FAILURE CAUSES

Overload
Fatigue Cracking
Corrosion-assisted Cracking
Creep
Wear
Chemical Reaction

PREVENTIVE MAINTENANCE
(avoiding component failure should reduce $\lambda$)

Periodic Care (e.g., changing oil)
Testing and Response
Replacement and Repair Before Failure
Monitoring and Response Repair, Replacement, Realignment
REPAIR

Take component out of service for repair/replacement

Fix What’s Broken
  Reactive
  Prepared
    Parts available { Stored nearby
                     Available via rapid delivery
    Teams trained
    Work planned { Quick execution
                   Accurate feedback
    Tools available

Replace What’s Broken

  Design for quick replacement { Modules
                  Good work space
  Store components prepared for quick replacement
# MAINTENANCE STRATEGIES*

<table>
<thead>
<tr>
<th>Maintenance Policy</th>
<th>Corrective Maintenance</th>
<th>Preventive Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run to failure</td>
<td>Replace upon failure</td>
<td>None</td>
</tr>
<tr>
<td>Age-dependent replacement</td>
<td>Replace upon failure</td>
<td>Replacement after interval, $\tau$, in service</td>
</tr>
<tr>
<td>&quot;Block&quot; replacement</td>
<td>Replace upon failure</td>
<td>Replace at fixed times, $k\tau$; $k = 1, 2, ...$</td>
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<tr>
<td>Minimal repair with &quot;Block&quot; replacement</td>
<td>Repair minimally upon failure</td>
<td>Replace at fixed times, $k\tau$; $k = 1, 2, ...$</td>
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<tr>
<td>Periodic testing (for latent defect detection)</td>
<td>Replace or repair upon test failure</td>
<td>Replace at fixed times, $k\tau$; $k = 1, 2, ...$</td>
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<tr>
<td>Monitoring-based repair or replacement</td>
<td>Replace or repair upon $P(\lambda dt) &gt; P^*$ or upon failure</td>
<td>None</td>
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