

# DEFINITIONS

**RELIABILITY:-** the probability that S/W does not fail

in a given period of time.

Or the probability that a given function will perform on demand.

**ROCOF:-** current rate at which failures are occurring.

**MTTR -** mean time to repair.

**MTTF:-** mean time to failure.

**MTBF:-** mean time between failures.

**Availability:-** the probability that S/W will be functioning at a given future time.

Time to target:- the further time expected to elapse (eg during testing) before a reliability target is achieved.

Expected:- mean of a statistical distribution.

Median:- point in a statistical distribution where there is a 50% chance a value will fall either side.

Reliability Growth Model:- probabilistic model of progressive inter-failure times as faults are removed.

# Accuracy of various models is very variable

- BUT accuracy can be assessed.
- CURRENT RELIABILITY

Is a statement about the future!

**KEY ASSUMPTION:-**

conditions of use in the future are the same as those in the past.

But most S/W test regimes do not emulate operational use

# Predictions are probabilistic

- We can't be sure of the inputs selected next.
- We can't be sure how efficacious is our fix.
- Use a mathematical model, statistical inference and a prediction procedure.
- ANALYSE PAST PREDICTIONS

# JELINSKI & MORANDA

- Best known model
- In Statistical Computer Performance Evaluation ,  
Ed. W. Freiberger.  
Academic Press, New  
York pp 465-484

# J & M MODEL is based on:-

- Homogenous Poisson point process ie randomness and uniformity of the failure rate.
- Failure rate is proportional to residual errors (N)
- O is the proportionality constant.
- Estimate N and O by the maximum likelihood principle.

# Using J & M

- Let  $X_1, X_2, X_3, \dots, X_n$

Be the sample of time intervals between successive errors

Then the density for  $X_i$

# Growth in S/W Reliability Summary

- It is usually possible to predict reliability
- There is no universally best model
- Most models need 'maximum likelihood' estimates of parameters and there are PC based tools to search for these



# Summary continued

- Collecting the data sets is difficult since environment changes
- These models are no good for safety critical systems ie ROCOF 10 per hour

<b>METRIC</b>	<b>DOMAIN</b>	<b>eg</b>
■ Reliability ■	failure very undesirable	avionics
■ ROCOF ■	frequent failure undesirable	OS's
■ MTBF ■ ■ ■	where utilisation is stable	control systems, S/W packages
■ Availability ■	down-time important	telecomms
■ Time to ■ Target ■ ■	during development	OS large RT systems