MATLAB EXPO

MathWorks®
Authorized Reseller

Oprogramowanie
Naukowo-Techniczne
sp. z o.o.

Warszawa, 11.06.2026 r.

MathWorks®
Authorized Reseller

Design robustness and relability
with systematic fault and effect analysis

Konrad Kolski, ONT

Oprogramowanie
Naukowo-Techniczne
sp. z o.o.

Agenda

- Why test for robustness
- Simulink Fault Analyzer overview
- Systematic safety analysis using simulation
  - Failure Mode and Effect Analysis (FMEA)

© 2026 www.ont.com.pl

Why test for robustness?

High Integrity Systems

8.4.3.2.2 The correct implementation of the functional and technical requirements at the system level shall be demonstrated using feasible test methods given in Table 10.

Table 10 — Correct implementation of functional safety and technical safety requirements at the system level

Methods		ASIL			
		A	B	C	D
1a	Requirement-based test[a]	++	++	++	++
1b	Fault injection test[b]	+	+	++	++
1c	Back-to-back test[c]	o	+	+	++

[a] A requirements-based test denotes a test against functional and non-functional requirements.

[b] A fault injection test uses special means to introduce faults into the system. This can be done within the system via a special test interface or specially prepared elements or communication devices. The method is often used to improve the test coverage of the safety requirements, because during normal operation safety mechanisms are not invoked.

[c] A back-to-back test compares the responses of the test object with the responses of a simulation model to the same stimuli, to detect differences between the behaviour of the model and its implementation.

