

NASA TECH BRIEF

Marshall Space Flight Center



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Predicting Service Life Margins

A method has been developed for establishing hardware service life margins for equipment susceptible to malfunction due to excessive time or operation cycles, and for identifying limited life equipment so that monitoring and replacing can be accomplished before hardware failure.

All functional dynamic hardware, such as engines, gears, actuators, valves, springs, pumps, switches and certain electrical components, are susceptible to failure due to wear. Depending upon the type of hardware, excessive time or operation cycles will normally result in performance degradation or failure. Good practice generally requires replacing hardware that is suspected of approaching its design service life, particularly if its failure could result in personnel hazard, loss of ability to perform a critical function, or excessive cost.

The proposed method of establishing service life is considered applicable to any hardware where a design service life has been established and where a reasonably accurate prediction of expected usage

(time or cycles) can be made. The procedures and specifications used in developing the method may be obtained for use as guidelines in developing requirements for specific industrial and consumer items.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Code A&TS-TU
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No patent action is contemplated by NASA.

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Category 06

NASA TECHNICAL BRIEF

MEMORANDUM FOR THE DIRECTOR

1. This document reports the results of a study conducted by the Langley Research Center, Hampton, Virginia, in cooperation with the NASA Johnson Space Center, Houston, Texas, and the NASA Marshall Space Flight Center, Huntsville, Alabama.

2. SUMMARY

The purpose of this study was to determine the effect of various parameters on the performance of a specific system. The results of the study are presented in the following sections.

3.1. The first parameter investigated was the effect of temperature on the system's performance. It was found that as the temperature increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate at high temperatures.

3.2. The second parameter investigated was the effect of humidity on the system's performance. It was found that as the humidity increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high humidity environments.

3.3. The third parameter investigated was the effect of vibration on the system's performance. It was found that as the vibration increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high vibration environments.

3.4. The fourth parameter investigated was the effect of shock on the system's performance. It was found that as the shock increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high shock environments.

3.5. The fifth parameter investigated was the effect of radiation on the system's performance. It was found that as the radiation increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high radiation environments.

3.6. The sixth parameter investigated was the effect of electromagnetic interference on the system's performance. It was found that as the electromagnetic interference increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high electromagnetic interference environments.

3.7. The seventh parameter investigated was the effect of mechanical stress on the system's performance. It was found that as the mechanical stress increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high mechanical stress environments.

3.8. The eighth parameter investigated was the effect of aging on the system's performance. It was found that as the system aged, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate for long periods of time.

3.9. The ninth parameter investigated was the effect of dust on the system's performance. It was found that as the dust increased, the performance of the system decreased. This was due to the fact that the system's components were not designed to operate in high dust environments.