



Fundamentals of Environmental and Use Conditions

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Environmental Stress

Failure Mechanisms



Better Information



What decisions rely
on

environmental and use
conditions?

Environmental Stresses



Weather



Critters



Transit/Phases

Weather



Some of this you cannot see and is not on the evening weather report

Classic weather

Powerline

Radiation

Chemical Exposure

Critters



Some products just taste good

Plants

Fungus and Mold

Insects

Rodents

Misuse

Transit/Phases



Transport

Storage

Mode of Use (taxi, flight, etc)

Different conditions
surround a product at
different times

What environmental
element

surprised you?

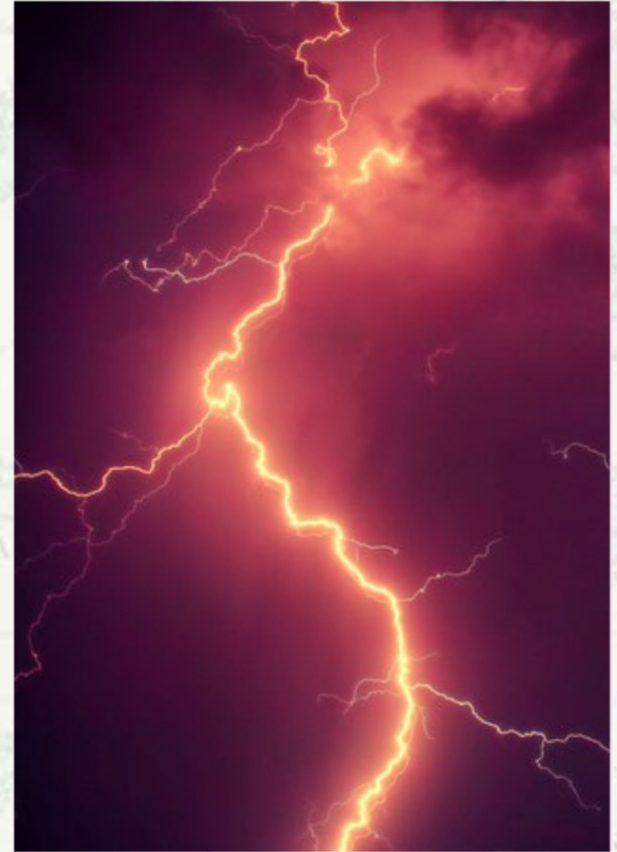
Use Stresses



Installation/Startup



Cycles or Steady



Idle

Installation/Startup



Let's see if this thing works

Unboxing

Installation

Startup (intial and each time)

Shut down

Cycles or Steady



What is a day in the life of
your product?

1 hour 1 day a year

24/7 all year

on demand or always on

load cycling

Idle time



Some failure mechanism
are always at work.

Is every element in use all the time?

How to loads and stresses change?

Do your customers

read the manual?

Failure Mechanisms



Connect to Stresses



FMEA & HALT



Modelling

Connect to Stresses



When the stress doesn't exist, then what?

Failure mechanisms respond to stress

Different mechanisms respond to the same stress differently

You can create meaningful testing

FMEA & HALT



Discover and Prioritize

There are too many stresses and mechanisms at play

Identify and prioritize the stress/mechanisms

Consider material and process variation, too

Consider environmental and use variation, too

Modelling & Understanding



How does this stress affect
this failure mechanism?

For the critical few

Get enough data to be useful

Understand the relationship between
stress and mechanism

Update and revise constantly as materials,
environments, knowledge, etc change

What does
85%RH/85°C

testing mean?

