How to Achieve Your Maintenance and Reliability Goals

Honor Your Discontent

By Nancy Regan

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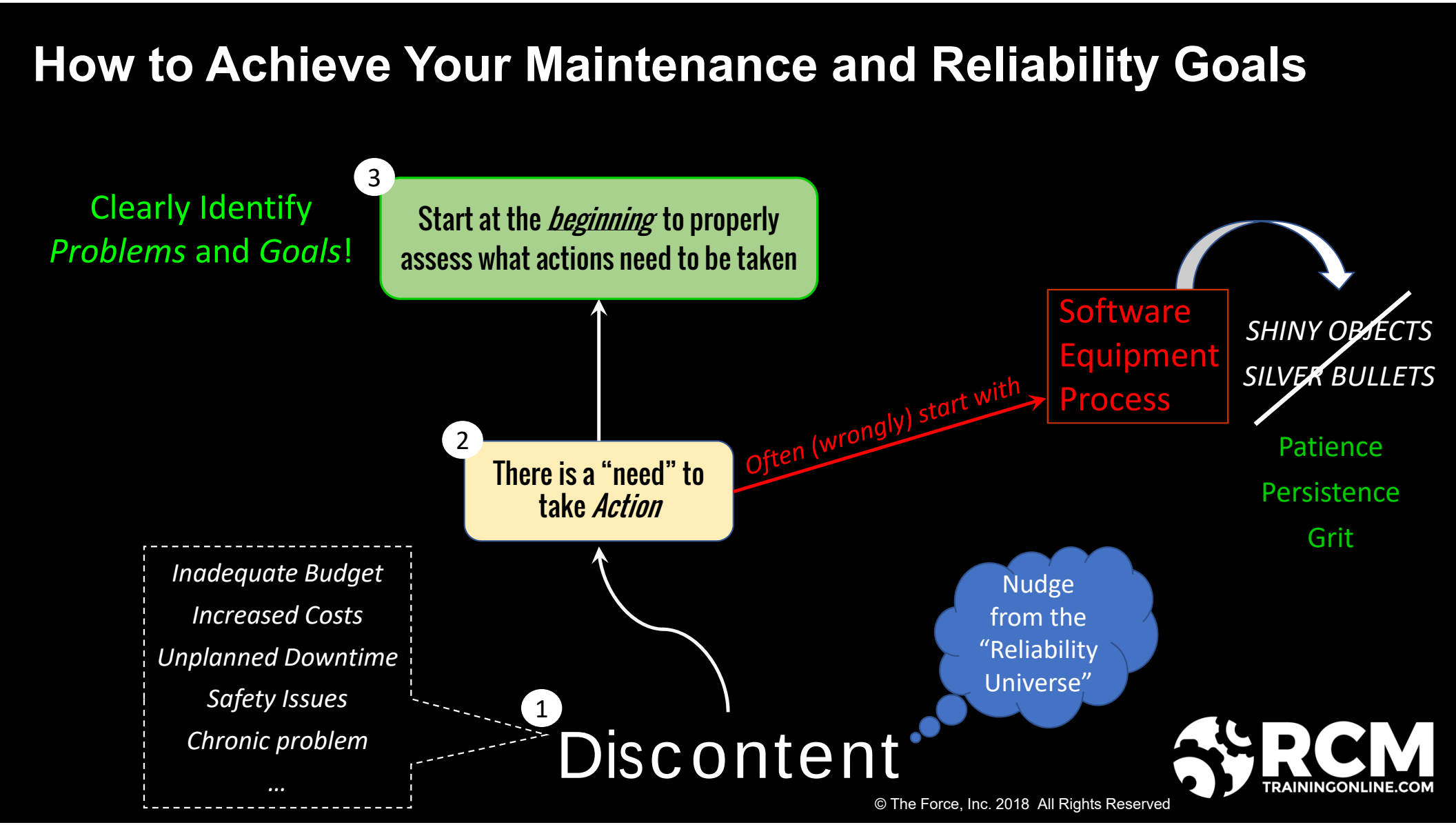

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STEP 1: PROBLEMS AND GOALS

Download Notes for Step 1

Do these three things:

1) Sit down in a quiet place.

2) With respect to Maintenance and Reliability, think about and identify the problems you're experiencing. What are you are facing? Write them all down.

3) Identify and write down your goals. Be specific. If you could wave a magic wand, what would you have already achieved?

STEP 2: OBSTACLES

Download Notes for Step 2

Do this:

Write down all of the obstacles that stand in your way. What do you have to overcome to achieve each goal?

As you write down the obstacles, don't judge them! Just focus on what's standing between you and your Maintenance and Reliability goals.

Write them all down.

STEP 3: YOUR "WHY"

Download Notes for Step 3

Do this:

Figure out your "WHY."

Your "WHY" is so important because it's the "umph" behind your actions.

