Errata

R. E. Hill (Ground Antenna and Facilities Engineering Section) has submitted the following errata to his article "A New State Space Model for the NASA/JPL 70-Meter Antenna Servo Controls" that appeared in the *Telecommunications and Data Acquisition Progress Report 42-91*, July–September 1987, November 15, 1987:

In Table 2 (page 253), the denominator, J_i, appearing in the equation for $\dot{x}_2$ should be replaced with J_B. The variable, x_i, appearing in the equation for $\dot{x}_{2i+4}$ should be replaced with x_1. The inequality symbol ($\neq$) appearing in the equation for $\dot{x}_{2i+4}$ should be replaced by a plus symbol (+).

In Table 3 (page 254), dashed lines are added to the linear system matrix to show the respective rows and columns corresponding to the flexible structure and alidade modes. The complexity of the changes to several elements of matrix **F** necessitate the reproduction of the revised version in its entirety, below.

Also in Table 3 (page 255), the output vector H_{Ee} should appear:

$$H_{Ee} = [1\ 0\ 0\ 0\ \ldots -1\ 0\ 0\ 0\ 0] \text{ Elevation only}$$

In the Notes section of Table 3 (page 255), the following errata were submitted:

Is	Should Be
$a1 \ldots a5$	$a_1 \ldots a_5$
$a0$	a_0
$a0 + a1 + \ldots aN = 1$	$a_0 + a_1 + \ldots a_N = 1$

Finally, in Table 4 (page 256), the term $\frac{\omega_m^2}{\nu}$ should be $\frac{\omega_m^2}{V}$.

$$
F = \left[\begin{array}{cccccccccccc|cc|c}
0 & 1 & & & & & & & & & & & & & 0 \\
\frac{-K_G - K_T}{J_B} & 0 & \frac{K_G}{J_B} & 0 & \frac{K_1}{J_B} & 0 & \frac{K_2}{J_B} & 0 & \frac{K_3}{J_B} & 0 & \frac{K_N}{J_B} & 0 & \frac{K_G}{J_B} & & 0 \\
 & & 0 & 1 & & & & & & & & & & & \frac{-K_G}{J_M} \\
 & & -\omega_m^2 & \frac{-D}{C} & \multicolumn{8}{c}{\text{FLEXIBLE MODES, 2N COLUMNS}} & \multicolumn{2}{c|}{\text{ALIDADE MODES, 4 COLUMNS}} & \\
\hline
0 & 0 & 0 & 1 & & & & & & & & & & & \\
\omega_1^2 & \frac{D_1}{J_1} & -\omega_1^2 & \frac{-D_1}{J_1} & & & & & & & & & & & \\
0 & 0 & & & 0 & 1 & & & & & & & & & \\
\omega_2^2 & \frac{D_2}{J_2} & & & -\omega_2^2 & \frac{-D_2}{J_2} & & & & & & & & & \\
0 & 0 & & & & & 0 & 1 & & & & & & & \\
\omega_3^2 & \frac{D_3}{J_3} & & & & & -\omega_3^2 & \frac{-D_3}{J_3} & & & & & & & \\
0 & 0 & & & & & & & 0 & 1 & & & & & \\
\omega_N^2 & \frac{D_N}{J_N} & & & & & & & -\omega_N^2 & \frac{-D_N}{J_N} & & & & & \\
\hline
0 & 0 & & & & & & & & & & & 0 & 1 & \\
\frac{K_G}{J_{A1}} & 0 & \frac{-K_G}{J_{A1}} & 0 & & & & & & & & & \frac{-K_G - K_{A1}}{J_{A1}} & 0 \quad \frac{K_{A1}}{J_{A1}} & \\
 & & & & & & & & & & & & & 0 \quad 1 & \\
 & & & & & & & & & & & & \frac{K_{A1}}{J_{A2}} & 0 \quad \frac{-K_{A1} - K_{A2}}{J_{A2}} & 0 \\
\hline
-1 & 0 & 1 & & & & & & & & & & 1 & & 0
\end{array}\right]
$$

2N ROWS

4 ROWS

With $K_T = \sum_1^N K_i$ and $\omega_i^2 = \frac{K_i}{J_i}$

Note: The matrix **F** is defined in a generalized form with a variable N, corresponding to the number of flexible modes (not including alidade modes) and is illustrated for the special case of $N = 4$. With the deletion of the rows and columns corresponding to the alidade, the generalized matrix structure is applicable to the azimuth axis. It should be noted that the **F** matrix structure is similar to a variant of the Jordan canonical form in that the damping coefficients appear along the diagonal and the squared natural frequencies appear along the subdiagonal with unit elements along the superdiagonal.