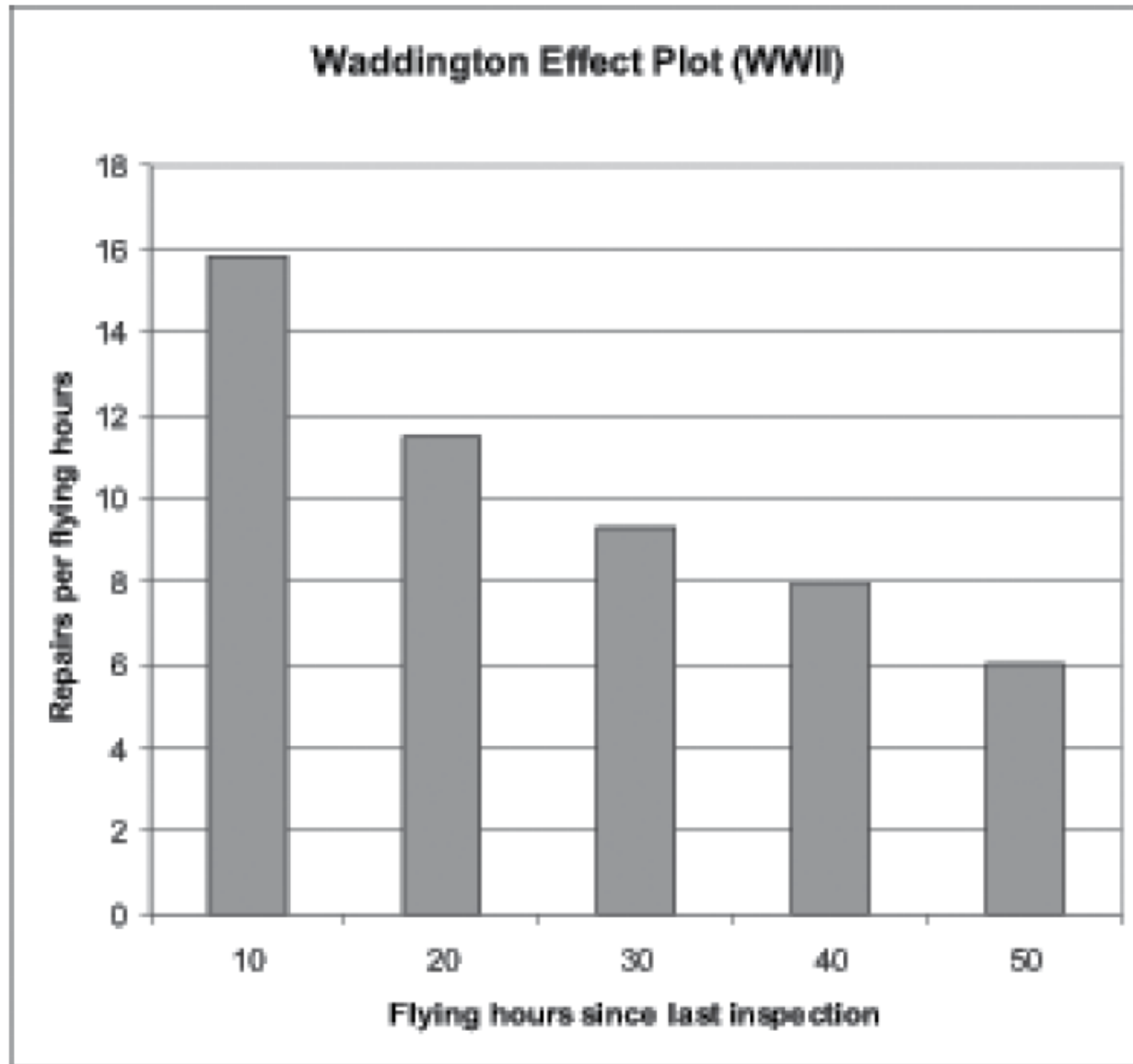


Maintenance & Reliability

Maintenance Results vs. Cost / Effort

- Do you have a strategy to maintain your assets?
- Is your strategy returning the investment?
- Is your strategy primarily PM?
- Do you have failures even after PM?
- Are maintenance costs too high and labor in short supply.