Environmental Manual



Scenerio or Location



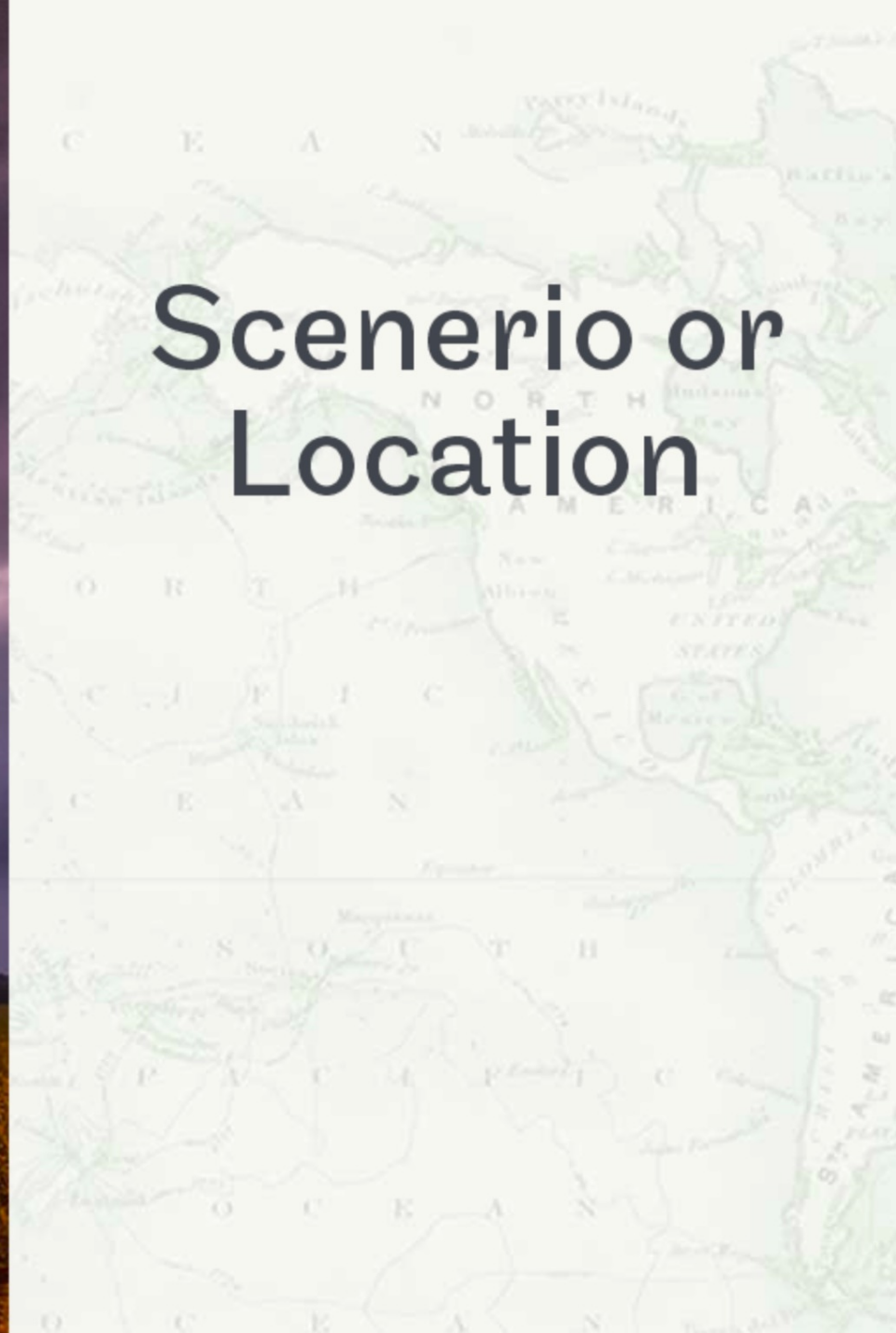
Enough Detail



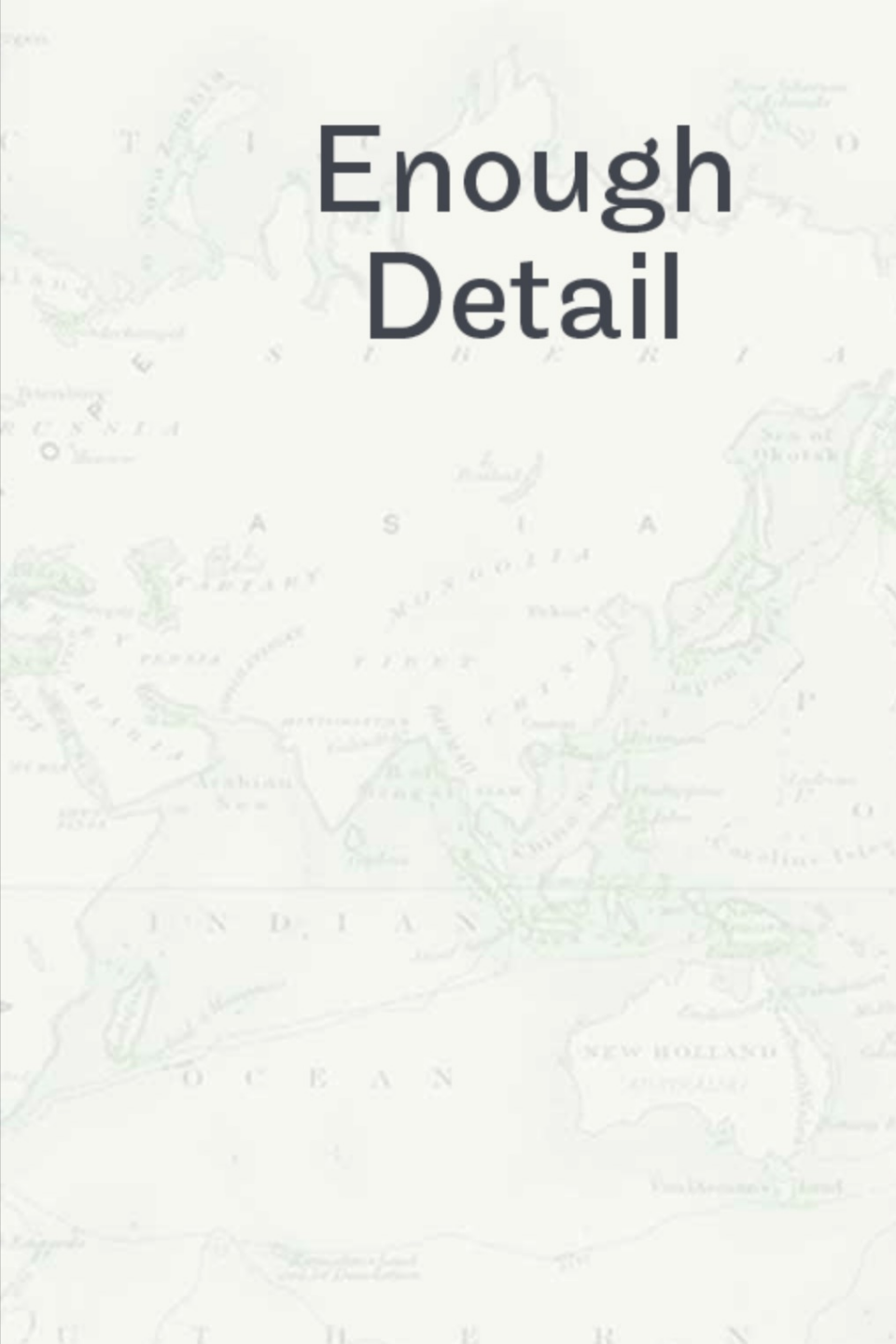
Stress to
Mechanism



