Bendix

Aerospace Systems Division

Appendix A

LSPE Transmitting Antenna Stability Investigation

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ATM-1036A	
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This is an Appendix to original ATM 1036 and revises the investigation to account for the monopole transmitting antenna.

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1.0 SUMMARY AND CONCLUSION

Since the publication of the original ATM the antenna design has substantially changed:

(a) Antenna was changed from a dipole to a monopole antenna.

(b) Height of antenna was changed from 12'-0" to 6'-0" and weight reduced from 1.71 lbs to .75 lb.

(c) Antenna cable attachment is at base of antenna rather than at the midpoint.

1.1 The results of the analysis are modified as follows:

(a) Since the cable is at the base of the antenna, it could not overturn the pallet, the moment being reduced to negligibility.

(b) The LM exhaust blast overturning moment, assuming Figures (2) and (3) to be correct, will develop a moment of .836 in lbs. where 7.88 in lbs is necessary for instability.

(c) It is not necessary to extend the pallet legs to obtain stability.

2.0 DISCUSSION AND RESULTS

2.1 An unstable (overturning) condition will not exist unless the pallet system is deployed on a slope of 64.10^{o} or greater. Obviously this is unrealistic. On such a surface the pallet would slide unless positively held. The pallet with the 6'-0" antenna can be deployed on any slope where there is sufficient frictional resistance to motion.

2.2 Referring to references (3) and (4), the antenna will not overturn due to dynamic blast pressure even if a pressure of .05 PSF (very conservative) is assumed and if the blast pressure is creating a lifting overturning moment on the pallet.

The moment due to lift will only occur if the pallet is deployed in such a manner as to induce a lifting moment. It was included for conservatism.

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ENGINEERING REPORT

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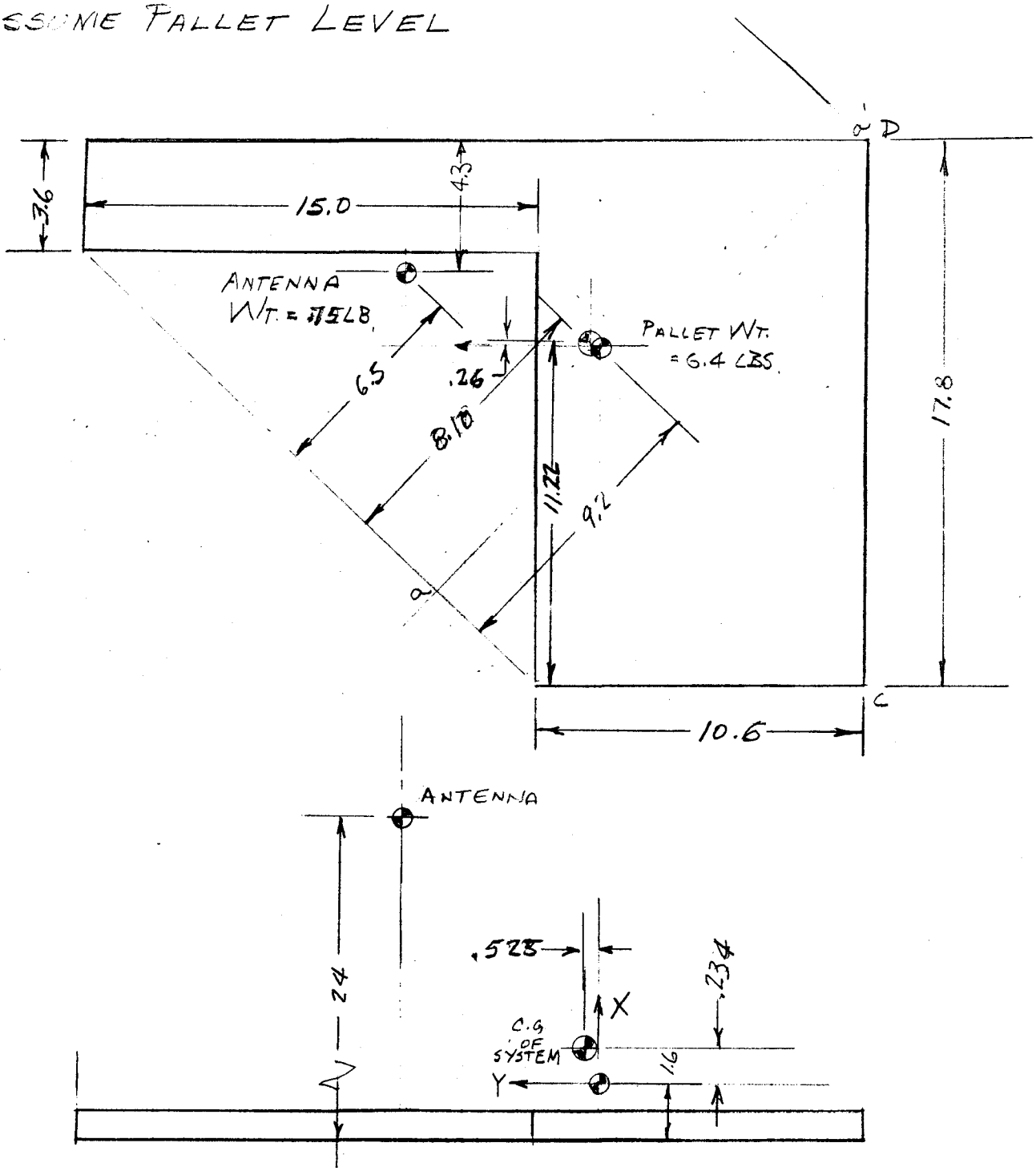
LUNAR SURFACE PROFILING EXPERIMENT STABILITY INVESTIGATION ~ ANTENNA DEPLOYED ON H.F.E. SUB PALLET