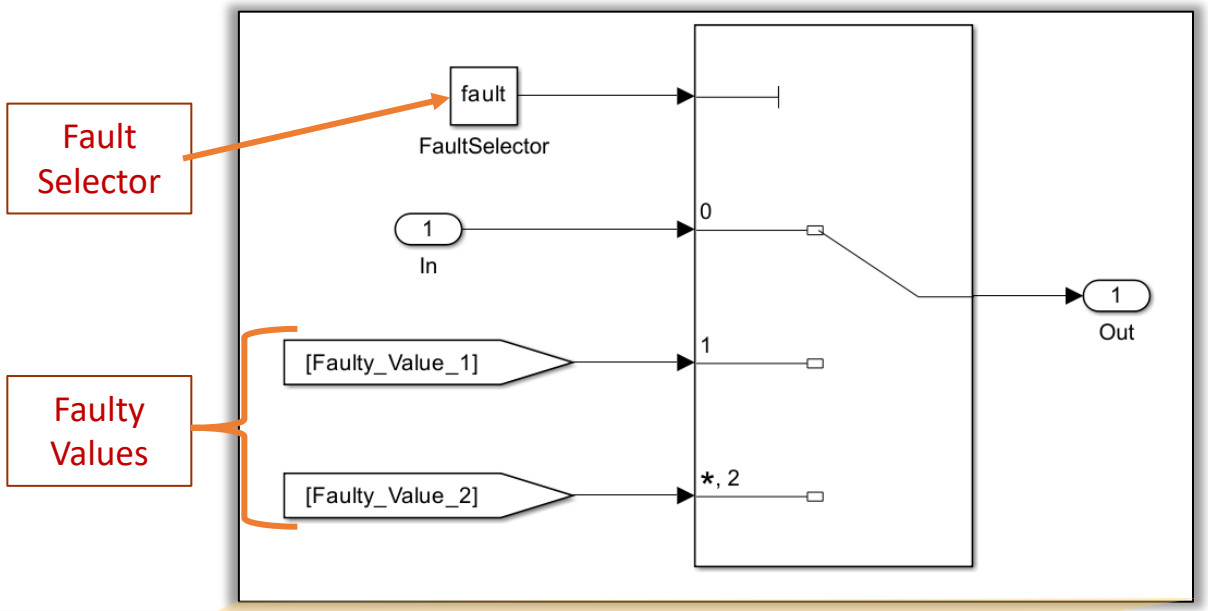
© 2026 www.ont.com.pl

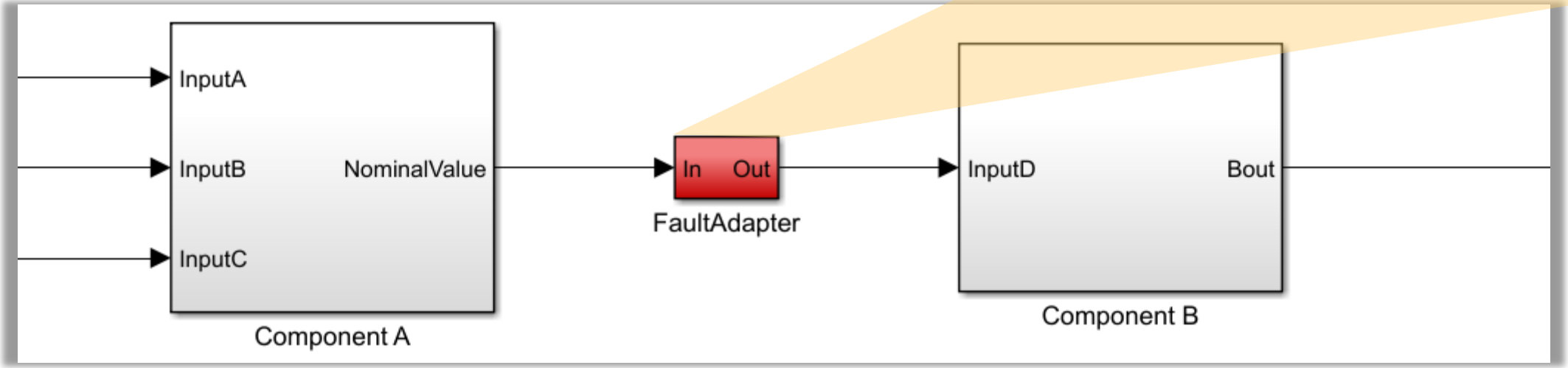
