This ATM presents the failure rate modifiers to be used for various types of ALSEP equipment during those mission phases from launch through deployment.

The failure rate modifiers are determined to be:

F Electrical	= 0.52
F Electromechanical	= 5.20
F Mechanical	= 52.0

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Determination of failure rates associated with equipment in a non-operating standby condition involves the use of modifiers to the basic failure rate in accordance with the following relationship.

$$P_s = e^{-(\lambda t K_E K^1 p)}$$

where P_s = Probability of success during standby operation
λ = Basic generic failure rate under laboratory conditions
t = Time of mission phase under consideration
K_E = Environmental failure rate modifier
K^1 = Type of equipment failure rate modifier:

= 0.001 for electronic equipment
= 0.010 for electromechanical equipment
= 0.100 for mechanical equipment

p = Probability of occurance modifier

For simplicication purposes, the factors K_E, p, & t are combined into a single factor, F_B which is suitably modified by K^1, according to equipment type, so that the relationship now becomes:

$$P_s = 1 - e^{-\lambda F}$$

The generation of F_B was accomplished by the matrix shown in Table I by means of the relationship:

$$F_B = \sum_{i=1}^{i=14} (t \cdot K_E \cdot p)i$$

Mission times in Table I were obtained from Table 2.2 of NASA ALSEP Familarization Meeting; MSC, Houston, Texas; 1 Sept., 1965. K_E values were obtained from Table II. 10-3, pg. II. 10-35; General Electric Technical Memorandum ASD-R-05-64, 15 May, 1964.

Table I
F_B Generation Matrix

i Mission Phase	t Time Applied, Hours	K_E Environmental Modifier	p Probability Modifier
1. Launch	0.197	1500	1.0
2. Earth Orbit	2.814	0.9000	1.0
3. Exit	0.088	1000	1.0
4. Coast	0.250	0.9000	1.0
5. Transposition	0.450	10.00	1.0
6. Coast & Mid-Course Corrections	60.452	1.000	1.0
7. Lunar Orbit Insert	0.097	50.00	1.0
8. Lunar Orbit	3.722	0.9000	1.0
9. Separation	0.333	50.00	1.0
10. Transfer Orbit Insert	0.010	50.00	1.0
11. Lunar Descent	0.968	0.9000	1.0
12. Lunar Landing	0.159	250.0	1.0
13. Lunar Deployment - No Drop	0.333	8.000	0.95
14. Lunar Deployment - Drop	0.333	22.00	0.05

$$F_B = 520.0777$$

since F equip = $K^1 F_B$, we have;

$$F = \text{electrical} \equiv 0.001 F_B = 0.5200777$$
$$F = \text{electromechanical} \equiv 0.01 F_B = 5.200777$$
$$F = \text{mechanical} \equiv 0.1 F_B = 52.00777$$

Of particular note is the caution to be employed in the use of these F values; these are for inoperative standby conditions only. Any mechanical structure whose primary function is the transportation of ALSEP equipment to the lunar surface should have failure rates determined in the normal manner; these F values do not apply in those cases. Prime examples would be the pallet structures and the fuel cask assembly.

These F values should be used for determination of all failure rates in the inoperative launch through deployment phase of the ALSEP Program.