Your "WHY" is what gets your butt to the gym when all you really want to do is keep sleeping.

Your "WHY" is what helps you stay awake finishing that report.

Your "WHY" is what keeps you from giving up when you've been told "no" over and over again.

Everyone's "WHY" is different, but when your "WHY" is strong, it makes achieving goals that much easier and sweeter!

For each goal you have written, identify what your "WHY" is and write it down.

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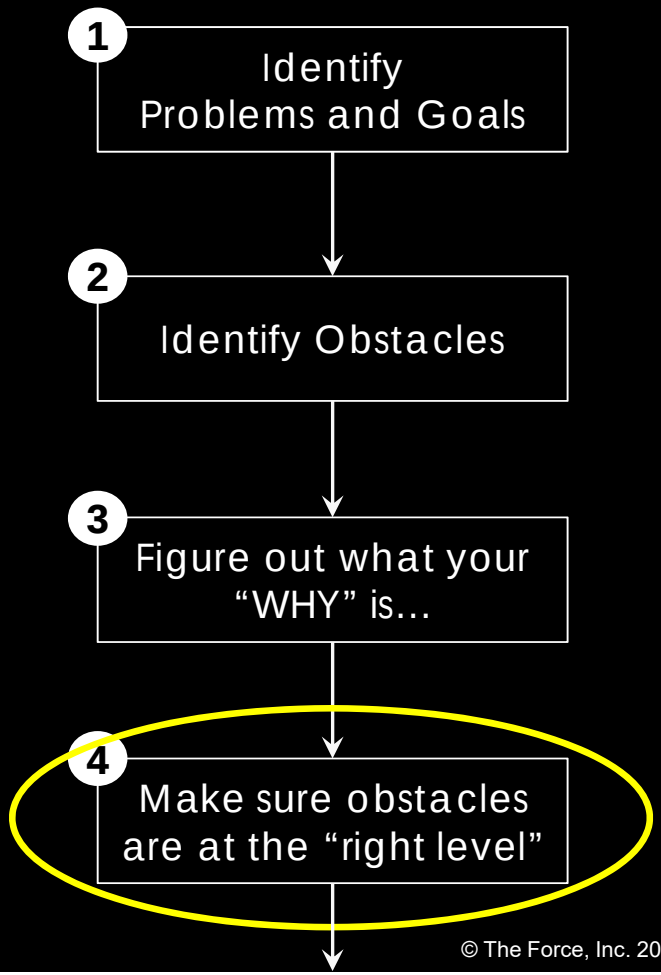

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Think about and identify the problems you're experiencing. What are you facing? Write them all down in the space below.

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- We have way too much unplanned downtime. We always seem to be fighting fires.

Notes

Identify your goals. Be specific. If you could wave a magic wand, what would you have already achieved?

Get out of Reactive Mode!

Ideas

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NOTE PAGES | STEP 2

STEP 2

Beside each of your goals, write all the obstacles that stand in your way.

GOALS	OBSTACLES
Get out of Reactive Mode! **Not written at the right level to formulate meaningful action.**	• My boss isn't a maintenance guy. • No money in the budget for any kind of maintenance analysis. • Upper management doesn't care about maintenance
Use an RCM principle to fix this.	
Notes	

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Reliability Centered Maintenance

RCM is a zero-based process used to identify the Failure Management Strategies that are required to ensure an asset meets its missions requirements in its operational environment in the most safe and cost effective manner

RCM Process

1. Functions
2. Functional Failures
3. Failure Modes
4. Failure Effects
5. Failure Consequences
6. Proactive Maintenance and Intervals
7. Default Strategies

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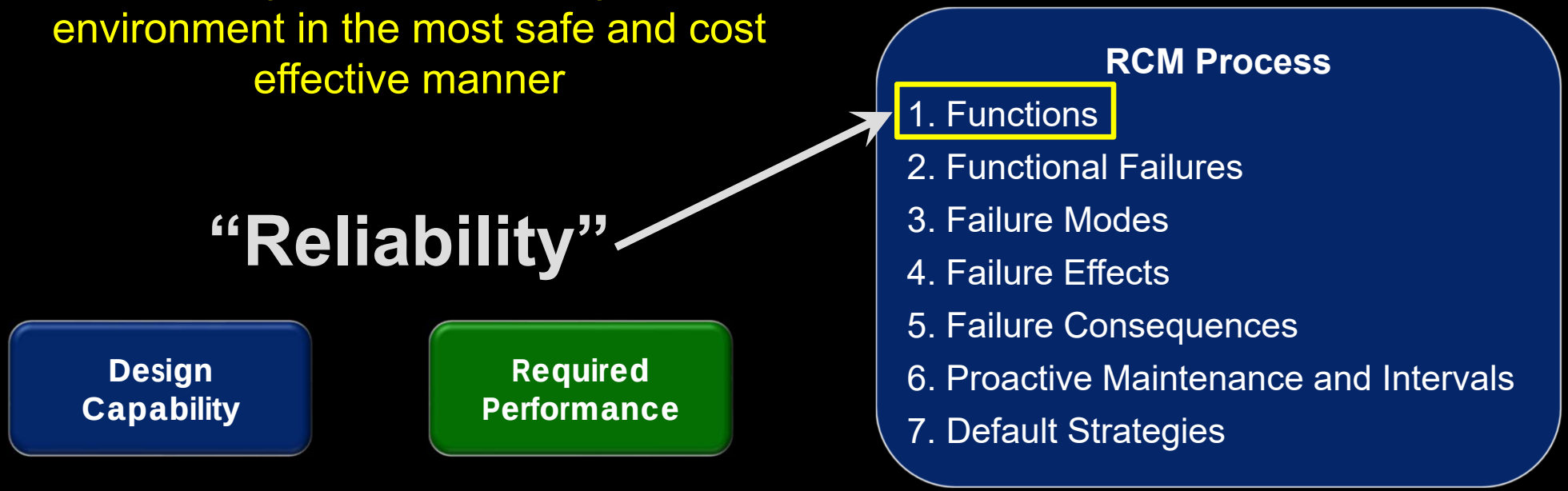

