

## Failure Mode and Effects Analysis



### KEY HIGHLIGHTS

- SAE, AIAG, AIAG & VDA FMEAs
- MIL-STD-1629, Piece-part FMECAs
- DFMEAs, PFMEAs, FMEA-MSRs
- Boundary Diagrams, P-Diagrams
- DVP&R, PFD, PCP
- Function and Failure Nets
- Always-in-sync™ technology
- Knowledge Banks™
- Workflow, Approvals & Notifications
- Data Autoflow™ & SmartSuggest™
- Audit Trails, Dashboards
- Zero-client, browser-based

**Relyence® FMEA (Failure Mode & Effects Analysis) is your all-in-one package supporting every element of failure mode analysis: Boundary Diagrams, P-Diagrams, Design FMEAs (including Function Nets, Failure Nets, and DVP&R), Process FMEAs (including Process Flow Diagrams and Control Plans), FMEA-MSRs, and FMECAs. Complete customization options allow tailoring to your needs.**

**Compliant and Custom FMEAs.** Relyence FMEA supports the commonly used FMEA methodologies including SAE J1739, ARP5580, AIAG, AIAG & VDA, MIL-STD-1629, IEC 60812, as well as the automotive standards of Daimler Chrysler, Ford, and GM. Relyence FMEA also supports piece-part DFMEAs and MIL-STD-1629 FMECAs and offers the FMD database and custom Part Failure Modes Library. Built-in templates are available for quick start up, and you can easily modify the templates to suit your needs. Alternatively, you can create a completely custom worksheet to match your requirements.

**FMEA Efficiency.** With Relyence FMEA's unique *always-in-sync™* technology, you can rest assured that your FMEAs remain organized and complete. Relyence FMEA maintains data connections between all phases of your analysis - Boundary Diagram, P-Diagram, Function and Failure Nets, Design FMEA, DVP&R, Process Flow Diagram, Process FMEA, and Process Control Plan - ensuring that no elements of your analysis are omitted or overlooked.

**The Relyence FMEA Advantage.** Relyence FMEA's acclaimed *Knowledge Banks™* streamline your FMEA activities by providing data reuse and automatic change synchronization. Use the Action Library and fully customizable Workflow, Approvals, and Notifications features for unparalleled process efficiency. Other high-powered features include autocomplete, RPN and AP calculations, the innovative *FMEA Data Autoflow™* & *SmartSuggest™* for superior data management and control, audit trails, support for custom Formulas, FMEA-Fault Tree linking, and *Failure Direct Connect™* for FMEA-FRACAS integration. In addition, our device independent platform enables you to perform FMEAs on your PC, Mac, tablet, or smartphone.

**Dashboard for FMEA.** The Relyence FMEA Dashboard provides an at-a-glance overview of your FMEA information. Combining all the data you need for quick assessment, the Dashboard offers the ability to monitor and manage your FMEAs with efficiency and effectiveness with a choice of customizable widgets. This focused overview enables you to

quickly gauge system health, proactively maintain your quality objectives, and turn insight into action.

**Deployment Choice.** Relyence FMEA, as all Relyence software tools, is built on the Relyence Platform - a highly adaptable and mobile-friendly framework constructed with today's workplace in mind. Relyence FMEA can be installed on-premise at your location, hosted in the Microsoft Cloud to take advantage of Microsoft's industry-leading Azure platform, or hosted in your own private secure cloud. All platforms offer the same features and functions. The choice is yours!

Step Number	Process Step	Failure Mode	Product Characteristic	Failure Mode Severity	Effect	End Effect	Effect Severity	Cause	Process Characteristic
50.05	Get size 10 socket and 4 bolts with trim diameter	Incorrect socket Incorrect bolts retrieved		3	Cannot fasten bolts Bolts too large, do not fit Bolts too small, do not fit	Camera cannot be attached to drone Camera cannot be attached to drone Camera cannot be attached to drone	3 3 3	Baskets of similar sizes not distinguishable Incorrect labeling in part supermarket Balls of similar sizes not distinguishable	
50.10	Clamp camera onto drone body	Clamp loose		6	Camera cannot be attached to drone	Camera cannot be attached to drone	6	Clamp not tightened enough by operator	
50.15	Fasten camera to drone body with bolts	Camera not securely fastened to drone	Camera fastened to drone	6	Camera dislodges from drone	Camera not fastened to drone	6	Bolt not torqued to required level	Bolt torque
50.20	Visually inspect for gaps between bolts, camera, and drone	Incorrect camera installation not caught		5	Poorly manufactured drone and camera delivered to customer	Customer complaint received	5	Incomplete work instructions on inspection steps	
50.25	Correct camera installation on drone body	Camera not securely fastened to drone	Camera fastened to drone	6	Camera dislodges from drone	Camera not fastened to drone	6	Bolt not torqued to required level	Bolt torque
50.30	Remove clamp from	Clamp not removable		3	Have to	Loss of	3	Clamp gears stuck	

## Failure Mode and Effects Analysis

Offering collaboration, effectiveness, compliance, and connectivity in one comprehensive platform.