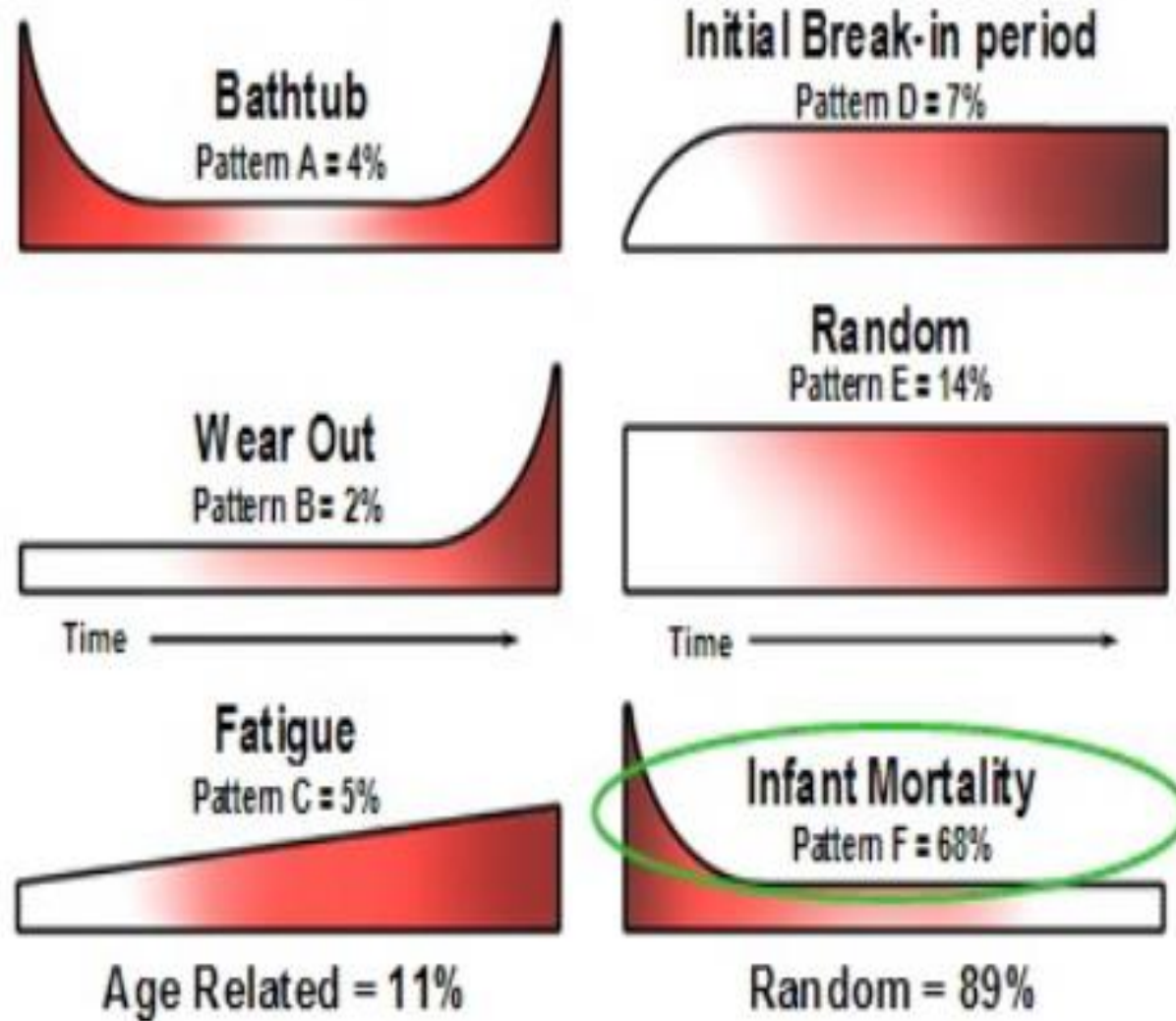
Maintenance & Reliability



The Waddington Effect



A biologist by trade, Conrad Waddington contributed to the war effort with his unusual insight into aviation maintenance. Is it possible to over-maintain a vehicle?



Nolan and Heap Curves

A form of [deterioration model](#) developed by Nolan and Heap in a study conducted in 1978 for the airline industry.