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What *specifically* causes a Functional Failure

We manage assets at the Failure Mode level

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A story of what would happen if we did nothing to predict, prevent, or manage the Failure Mode.

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Safety
Environmental
Operational
Non-Operational

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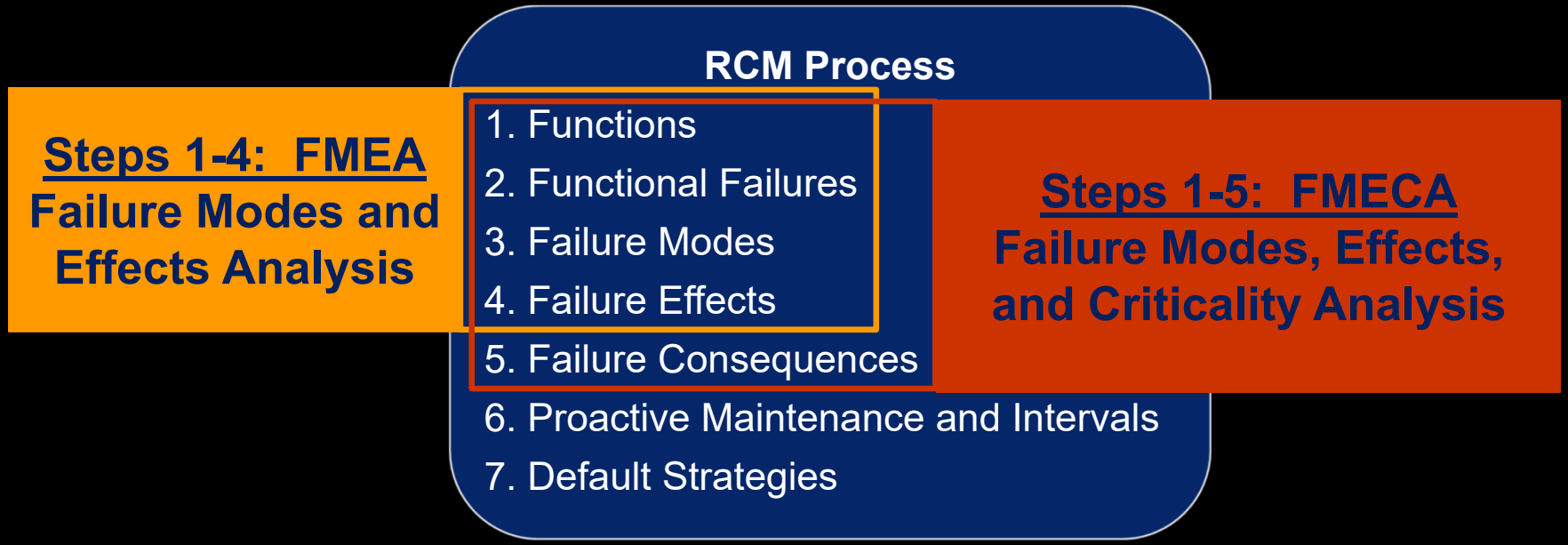
RCM Misconception

FMEA, FMECA, and RCM are separate processes



FMEA: Failure Modes and Effects Analysis

FMECA: Failure Modes, Effects, and Criticality Analysis

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- Preventive Maintenance

(Scheduled Restoration and Replacement Tasks)

- Condition Based Maintenance (CBM)