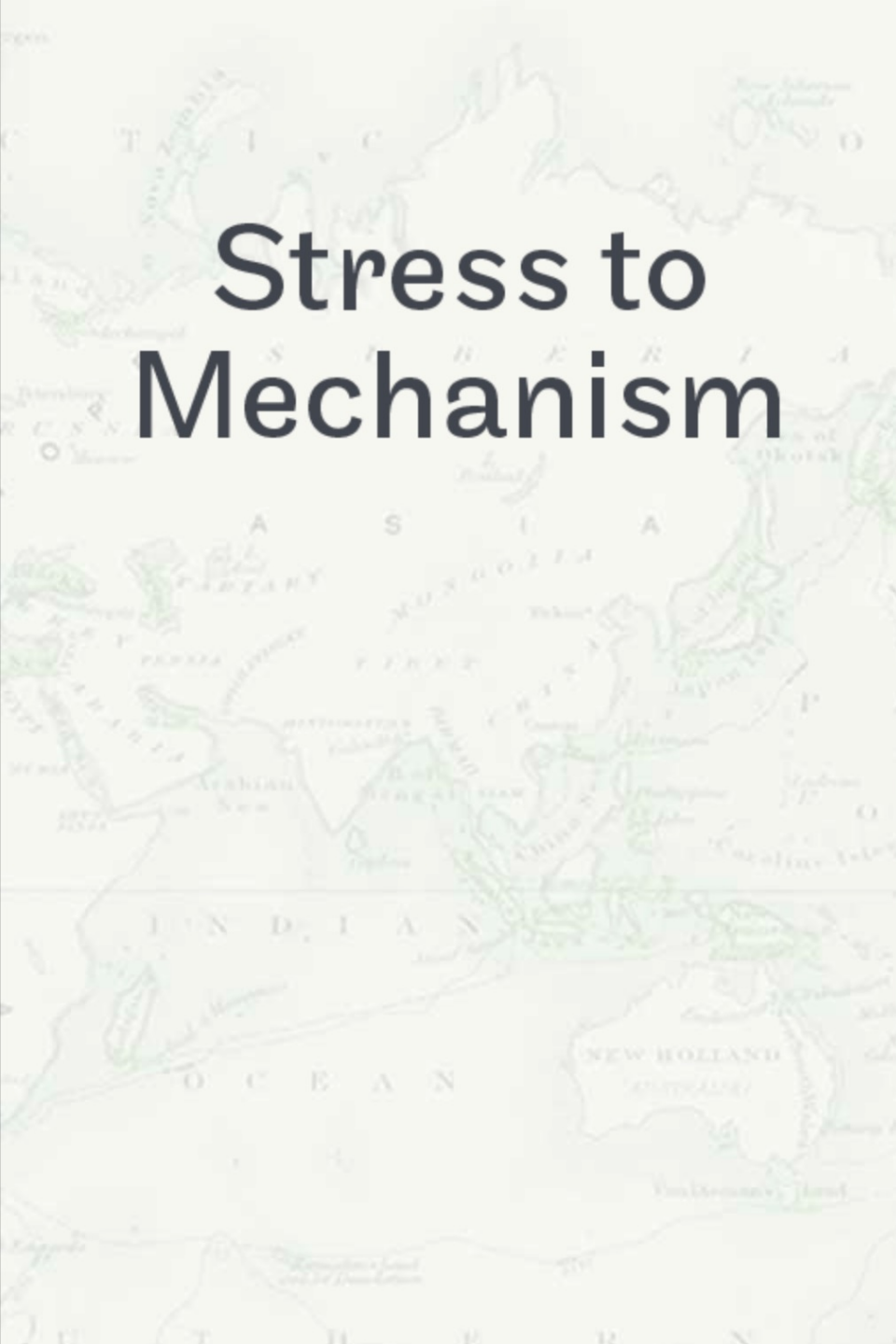
Scenerio or Location



Enough Detail



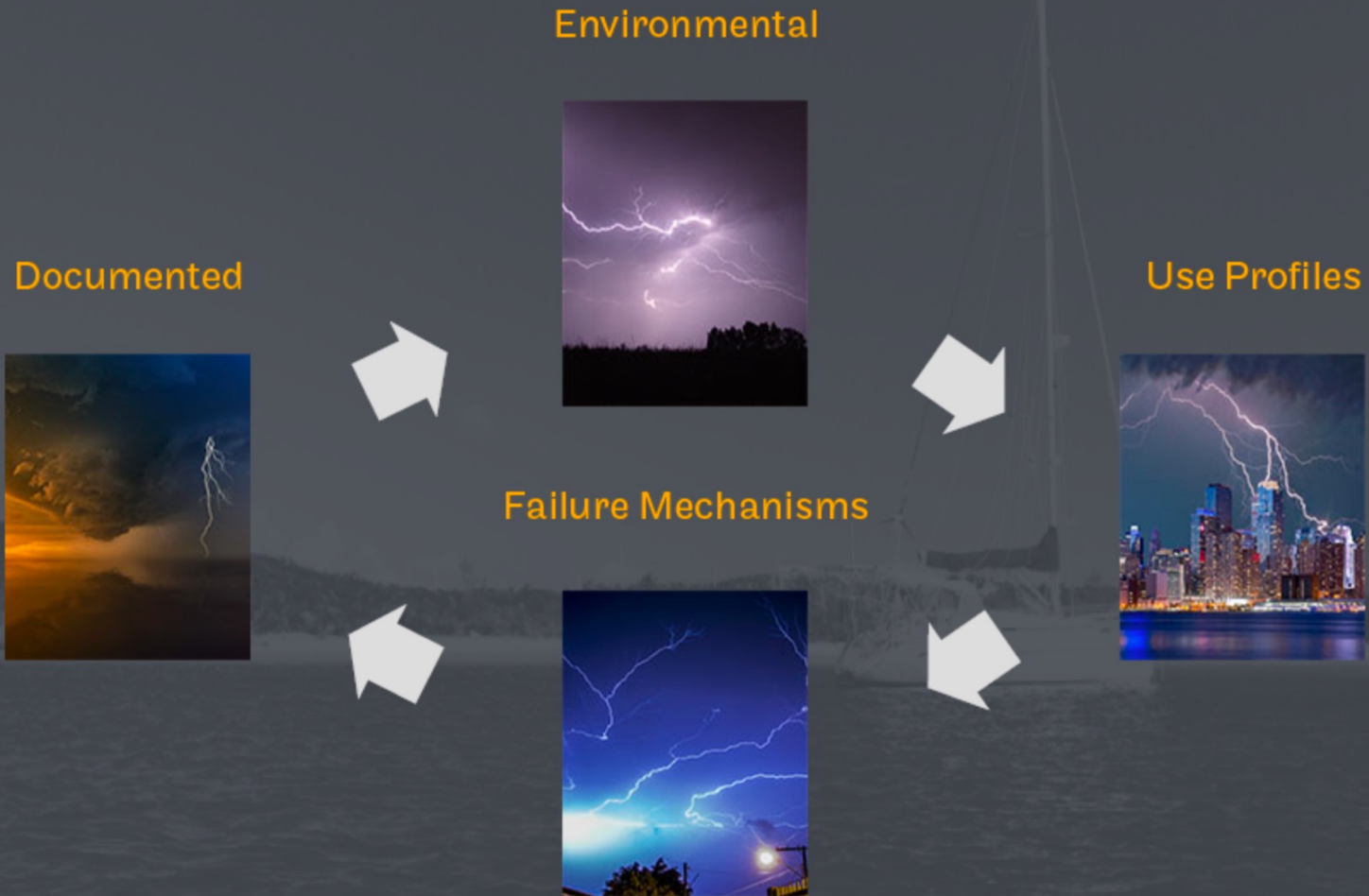
Stress to Mechanism



Is your product

lightening strike proof?

In Summary



More Information

Visit [AccendoReliability.com](https://www.AccendoReliability.com)

Let me know if you have any questions.

Check out the reliability engineering podcast network at [Reliability.FM](https://www.Reliability.FM)

Schedule time to create or improve your environmental manual today.