



# Basic Steps to Building Your Reliability Plan

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Budget





A photograph of a marina at sunset. Fourteen white sailboats are docked in a row along a wooden pier, each with a black number on its bow. The numbers are 1 through 14, starting from the far right and moving left. The boats are illuminated by the warm, golden light of the setting sun. The water is dark with some ripples. On the pier, there is a black wheelbarrow and a white outboard motor. The text "Sample Size" is overlaid in white on the lower part of the image.

Sample Size





Objective



Why else do you  
need a reliability



# Step 1 Document Goals



Function



Environment



Probability of Success  
and Duration



# Functions, easy right?

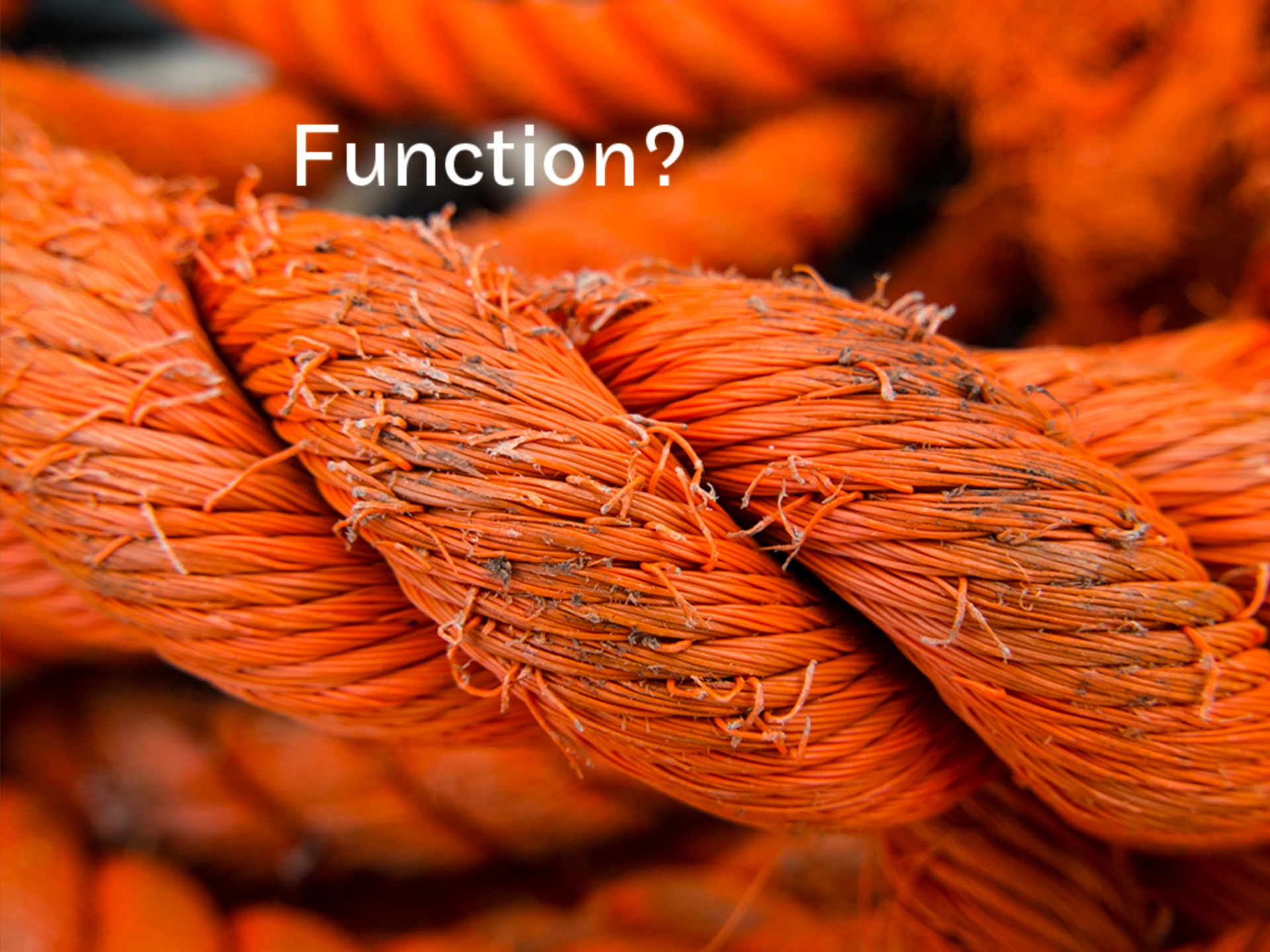


What will your customer  
deem a failure?