RCM Process

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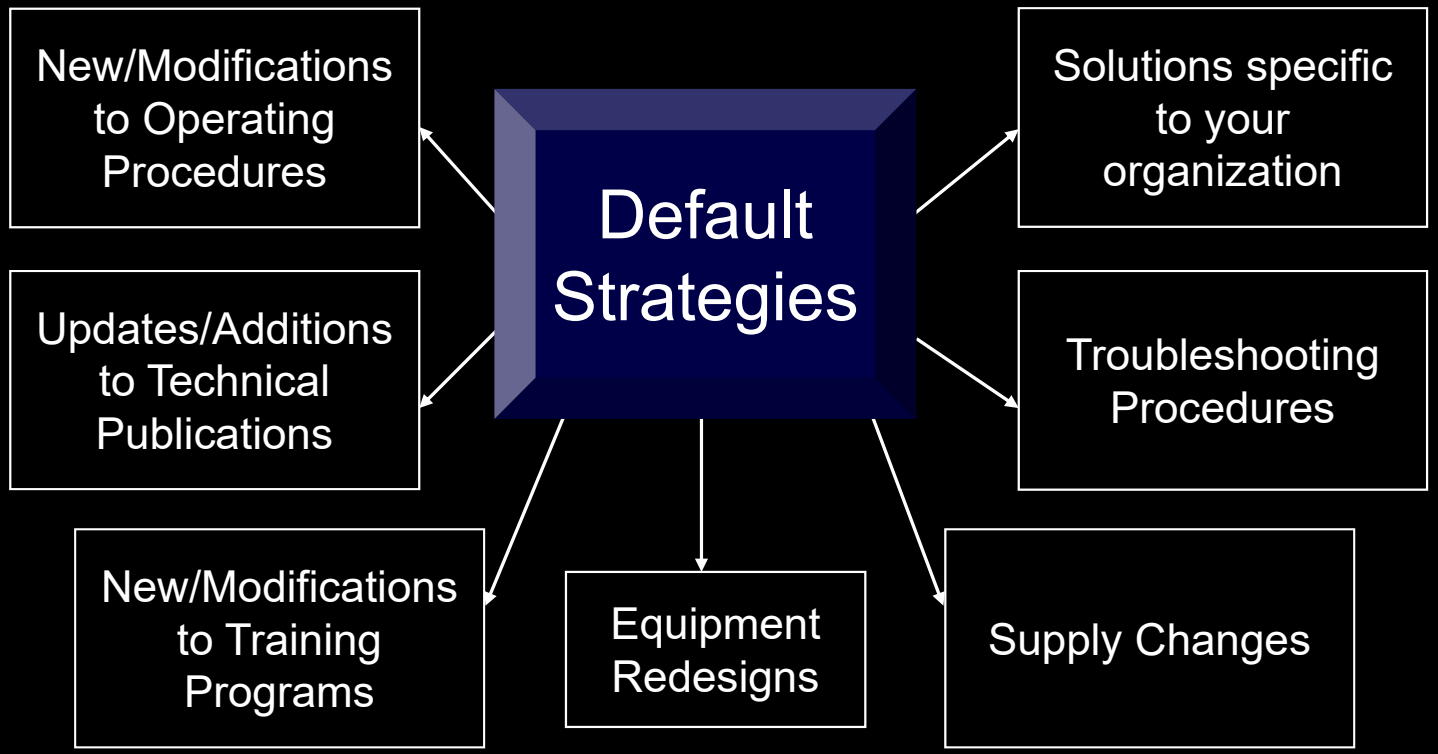
Potential Products of an RCM Analysis

Development of the most *safe*, *cost effective*, and *technically defensible* Proactive Maintenance Plan



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RCM is a zero-based process used to identify the Failure Management Strategies that are required to ensure an asset meets its missions requirements in its operational environment in the most safe and cost effective manner