ASSUME PALLET LEVEL



LUNAR SURFACE PROFILING EXPERIMENT
STABILITY INVESTIGATION ~ ANTENNA DEPLOYED ON HFE SUB PALLET

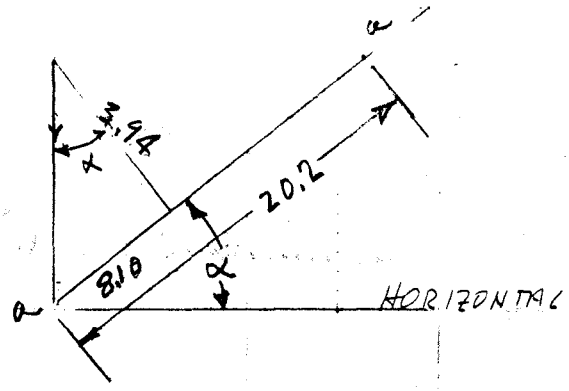
STABILITY ALONG SECT. a-a' AND CD ~ PALLET ON A SLOPE

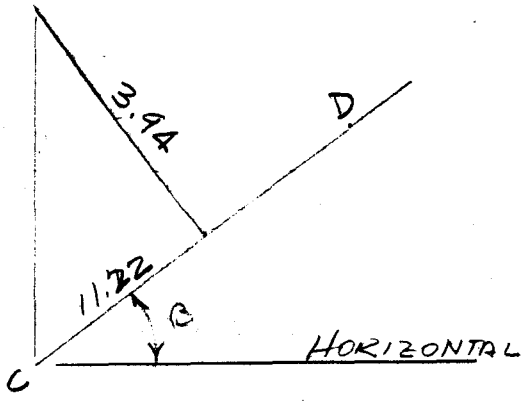
$$\text{SLOPE } \alpha = \tan^{-1} \frac{8.10}{3.94} = 64^\circ\text{-}10'$$