Engineering reference document  
Customer requirements  
and the unwritten expectations



Function?



# Environment



The where and how of use

The weather around the product

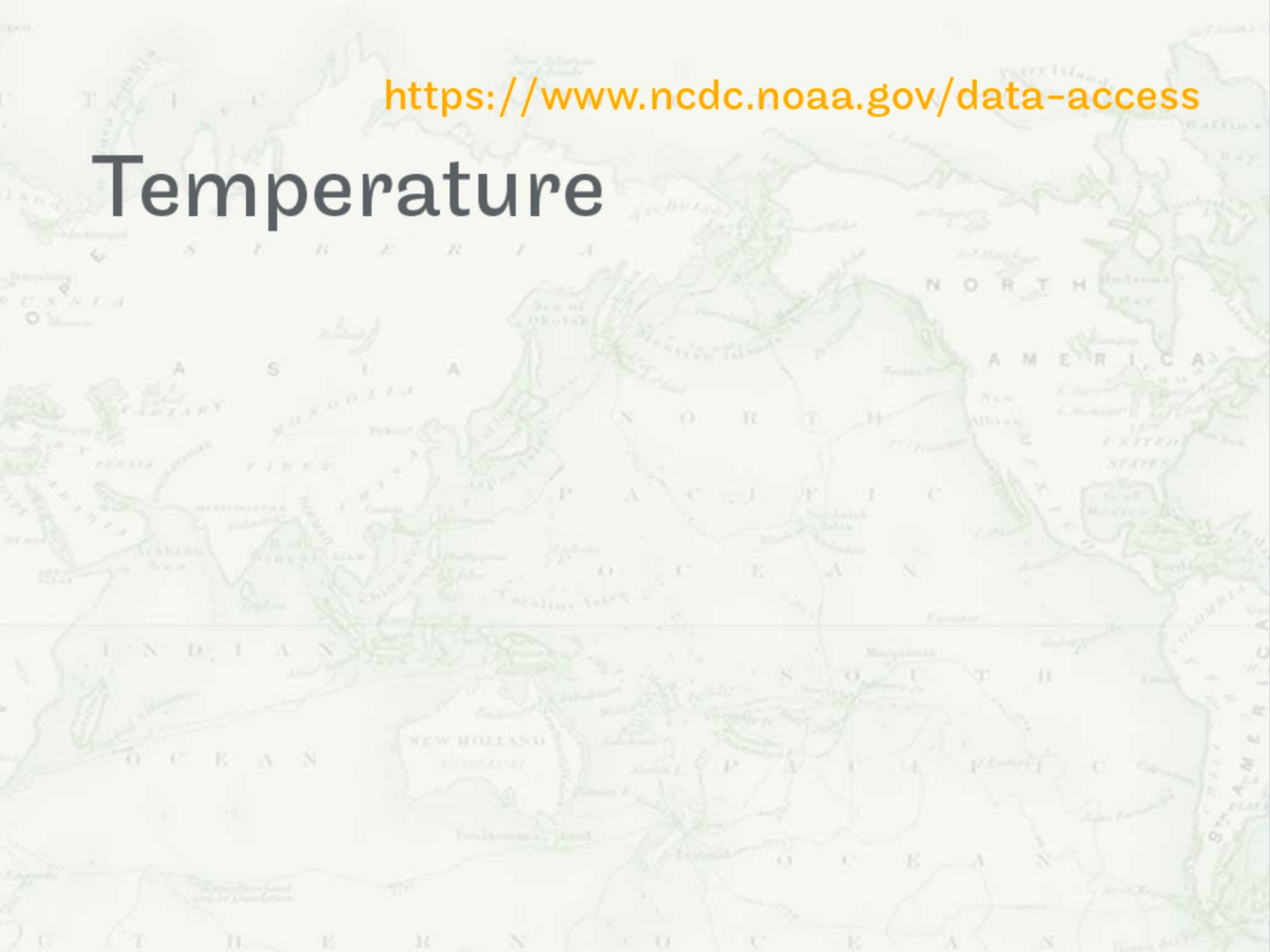
The use profile of the product

The range and distributions



<https://www.ncdc.noaa.gov/data-access>

# Temperature



# Probability and Duration



Always in couplets

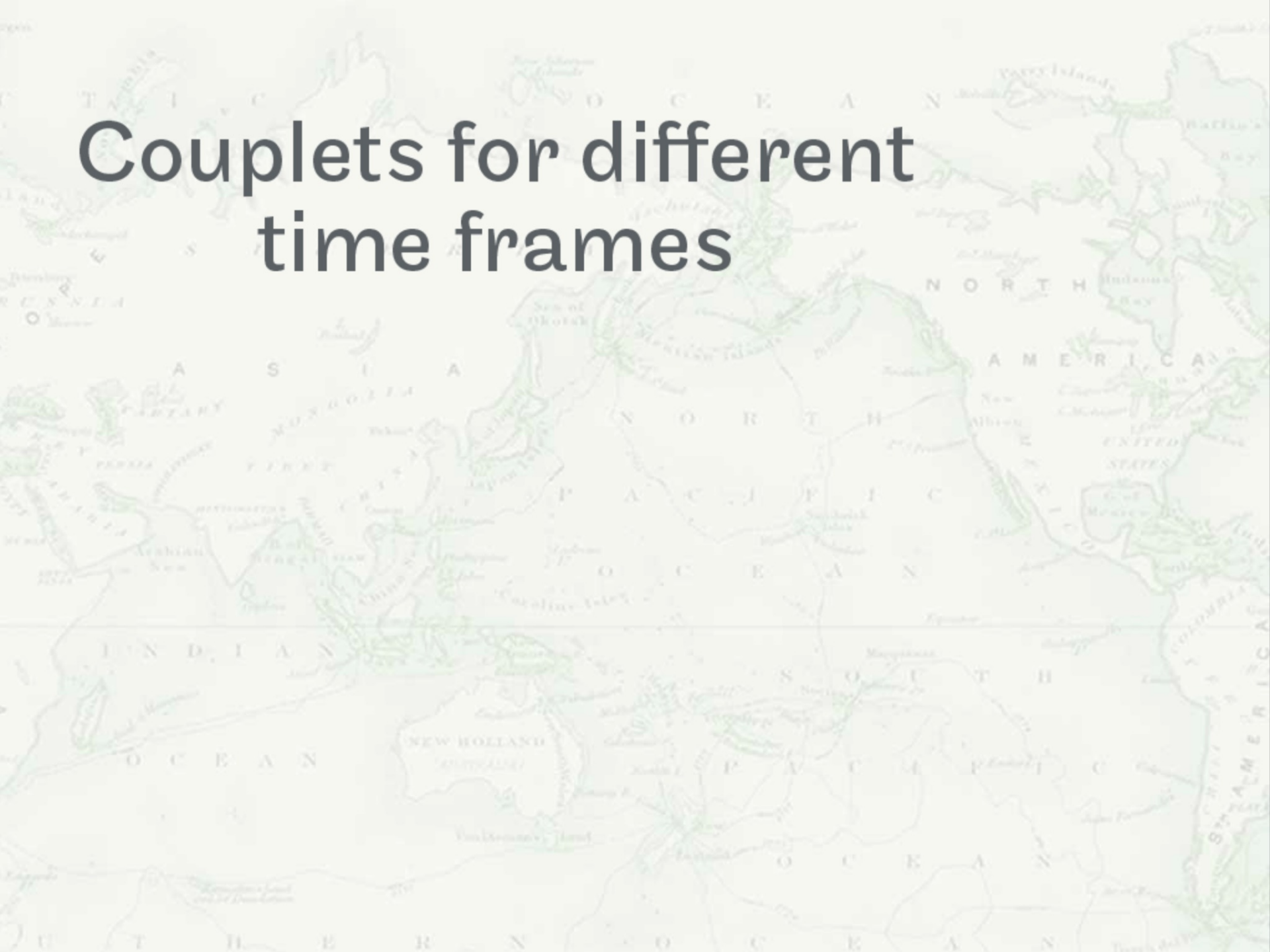
In short, how many should survive  
for how long?



Couplet



# Couplets for different time frames





Let's break down the  
goals a bit

# Modeling & DFR



Apportionment



Design for Reliability



Decision Making



# Apportionment



Break down the system goal

Reliability block diagrams

Markov models

Petri net models

# A simple RBD



# Design for Reliability



Cost of a failure (2.5x retail price)

Tolerance Analysis

Stress / Strength and Derating

what else?

Influence the point of  
decision





What do you  
recommend?



# Decision Making



Reliability occurs at the  
point of decision

Adequate information to make a decision

Part of every decision

Trade-off and balance with other factors

A close-up photograph of a thick, braided rope. The rope is made of natural fibers, likely cotton or hemp, and is braided in a traditional three-strand pattern. The end of the rope is frayed, showing the individual fibers. The rope is set against a blurred background, which appears to be an indoor setting with some greenery and a dark surface.

How does  
this  
impact  
reliability?