What *specifically* causes a Functional Failure

Problem

We manage goals at the obstacle level

Goals

RCM Process

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Obstacles

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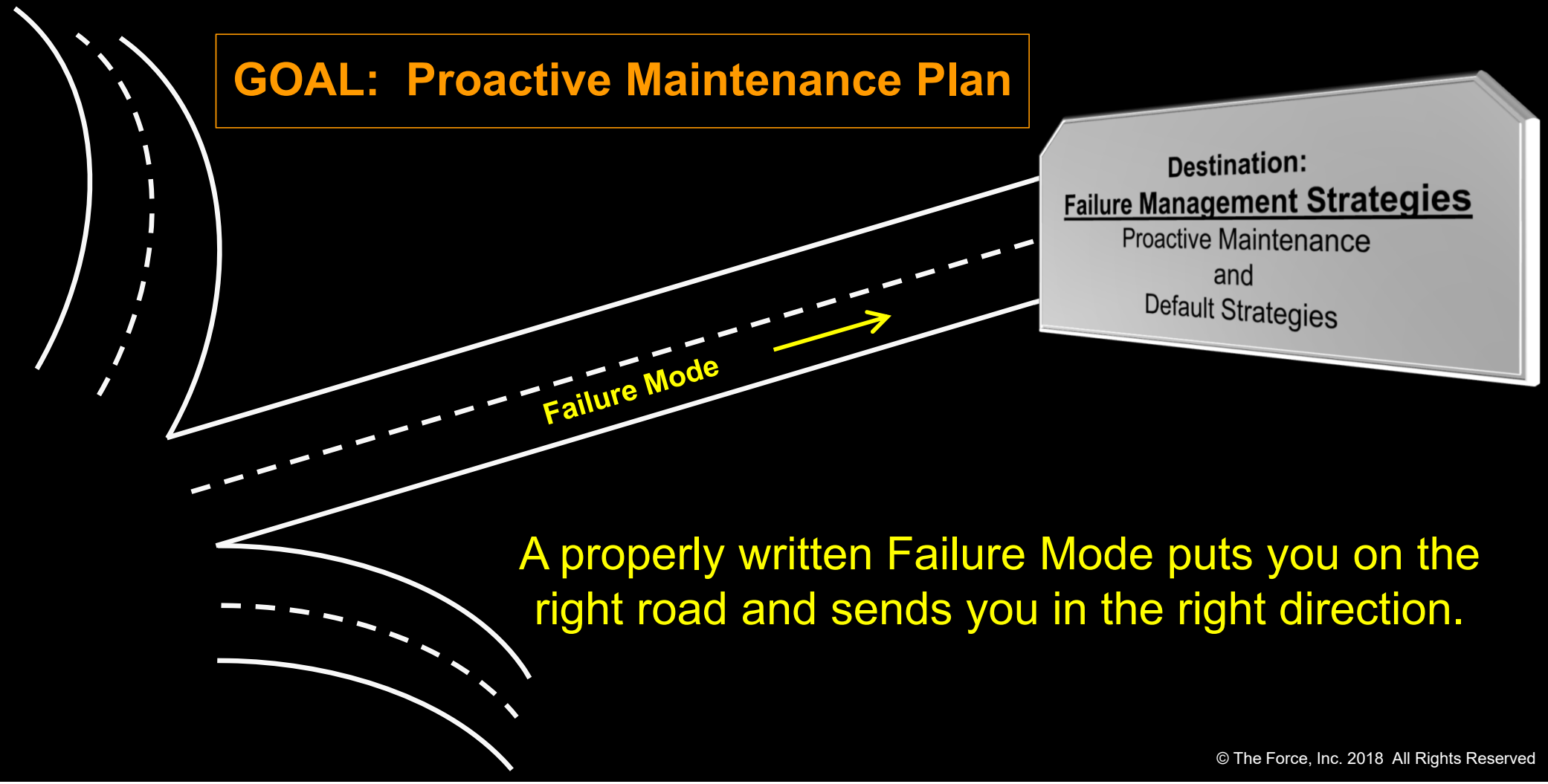
Failure Modes Often Written at Way Too Low Level

GOAL: Proactive Maintenance Plan



A properly written Failure Mode puts you on the right road and sends you in the right direction.