Simulate Faults Earlier

Intrusive Fault Modeling in Simulink

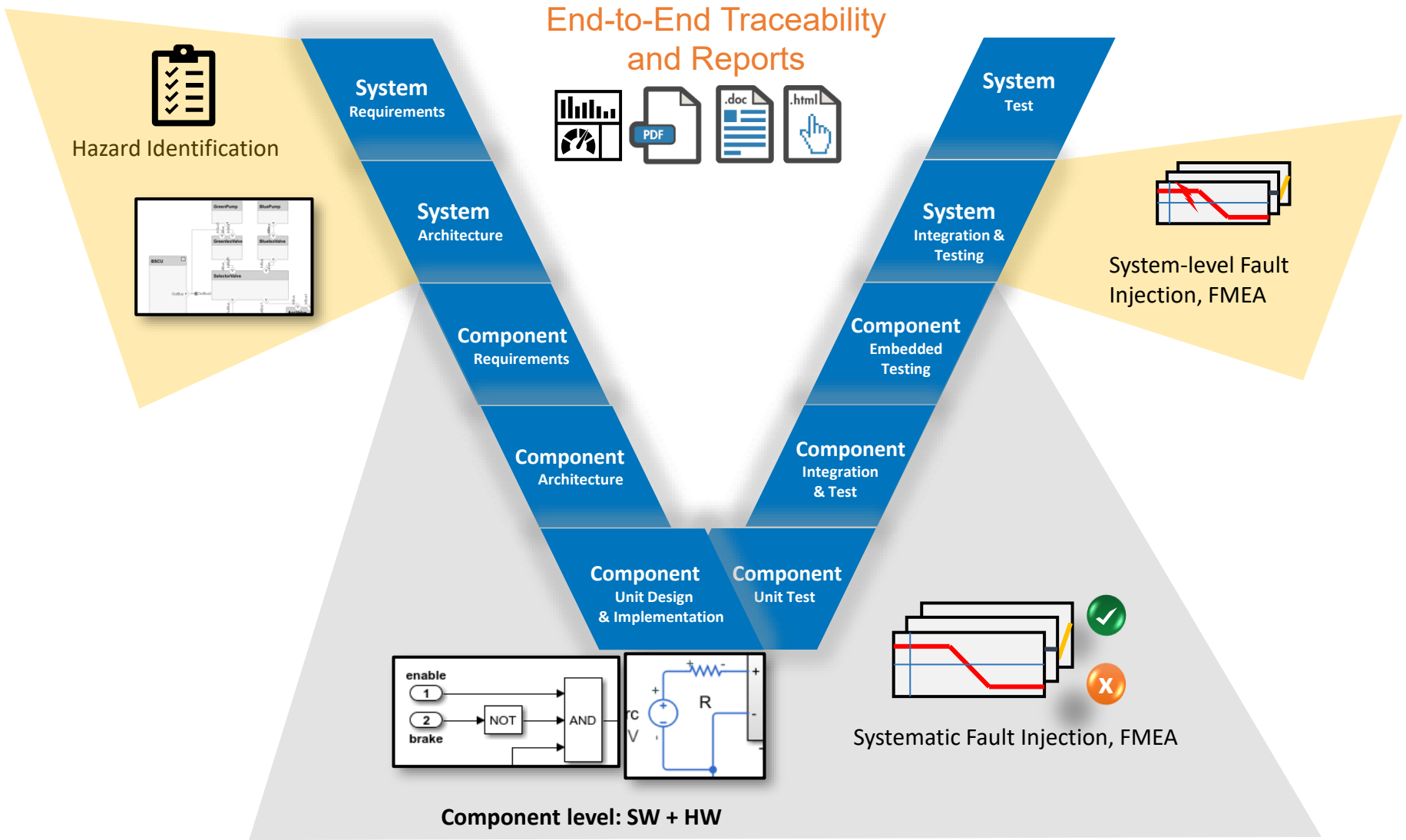
Key pains:

- Modifies design
- Hard to manage faults within model hierarchy
- Difficult to estabilish relationship with system safety

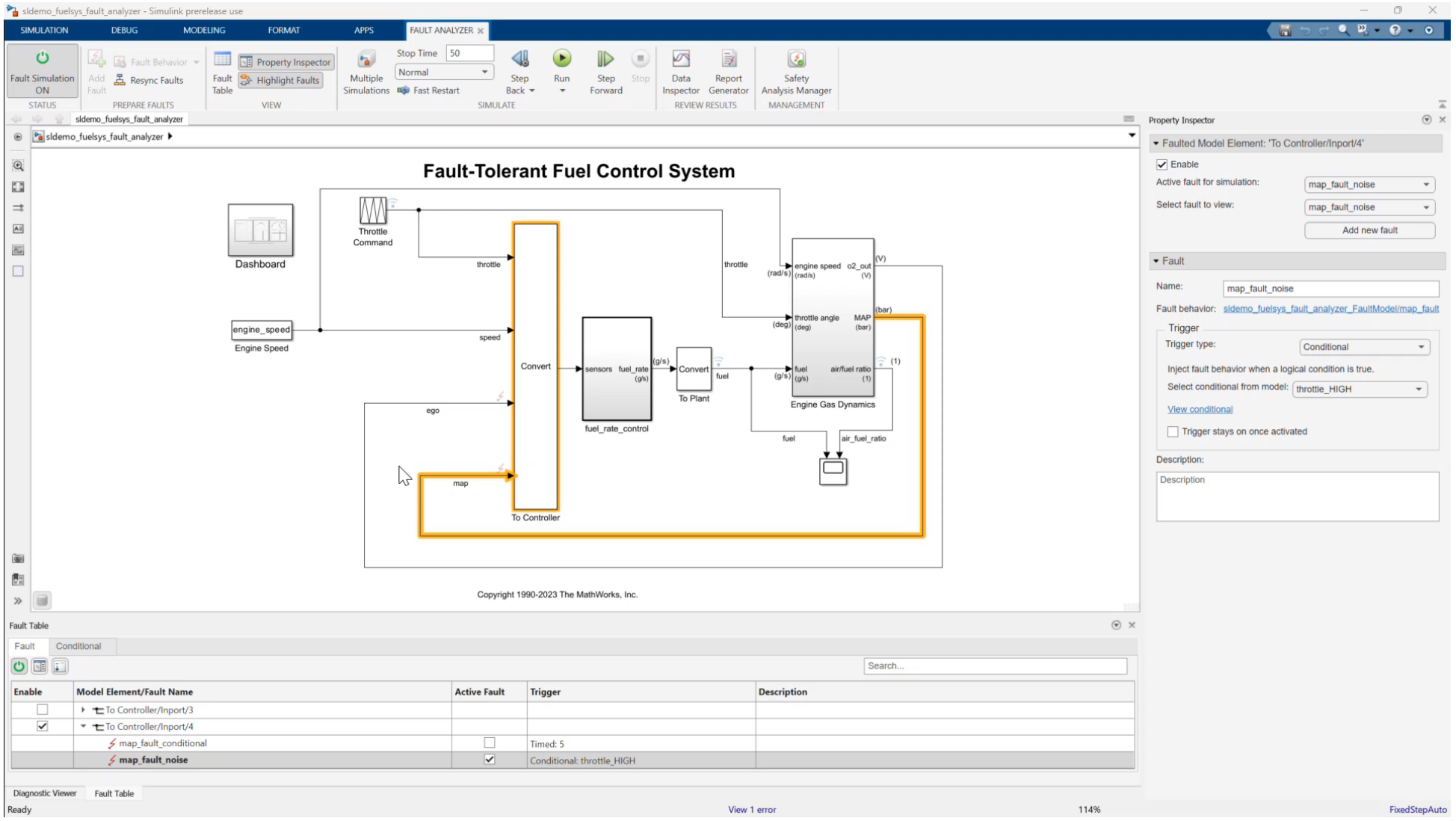




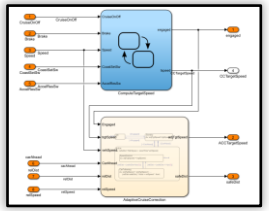
Simulink Fault Analyzer supports End-to-End safety analysis



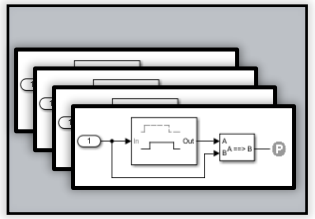
What is Simulink Fault Analyzer?



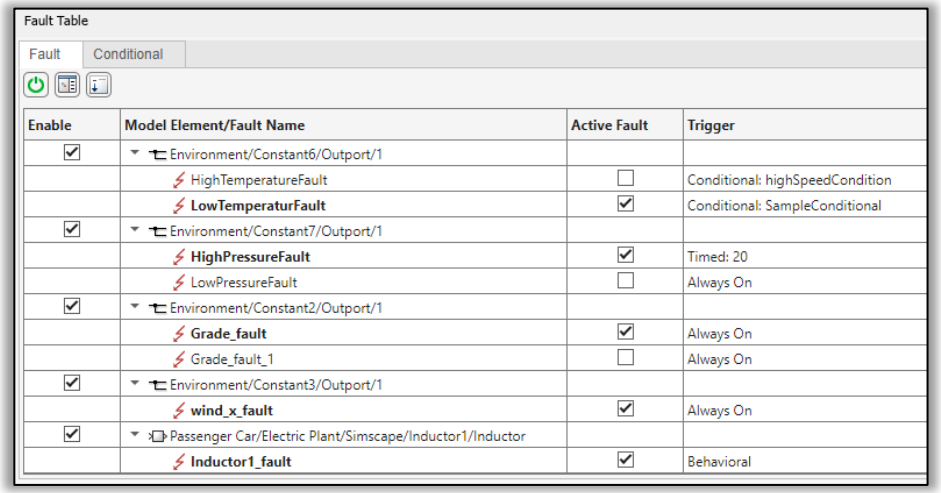
Design Logic



Fault Logic

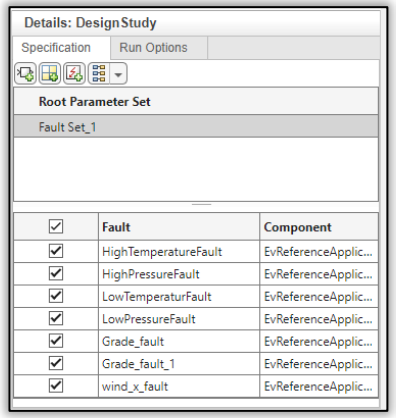


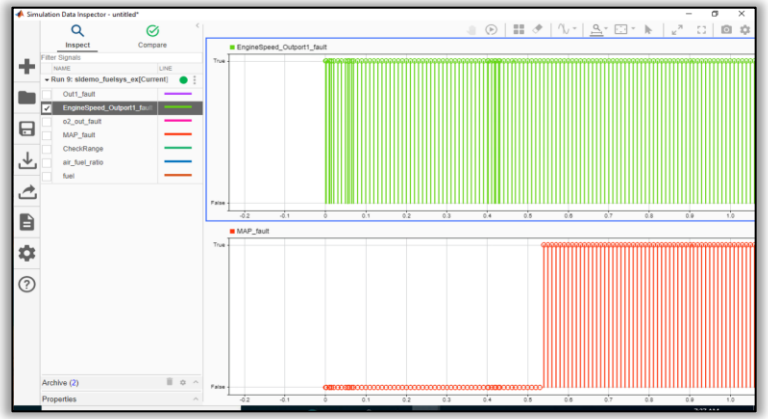
Model faults without modifying the design