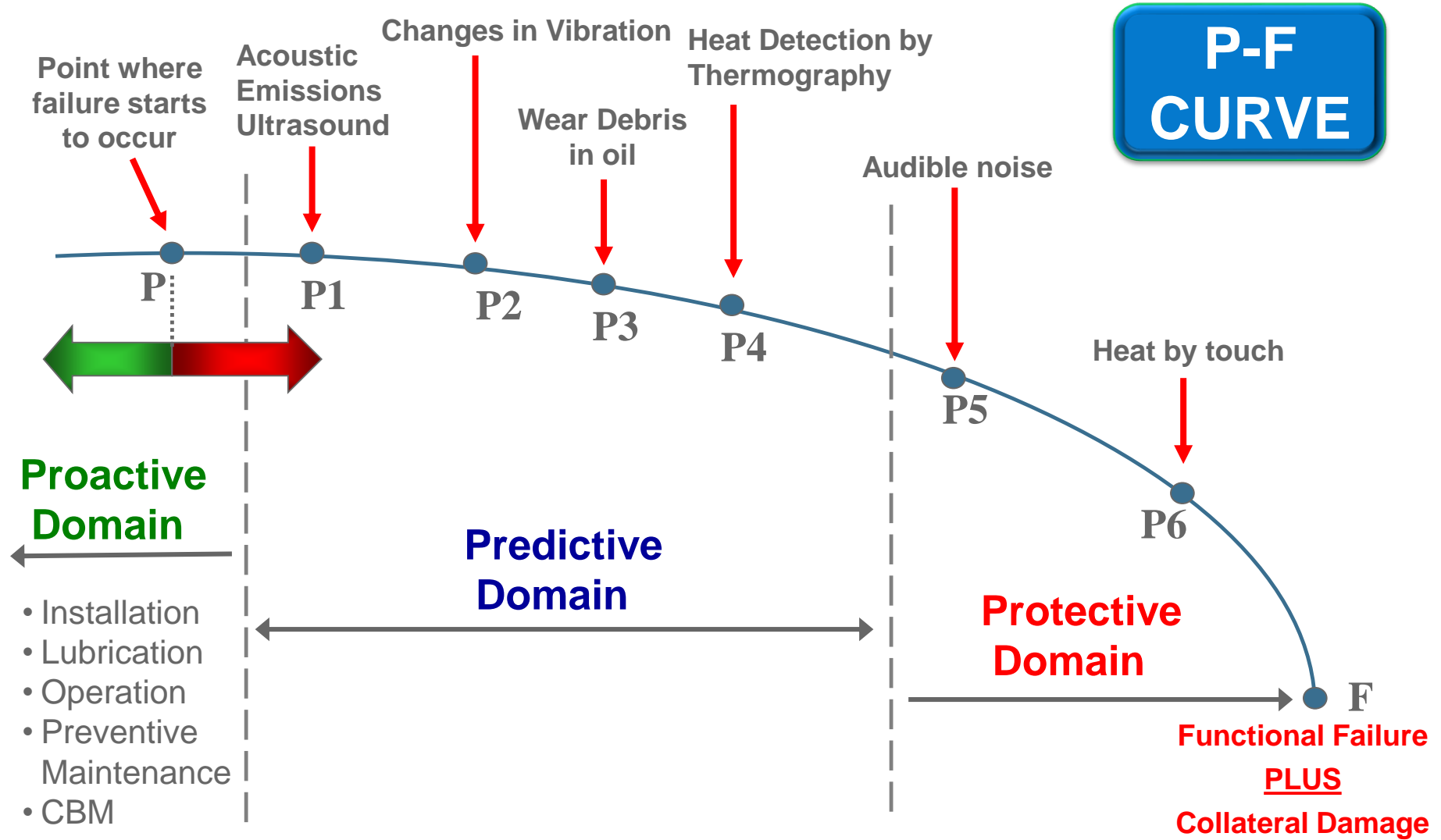
Fig. The six failure patterns identified by Nolan and Heap.

Maintenance & Reliability

PM Evaluation

- **Do not address the asset failure modes.**
- **Scheduled at incorrect frequency.**
- **Intrusive.**
- **Have value but not well defined. Rewrite/Quantify**
- **Regulatory/Safety/PSM**
- **Eliminate non-value added**

P-F Interval Curve



Maintenance & Reliability

Condition Based Monitoring & Acceptable Risk

- Choose a strategy
- Evaluate
- Refine based on cost vs. acceptable risk.
- Vibration
- UE
- Oil Analysis
- Thermography



Maintenance & Reliability

What is stopping you

- **Greater reliability**
- **Reduced cost to maintain**
- **Labor gained from non-value added tasks**

What is missing?

Maintenance & Reliability

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