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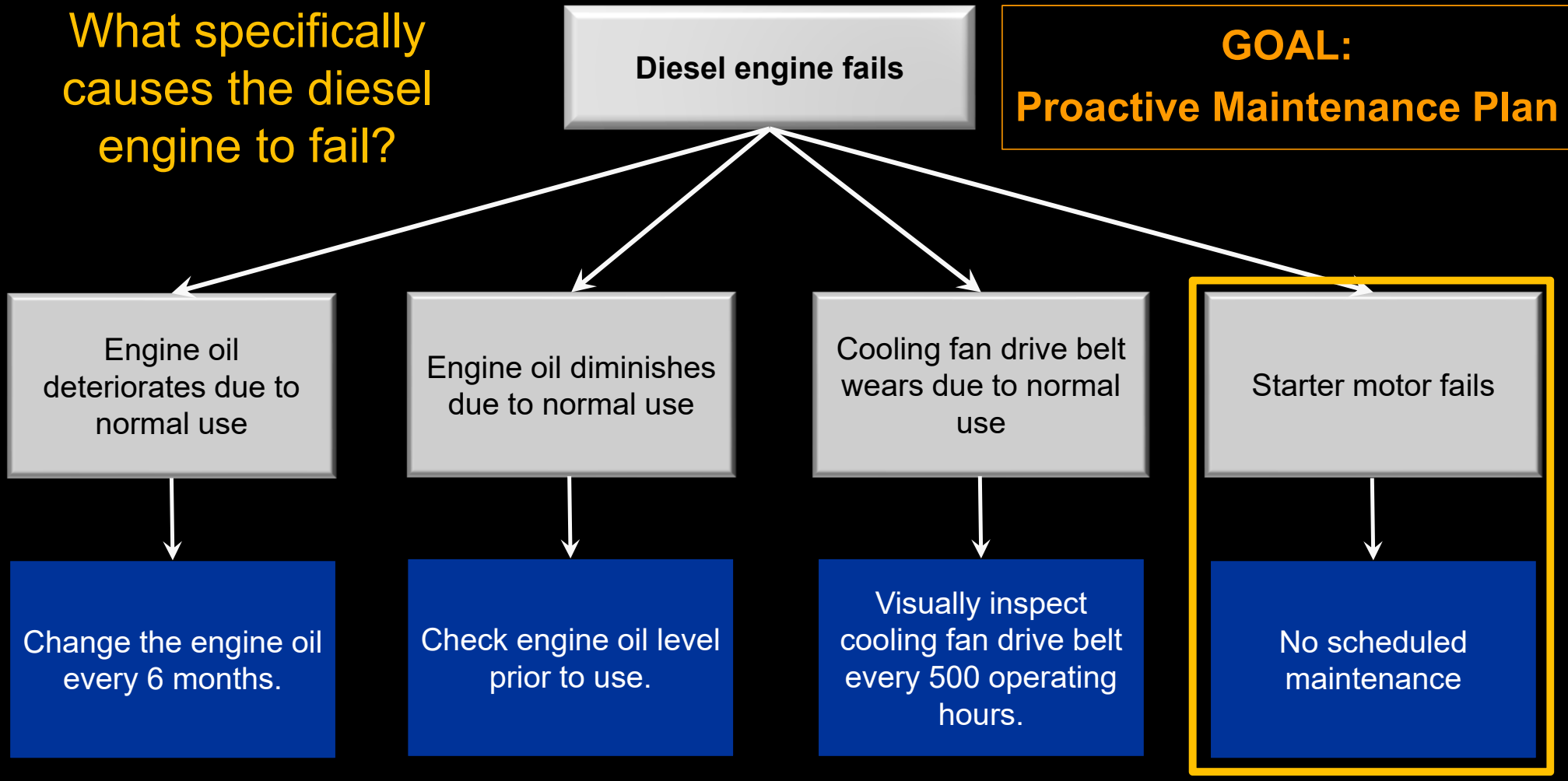
How detailed should Failure Modes be written?

What specifically causes the diesel engine to fail?



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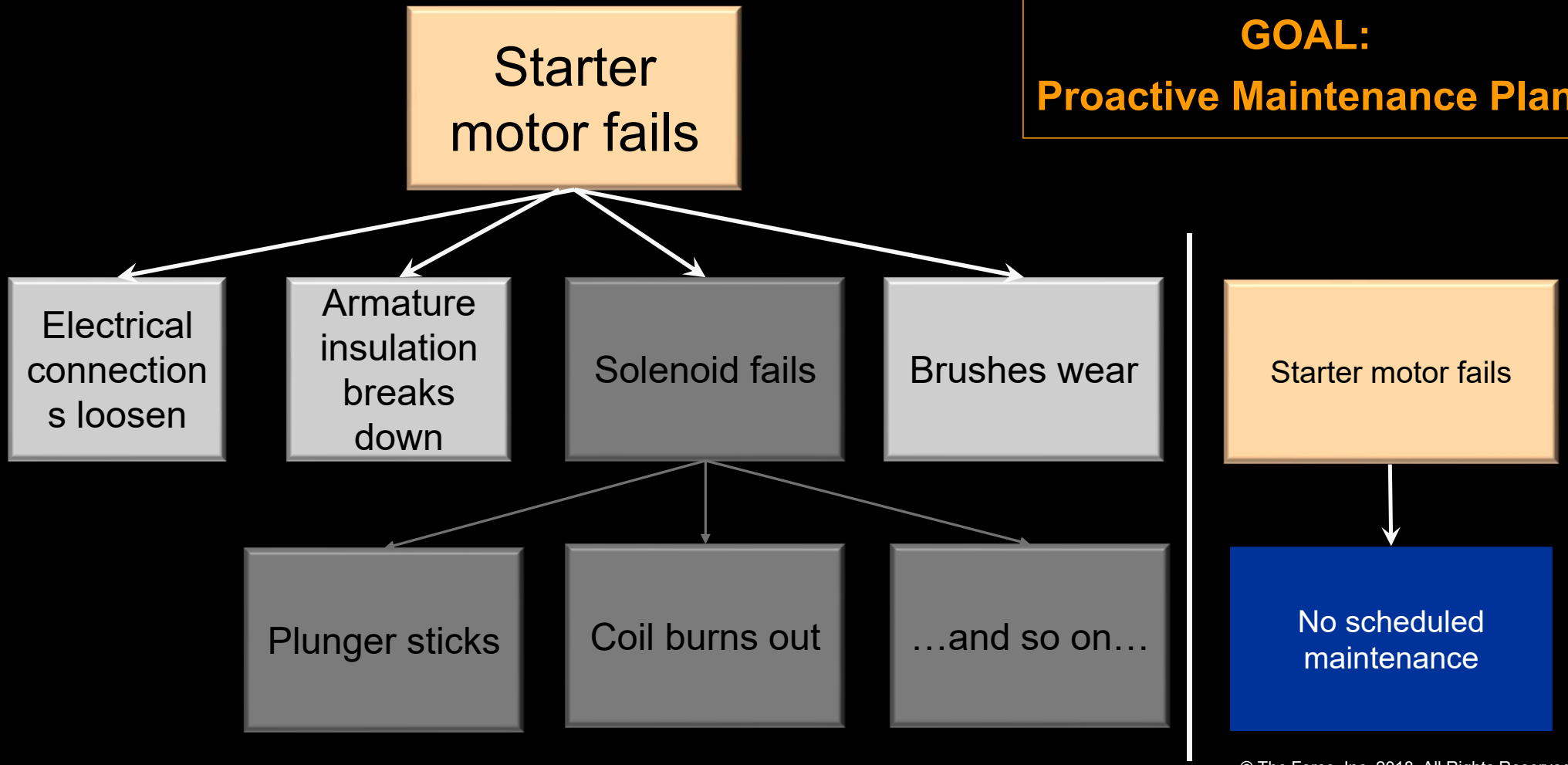

