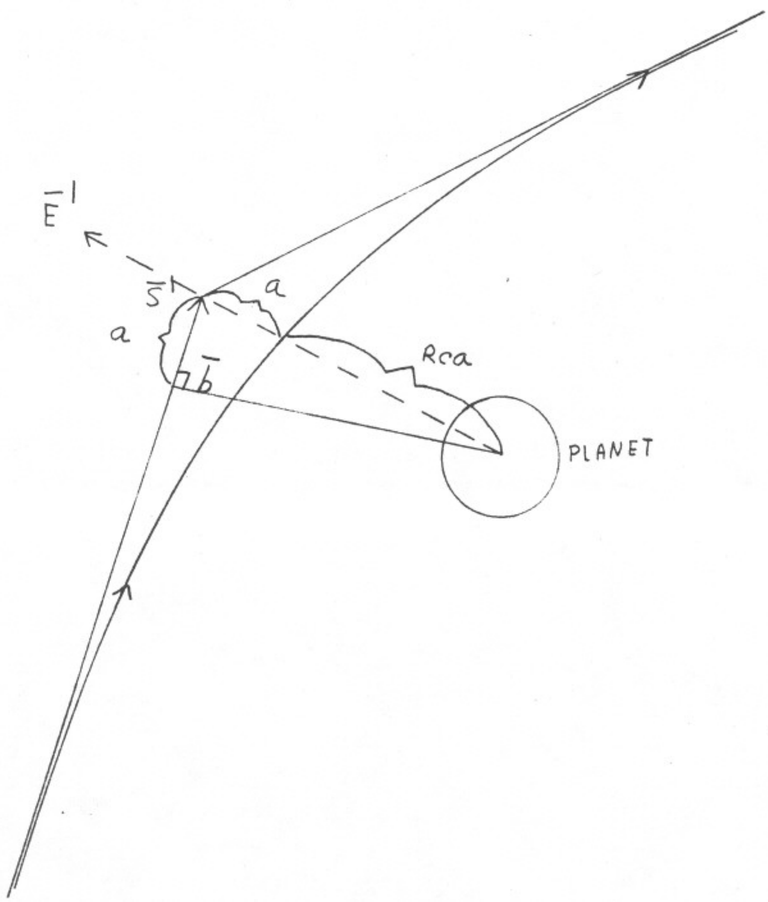
JET PROPULSION LABORATORY *California Institute of Technology* • *4800 Oak Grove Drive, Pasadena, California*

April 16, 1962

Mr. Michael Minovich
580 Gayley Avenue
Zone 24
Los Angeles, California

Dear Mike:

As you may recall in our last conversation, we promised to send you the necessary formulas for converting your output vectors near the planet to the parameters $\bar{b} \cdot \bar{T}^1$ and $\bar{b} \cdot \bar{R}^1$. These two quantities are absolutely necessary in checking the accuracy of your conic program, and are defined below.



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$$\overline{b} = (a + R_{ca})\,\overline{E}^{1} - a\,\overline{S}^{1}$$

where,

$$a = \frac{\mu}{V_\infty^2}$$

μ = gravitational constant of target

V_∞ = hyperbolic excess speed

R_{ca} = distance of closest approach from center of planet

a = major-semi axis of hyperbola

$\overline{b}$ = impact parameter, directed from center of planet perpendicular to incoming asymptote ($\overline{S}^{1}$)

$\overline{S}^{1}$ = a unit vector having the direction of the <u>incoming</u> asymptote or hyperbolic excess velocity

$\overline{E}^{1}$ = a unit vector directed from center of planet toward closest approach

$\overline{p}^{1}$ = unit vector normal to ecliptic or Earth's equatorial plane (up), whichever is the most convenient

$$\overline{T}^{1} = \frac{\overline{S}^{1} \times \overline{p}^{1}}{\left|\overline{S}^{1} \times \overline{p}^{1}\right|}$$

$$\overline{R}^{1} = \overline{S}^{1} \times \overline{T}^{1}$$

The quantities needed are $\overline{b} \cdot \overline{T}^{1}$ and $\overline{b} \cdot \overline{R}^{1}$, the projection of the impact parameter ($\overline{b}$) onto the unit vectors $\overline{T}^{1}$ and $\overline{R}^{1}$ respectively.

Your friend,

JET PROPULSION LABORATORY

Gene Bollman

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P.S. If there are any questions, don't hesitate to call me at SY 0-6811,