Built-in Compliant and Customizable Worksheets

Support for All FMEA Types

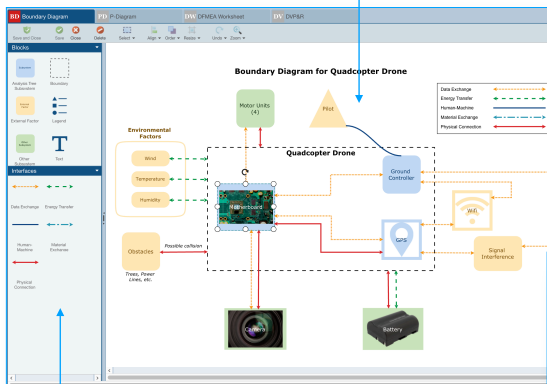
Tree Structure for FMEA Organization

Function	Failure Mode	Failure Mode Severity	Effect	End Effect	Effect Severity	Product Characteristic	Cause	Classification	Occurrence	Prevention Controls	Detection
Provides convenient flying, aerial surveillance and video recording functionality and experience	Low battery life	7	Possible collision	Drone inoperable	7	Degraded battery	Cathode wear out	II: Critical	5	Replace battery periodically	
	Battery leaking	10	Legal and safety issue	Legal and safety issue	10	Manufacturing and packaging defects	Structural failure	I: Catastrophic	2	Operational instructions	
	Structural imbalance	10	Collision	Drone inoperable	10	High winds and gusts		I: Catastrophic	4	Operational instructions Operate at a speed (8)	
	Unable to fly straight		Drone uncontrollable	Drone uncontrollable	5			III: Marginal	3		
	No communication between controller and drone	7	Unable to control drone from controller	Drone inoperable	7	Motor malfunction	Touchpanel inoperable (Ground Controller)	I: Catastrophic	2	Operational instructions	
Provides the thrust and motor malfunction motion to the flight	Error in motor controller	7	Possible collision	Drone inoperable	7	Loss of communication (Ground Controller)	Motor mechanical failure	II: Critical	4		
	Wear		Drone inoperable	Drone inoperable	7			II: Critical	5		
	High voltage		Drone inoperable	Drone inoperable	7			II: Critical	3		
Provides for mounting camera on drone	Camera mounting plate cracked	6	Camera mounting cracks	Camera loosely attached to drone and may detach	6	Material hardness of camera mounting plate	Hard landing	II: Critical	5		
	Mounting holes not found at 4 corners of rectangular camera mounting plate	6	Camera cannot be mounted on drone for video recording	No video can be captured	6	Improperly designed camera mounting plate		II: Critical	5		

Design FMEA Worksheet

Graphical Boundary Diagram

Built-in & Customizable Styles



Boundary Diagram

Easy Drag-and-Drop Interface

Important Items List with Drilldown

Overdue Recommended Actions List

RPN Breakdown by Component

The dashboard provides a comprehensive overview of the FMEA process. It includes a table of overdue recommended actions, a pie chart for RPN breakdown by component, and a list of important FMEA causes. A prominent '96% COMPLETE' badge indicates the progress of DFMEA for the system.

RECOMMENDED ACTIONS	TARGET COMPLETION DATE	RESPONSIBILITY
Review inspection work instructions for missing steps or details	1/22/2018	Nancy McPherson
Add color image of camera to kitting BOM	1/15/2018	Morgan Ross
Add color coding to sockets in tool distribution and on BOM	1/15/2018	Kim Akers
Calibration	1/16/2018	Kim Akers
Add color coding to sockets in tool distribution and on BOM	1/16/2018	Nancy McPherson
Add color coding to sockets in tool distribution and on BOM	1/17/2018	Kim Akers
Add color image to operator instructions with expected look after camera installation	1/17/2018	Morgan Ross
Add color coding to bolts in part supermarket and on BOM	1/19/2018	Nancy McPherson
Review kitting BOM for part lists	1/22/2018	Morgan Ross
Add color image to operator instructions with expected look after camera installation	1/24/2018	Corey Beck
Add color coding to sockets in tool distribution and on BOM	1/27/2018	Morgan Ross

Example FMEA Dashboard

Top 10 Risk Items