Let's consider what  
could go wrong

# Identify the Risks



Design and Process FMEA



HALT



Any proto or field issue



# FMEAs



A messy living process

Early and often

Involve the team

Include key suppliers

Include manufacturing partners

Includes customers



# Failure Causes





# HALT




Sometimes it just feels  
good to break something

Identify key stresses

Find margins and limits

FAILURE ANALYSIS

Take action

An underwater scene featuring a thick, orange-brown braided rope that stretches diagonally across the frame from the bottom left towards the upper right. The rope has a textured, fibrous appearance. The background is clear, bright blue water filled with numerous small, dark-colored fish swimming in various directions. The lighting is natural, creating a serene and slightly mysterious atmosphere.

What stresses  
would you apply?



# Issues (problems)



Deal with every single problem spotted

FRACAS

Solve the right problems  
and then some more

You will not find them all

A close-up photograph of a sailboat's bow, featuring a white hull with the registration number '038 LD' in black. A thick, light-colored rope is tied to a wooden post on a pier. The background shows a calm body of water and a clear blue sky. The text 'Do you sail with known issues?' is overlaid in orange in the upper right corner.

Do you sail with  
known issues?



How do you stay on  
target?

# Setup Feedback Mechanisms



Estimates



Predictions



Testing



# Estimates



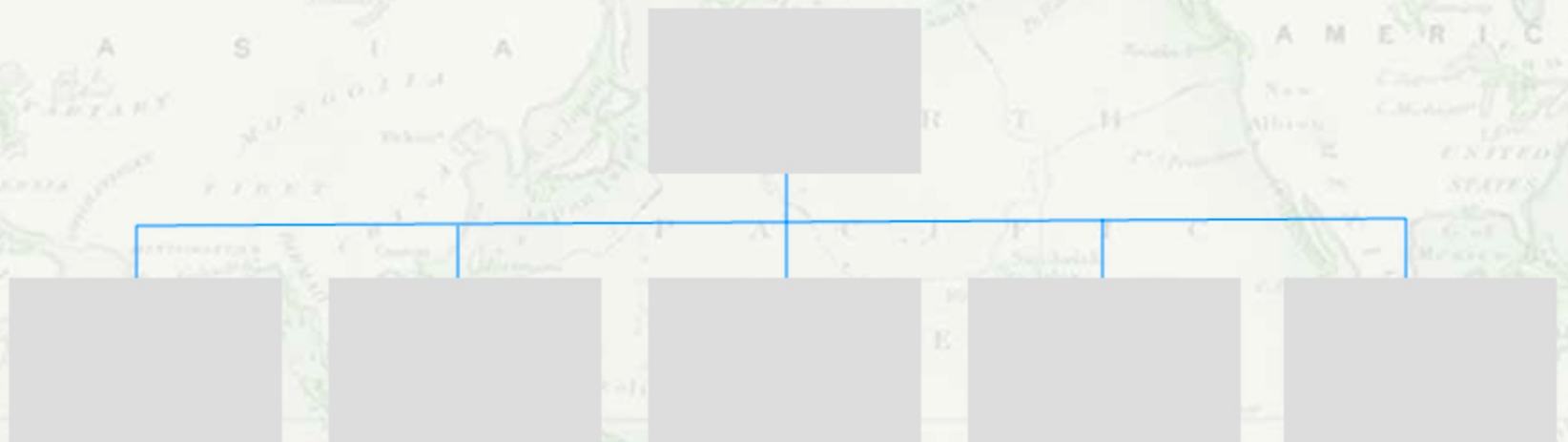
It is rough and good  
enough to get started

Engineering judgment

Expert opinion

Delphi System

# A simple RBD





# Predictions



Would you use a parts  
count prediction? really?