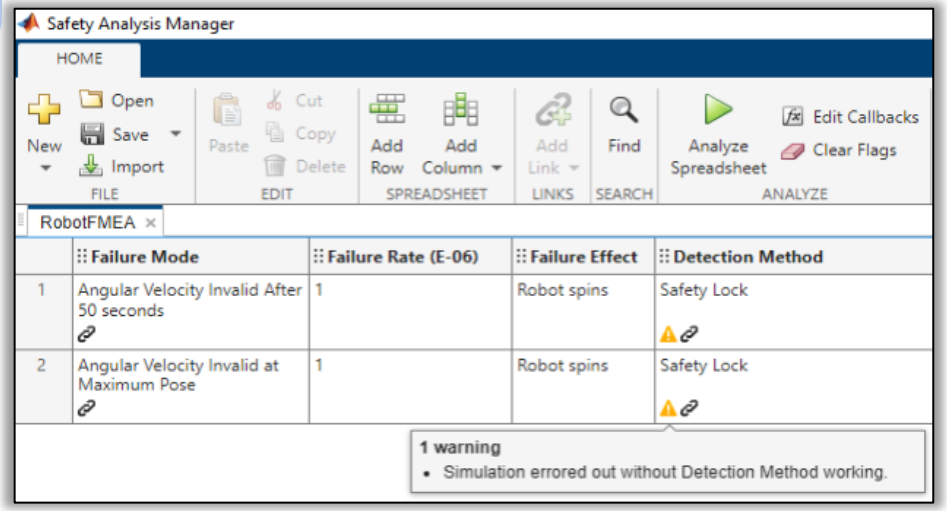
Manage faults across multiple domains

Simulink Fault Analyzer™





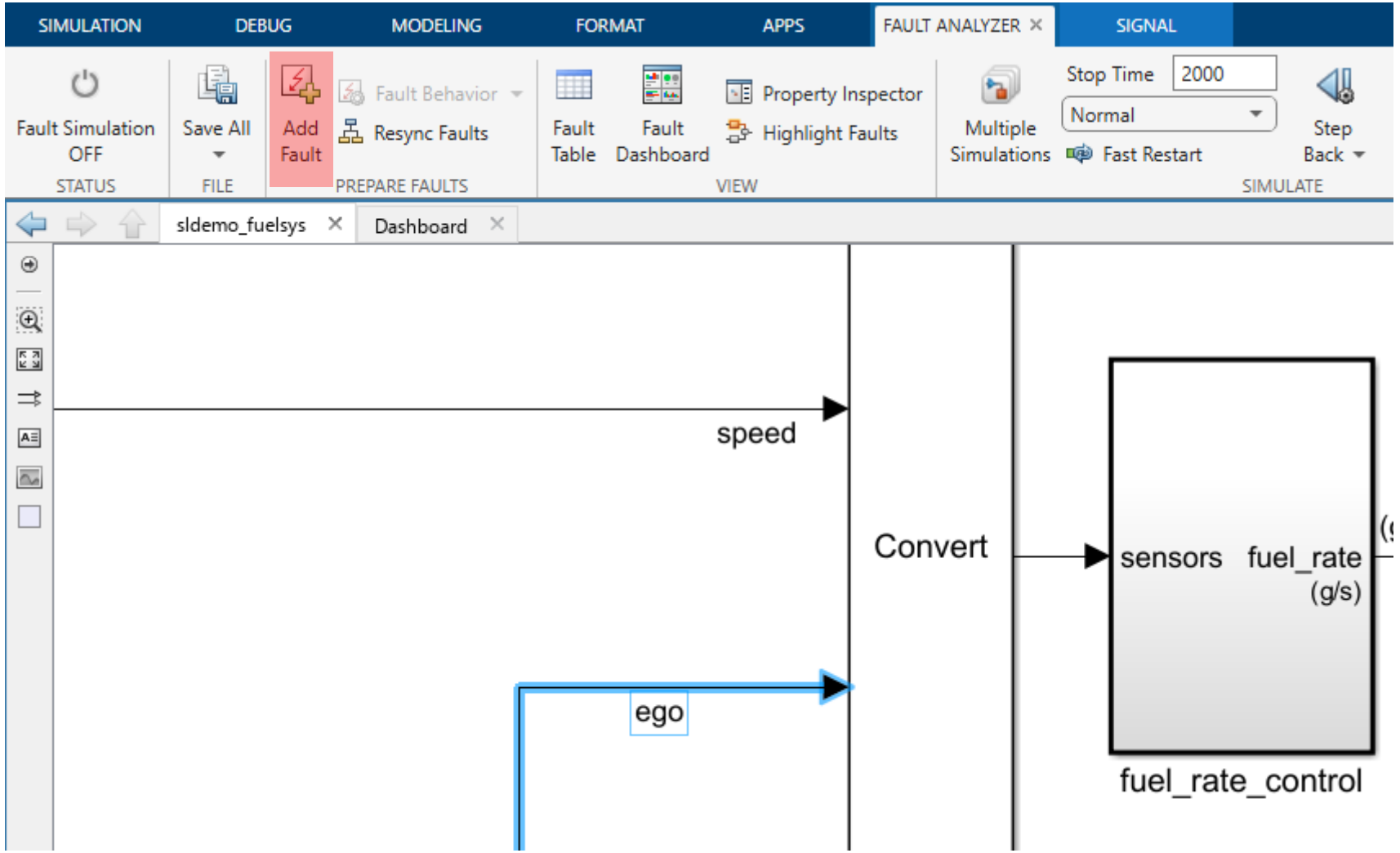
Simulate, explore and analyze fault effects