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Notes	• Upper Management doesn't understand that costs would decrease if we worked proactively instead of reactively.

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INFORMATION WORKSHEET

	FUNCTION		Functional Failure		Failure Mode	Failure Effect
	GOALS		PROBLEMS		OBSTACLES	EFFECT
1	Get out of Reactive Mode!	A	We do way more reactive maintenance than proactive maintenance. We have way too much unplanned downtime. We always seem to be fighting fires.	1	My boss doesn't understand the value of proper proactive maintenance.	
				2	My department isn't represented during budget meetings.	
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FMEA

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Failure Effects:

A story of what would happen if nothing were done to predict, prevent, or manage the Failure Mode.

- A description of the failure process from the occurrence of the Failure Mode to the Functional Failure
- Physical evidence that the failure has occurred
- How it adversely affects safety and/or the environment
- How it affects operational capability/mission
- Specific operating restrictions as a result of the failure
- Secondary damage
- What must be done and how long it takes to repair the failure

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Failure Mode: *Feedwater pump bearing lubrication dissipates.*

Failure Effect:

Lack of lubrication causes the bearing to wear abnormally. Vibration levels increase. Eventually, noise develops and just before failure, friction increases such that heat and smoke are generated. The bearing seizes, the pump stops, and feedwater is no longer supplied to the boiler. The water level in the boiler drops and is indicated on the water level sight gauge. If this goes unnoticed, eventually inadequate water is available to continue producing steam. The output steam pressure decreases such that less than 10 psi is delivered to the paper drying process. The drop in output pressure is indicated on the steam pressure gauge. When the steam supplied to the paper drying process falls below 140 psi, the low steam pressure alarm sounds. Up to 20,000 feet of paper are not thoroughly dried before the steam to the paper drying process can be stopped. The paper is scrapped for recycle and the feedwater pump motor is replaced. Downtime to repair, 8 hours.

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RCM INFORMATION WORKSHEET

TOW TRACTOR

	FUNCTION		FUNCTIONAL FAILURE		FAILURE MODE	FAILURE EFFECT
1	To tow equipment and objects weighing up to 10,000 pounds at speeds up to 10 mph, on a maximum slope of 2 degrees, as required.	A	Completely unable to tow	1	Engine oil pump fails.	Without warning, the oil pump fails. When the oil pressure falls below 15 psi, the low oil pressure shutdown switch is energized and the engine is automatically shut down. Operator notifies supervisor that tow tractor must be towed back. Operations are delayed up to two hours while another tow tractor is checked out. Engine oil pump is replaced. Downtime to repair, up to two days.
				2	...and so on...	
		B	Tows up to 10,000 pounds but at a speed less than 10 mph.	1	Fuel filter clogs due to normal use.	Over time, fuel flow to the engine is restricted. Eventually fuel is restricted to the point that then engine runs rough and may shut down. Operator notifies supervisor that tow tractor must be towed back. Operations are delayed up to two hours while another tow tractor is checked out. Fuel filter is replaced. Time to repair, up to 4 hours.
				3	...and so on...	
2	To bring the tow tractor to a controlled stop, with no load, from a speed of 10 mph, over a distance of no more than 21 feet, as required. (hydraulic brakes)	A	Unable to stop the tow tractor.	1	Brake fluid is contaminated due to normal use.	This Failure Mode is considered too unlikely to justify further analysis.
				2	...and so on...	
		B	Brings the tow tractor to a controlled stop, with no load, from a speed of 10 mph but over a distance of more than 21 feet.		Brake pads wear due to normal use.	Over time, brake discs score and warp. A grinding/squeaking noise is detectable by the Operator. If this goes unnoticed, eventually the tow tractor pulls to one side when the brakes are applied. Operator notifies supervisor that tow tractor must be towed back. Operations are delayed up to two hours while another
				2	...and so on...	