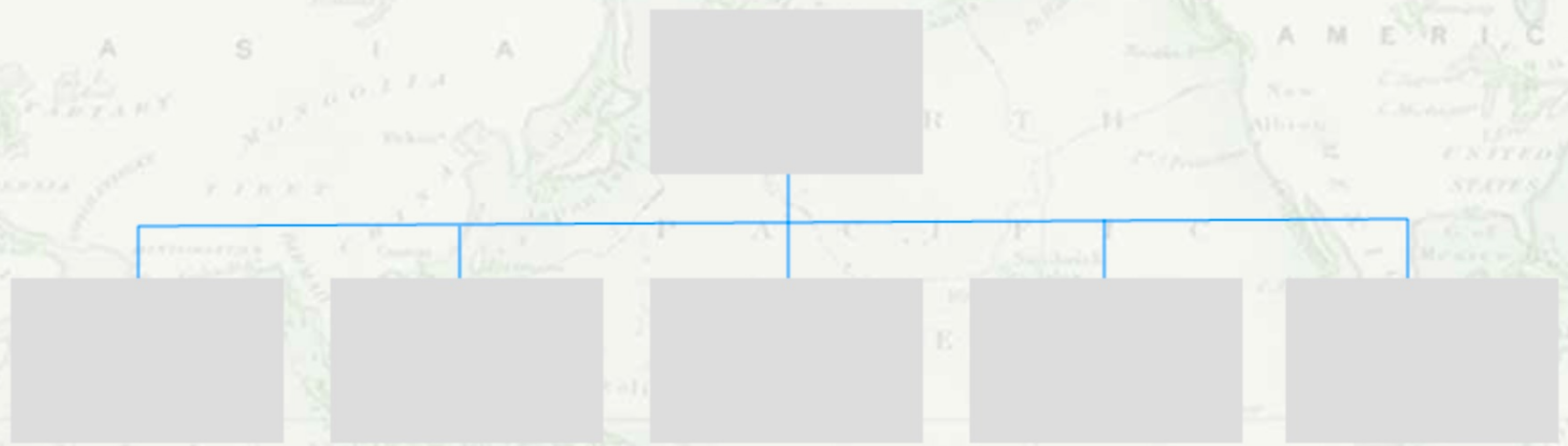
Physics of failure models

Material degradation simulation

Literature / Test reports

Reliability Growth Modeling

# A simple RBD





# Testing



What do you learn with a test and no failures?

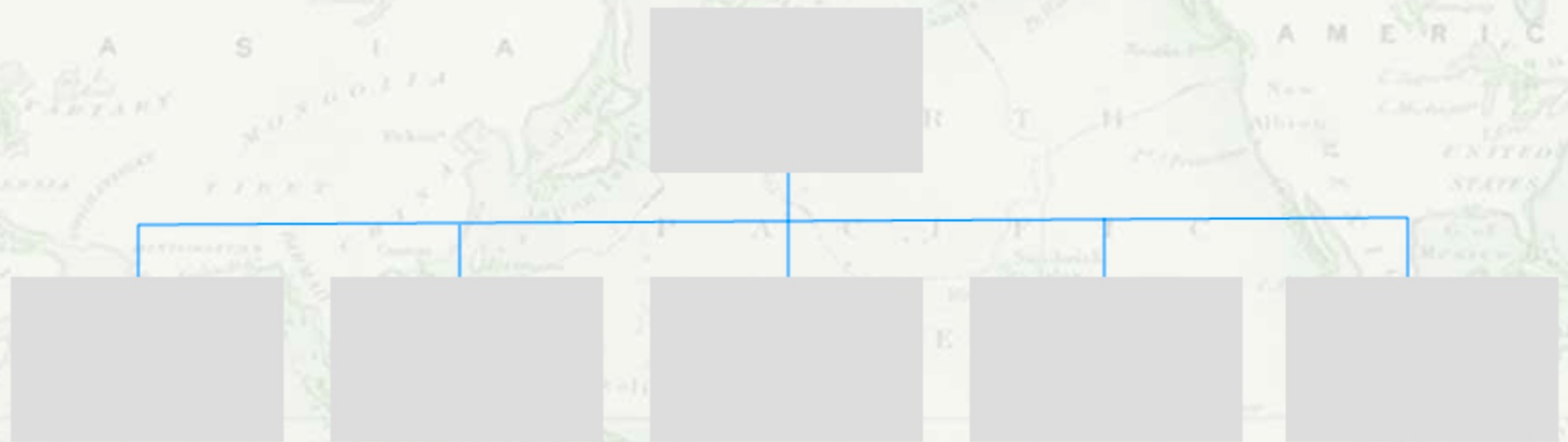
Regulatory testing

Environmental testing

Life testing

Materials, components, subsystems

# A simple RBD





Staying on track

# Establish Controls



Statistical Process Control



Supplier & Manufacturing  
Issue Tracking



Any Field Failures



# Statistical Process Control



Is it stable?  
Is it capable?

Critical to Reliability

Measure key elements

Use control charts

Teach your vendors how to use them, too

What would  
you monitor?





# Issue Tracking/Resolution



There is gold in dem thar failures

FRACAS again

Get samples back for detailed FA

Devote a team to resolve issue quickly

# Any Field Failures



How many no trouble  
finds do you have?

Remember a failure is defined  
by the customer

How have you anticipated how customers  
define failures?



# Summary

Set Goals & Models



Design For Reliability  
Identify Risks



Track Progress  
& Make Adjustments



Controls & Monitoring



# More Information

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Continue to explore your data and make improvements.