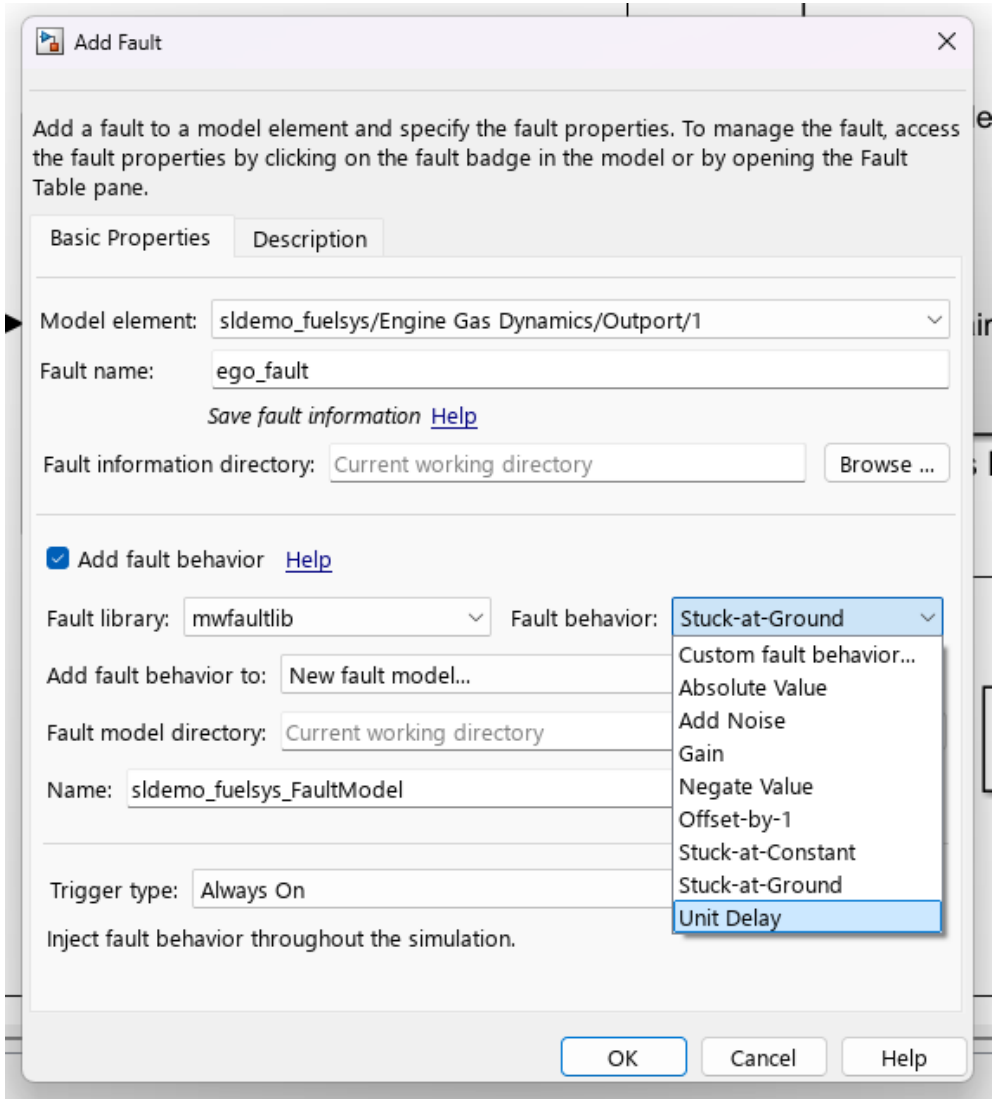
Perform systematic safety analysis using simulation