$$\text{SLOPE } \beta = \tan^{-1} \frac{11.22}{3.94} = 70^\circ\text{-}35'$$

} SLOPE NECESSARY TO OVERTURN ANTENNA

OBVIOUSLY ON A SLOPE OF THIS MAGNITUDE THE PALLET WILL SLIDE UNLESS RESTRAINED



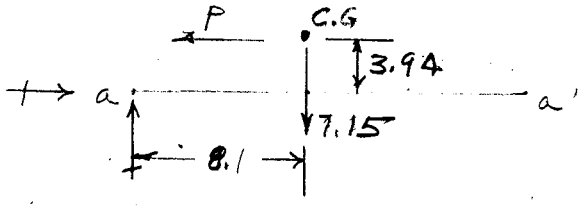


LUNAR SURFACE PROFILING EXPERIMENT

STABILITY INVESTIGATION ~ ANTENNA DEPLOYED ON HFE SUB PALLET

OVERTURNING MOMENTS

WT. = 6.8 LBS

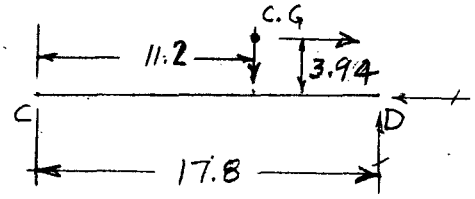


$P = 7.15 \times 8.1 / 3.94 = \frac{58}{3.94}$

$= 14.7$ LBS EARTH

$= \frac{14.7}{6} = 2.45$ LBS MOON

MOON OVERTURNING MOMENT $= \frac{58}{6} = 9.68$ IN LBS



$P = 6.6 \times 7.15 / 3.94 = 12.0$ LBS EARTH

$\frac{12.0}{6} = 2.0$ LBS MOON

MOMENT $= 6.6 \times 7.15 = 47.2$ IN LBS EARTH

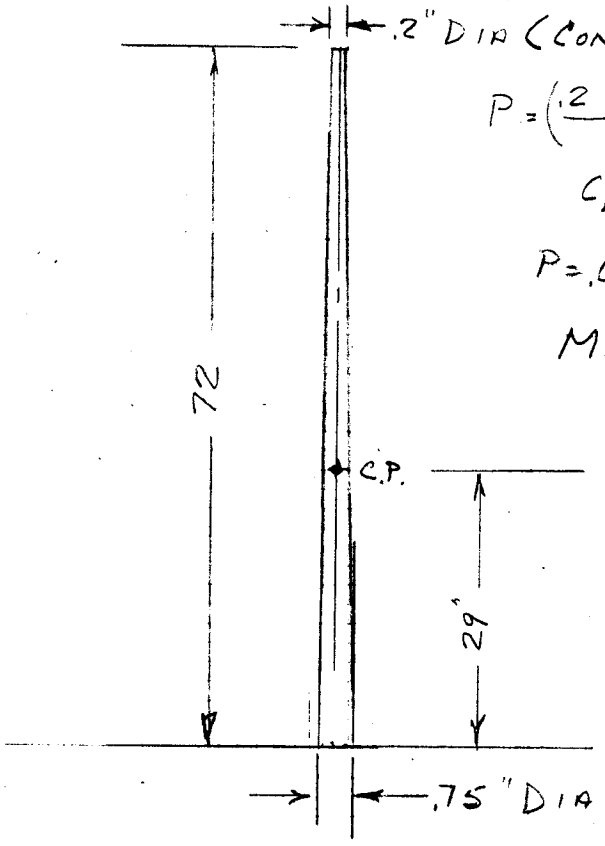
$\frac{47.2}{6} = 7.88$ IN LBS MOON

MINIMUM OVERTURNING MOMENT = 7.88 IN LBS.

LUNAR SURFACE PROFILING EXPERIMENT STABILITY INVESTIGATION ~ ANTENNA DEPLOYED ON H.F.E. SUBPALLET

OVERTURNING MOMENT DUE TO DYNAMIC BLAST IMPACT PRESSURE ON ANTENNA

VERY CONSERVATIVELY ASSUME PRESSURE [illegible] PSF FROM REFERENCES 3 & 4.



$$P = \left(\frac{.2 + .75}{2}\right) 72 \times \frac{.05}{144} \times C_D = .0119 C_D$$

$C_D \cong 1.0$ REF (2) Pg. 54-3

$P = .0119$ LBS

MOMENT $= .0119 \times 29 = .344$ IN LBS

LUNAR SURACE PROFILING EXPERIMENT

STABILITY INVESTIGATION ~ ANTENNA DEPLOYED ON H.F.E. SUB PALLET

OVERTURNING MOMENT DUE TO DYNAMIC BLAST + LIFT FORCE ON PALLET

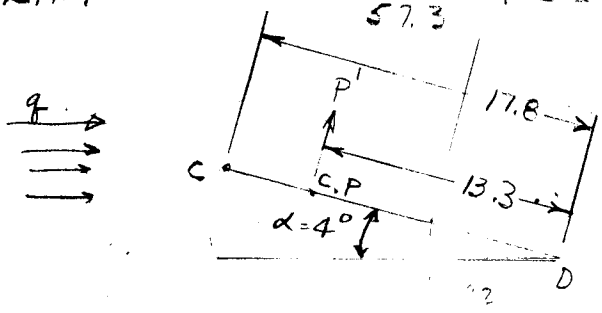
ASSUME PALLET TILTED TO GIVE ANGLE OF ATTACK

$\alpha = 4^0$ FOR MAX LIFT

$C_L = 2\pi\alpha$ (REF. 2 PG. 1532)

$= \frac{2\pi \times 4}{57.3} = .438$

$q = .05$ PSF (VERY CONSERVATIVE)



AREA OF PALLET = $17.8 \times 10.6 + 15 \times 3.6 = 189 + 54 = 243$ IN.^{2}

$P_1 = C_L q S = .438 \times .05 \times \frac{243}{144} = .037$ LB.

$M_D = .037 \times 13.3 = .492$ IN. LBS.

TOTAL BLAST OVERTURNING MOMENT = $.344 + .492 = .836$ IN. LBS.

STABILIZING MOMENT = 7.88 IN. LBS

PALLET WILL NOT OVERTURN