limit is reached first, and

$C_\xi = C_{rm}$ if the transmitter aperture limit is reached first.

A SAMPLE PROBLEM CALCULATION

The foregoing optimization procedure has been applied to a laser communication system using an argon-ion laser ($\lambda = 0.5\mu$) and to 2.3 gc and 94 gc microwave system transmitting 1 megacycle television with an error rate of 10^{-3}. Figure 8 depicts minimum system variable cost as a function of range for each of these systems.

In this calculation, cost and weight of laser system transmitter and receiver apertures are assumed to vary as the cube of the aperture diameter. Microwave system aperture cost and weight is assumed to vary as the square of the aperture diameter. The same power system and launch costs were assumed for all systems. Power system weights and costs are based on a solar photovaltaic power system at near Mars solar illumination intensity and assume 20% power conditioning losses. Launch costs were based on a Voyager Mars mission circa 1975 and estimated 1970-75 Saturn V booster costs. These cost values are given in Tables I and II.

The laser system cost is divided optimally between transmitter power, transmitter aperture, and receiver aperture until transmitter power reaches an assumed limiting value of 2 watts. System cost

This Figure is for illustrative purposes only - neither absolute values nor relative values should be considered final.

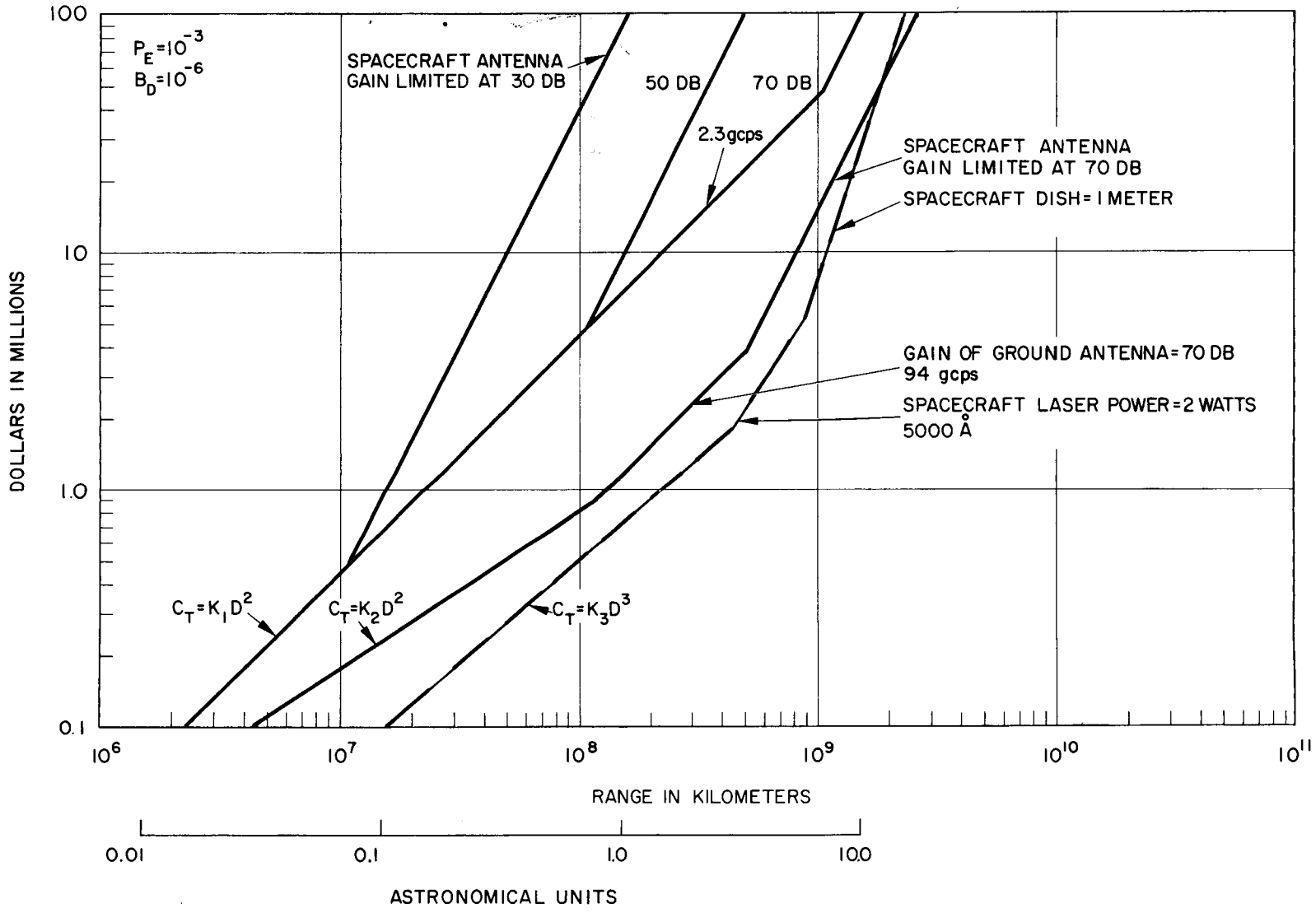

Figure 8. Cost comparison of transmission systems.