© 2026 www.ont.com.pl

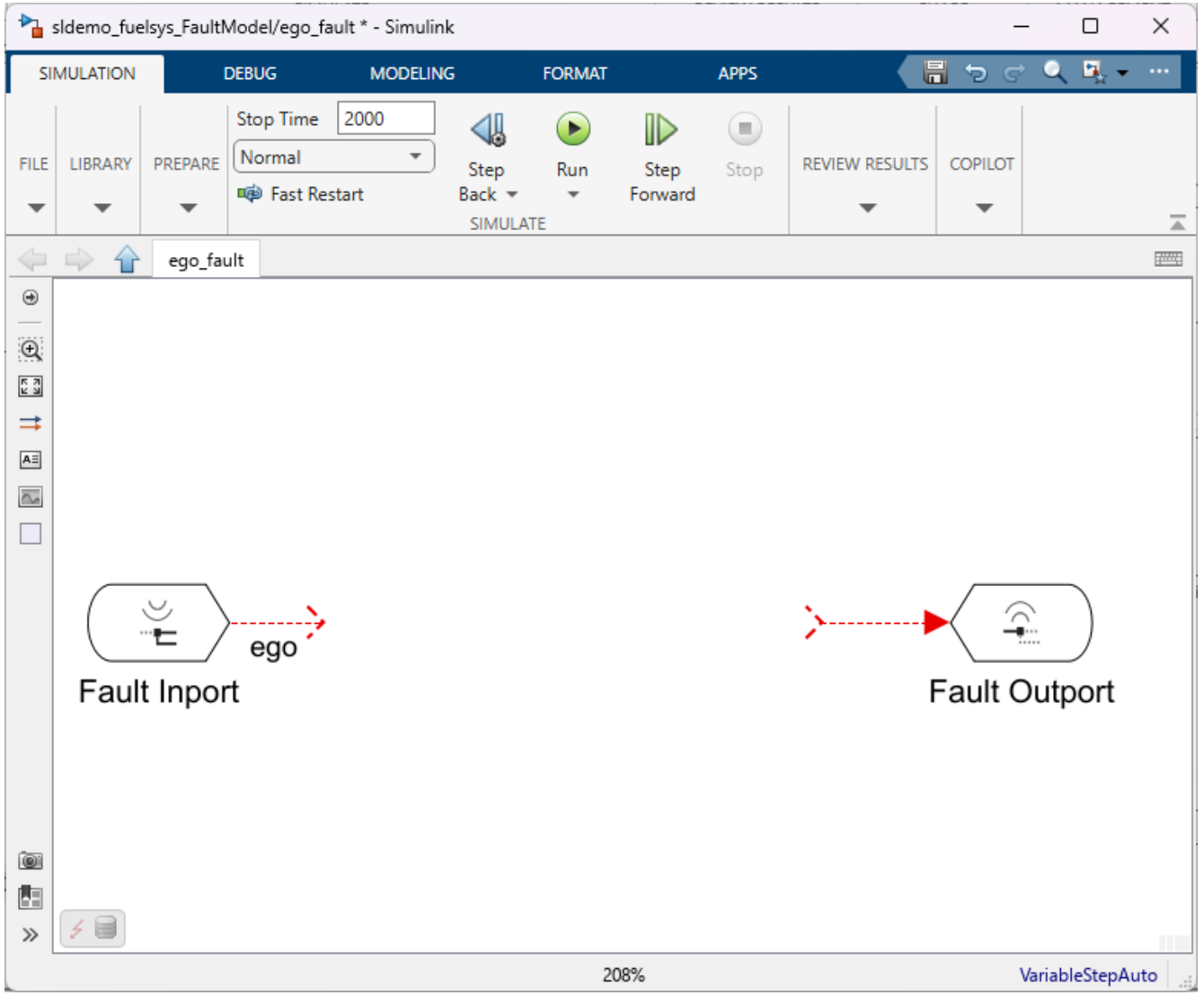
Select tested signal