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	FMEA			3	Upper management doesn't understand that costs would decrease if we worked proactively instead of reactively.	

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Before you can even think about changing a culture…

- Identify problems
- Identify obstacles
- What happens if those obstacles are allowed to remain in place?

- There are no silver bullets
- There are no magic shiny objects

- Patience
- Persistence
- Grit

"Capture the villages and the cities will fall."

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INFORMATION WORKSHEET

	GOALS		PROBLEMS		OBSTACLES	EFFECT
1	Get out of Reactive Mode!	A	We do way more reactive maintenance than proactive maintenance. We have way too much unplanned downtime. We always seem to be fighting fires.	1	My boss doesn't understand the value of proper proactive maintenance.	▪ What happens if the obstacle is allowed to remain in place? ▪ How does is adversely affect the organization and its employees?
				2	My department isn't represented during budget meetings.	▪ Bottom line? ▪ How does it affect the organization's "mission?"
	Assignment ▪ Edit/Identify Goals, Problems, and Obstacles ▪ Write Effects for each obstacle			3	Upper management doesn't understand that costs would decrease if we worked proactively instead of reactively.	▪ Secondary damage? ▪ Tell the story. Really think it out. Put it all down on paper.

Questions?

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Workshop Attendee Questions

- My company devoted a lot of effort towards identifying preventive maintenance but we hardly update these with actual failure scenarios.

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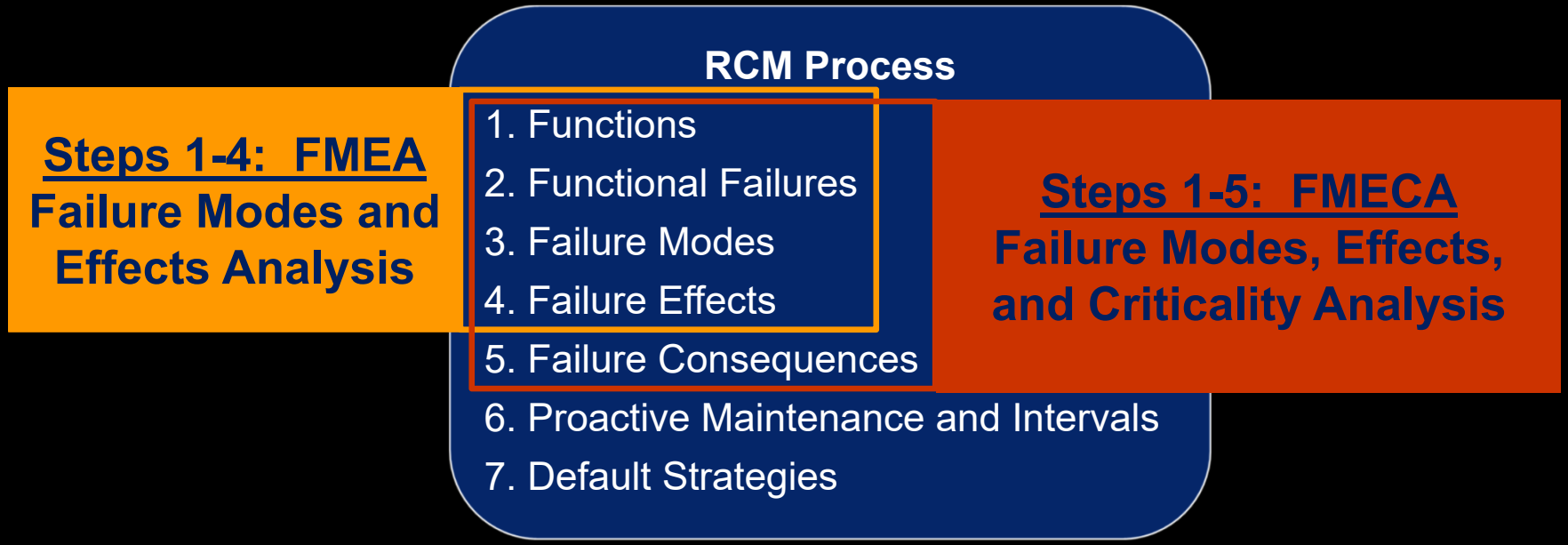

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The *5-Whys* of Root Cause Analysis

Ask "Why" Five Times

1. Why did the bearing seize?

- Because there was excessive wear on the raceways and rolling elements.

2. Why was there excessive wear on the raceways and rolling elements?

- Because the bearing had insufficient lubrication.

3. Why did the bearing have insufficient lubrication?

- Because the technician didn't lubricate the bearing properly.

4. Why didn't the technician lubricate the bearing properly?

- Because he was hung over and wasn't paying attention during the lubrication task.

5. Why was the technician hung over?

- Because he had a fight with his wife and went out to the pub the night before with his buddies.

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