



**Aerospace
Systems Division**

ALSEP Reliability Mathematical
Model and Prediction
Addendum 1 HFE

ATM 274 | G-1

PAGE 1 OF 3

DATE 8/6/71

This addendum covers the effect on the prediction of HFE due to changes in the electronic design.

Prepared by: *Robert W. Hiebert*
R. W. Hiebert,
Reliability Engineer HFE

8-19-71
JEH
Approved by: *S. J. Ellison*
S. Ellison, Manager
ALSEP Reliability



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ATM 274	G-1
PAGE 2	OF 3
DATE 8/6/71	

The effects of these changes on ATM 274G (ALSEP Reliability Mathematical Model and Prediction as to the HFE (page 5) are as follows:

1. The last prediction dated 27 Sept 67 was 0.80777.
2. The effect of CRD 60623 on the ATM is zero since the operation of the ferite bead will not effect the circuit.
3. The effect of CRD 60439 will increase the reliability by deletion of one diode from the circuit.
4. The effect of CRD 60438 will increase the reliability by the deletion of one resistor. The resistor is an "R" level part.
5. The effect is as follows

$$0.80777 = e^{-\lambda t} \text{ where } t = 8.750 \text{ K hr}$$

$$-\lambda t = 0.21355 \pm .00005$$

The change in the value of $-\lambda t$ is:

$$\lambda t' = \lambda t - \Delta \lambda t$$

where $\Delta \lambda t$ is:

$$\Delta \lambda t = (\alpha_1 \lambda_1 + \alpha_2 \lambda_2) t$$

and where:

α_1 is the mode effect multiplier for diodes

α_2 is the mode effect multiplier for resistors

λ_1 is the failure rate for diodes

λ_2 is the failure rate for resistors.



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ATM 274

G-1

PAGE 3 OF 3

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The values for:

$$\alpha_1 = .60$$

$$\alpha_2 = .05$$

$$\lambda_1 = 8.2 \times 10^{-6} \text{ failures/1K hr}$$

$$\lambda_2 = 2.2 \times 10^{-6} \text{ failures/1K hr}$$

The value of $\Delta\lambda t$ is .000044. Since the value of $\Delta\lambda t$ is less than the error in λt of $\pm .00005$, the deletion of the resistor and diode will not have a noticeable effect on the overall reliability. Therefore the prediction as of 6 Aug 1971 remains the same as the 27 Sept 67 value. No adjustments are needed in the ALSEP Reliability Status Record. No adjustments need be made in the single point failures.