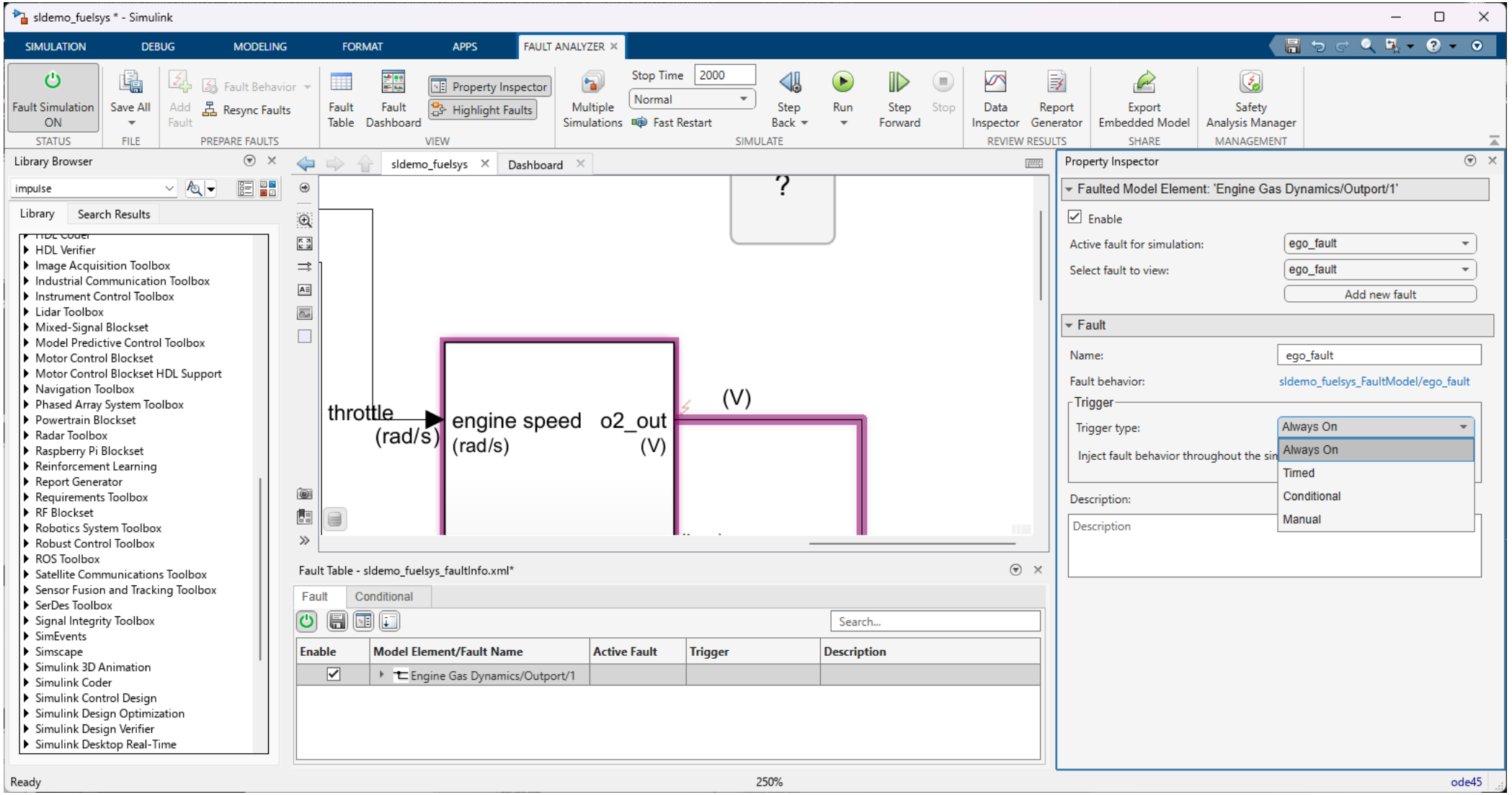
Model fault behaviour – built in



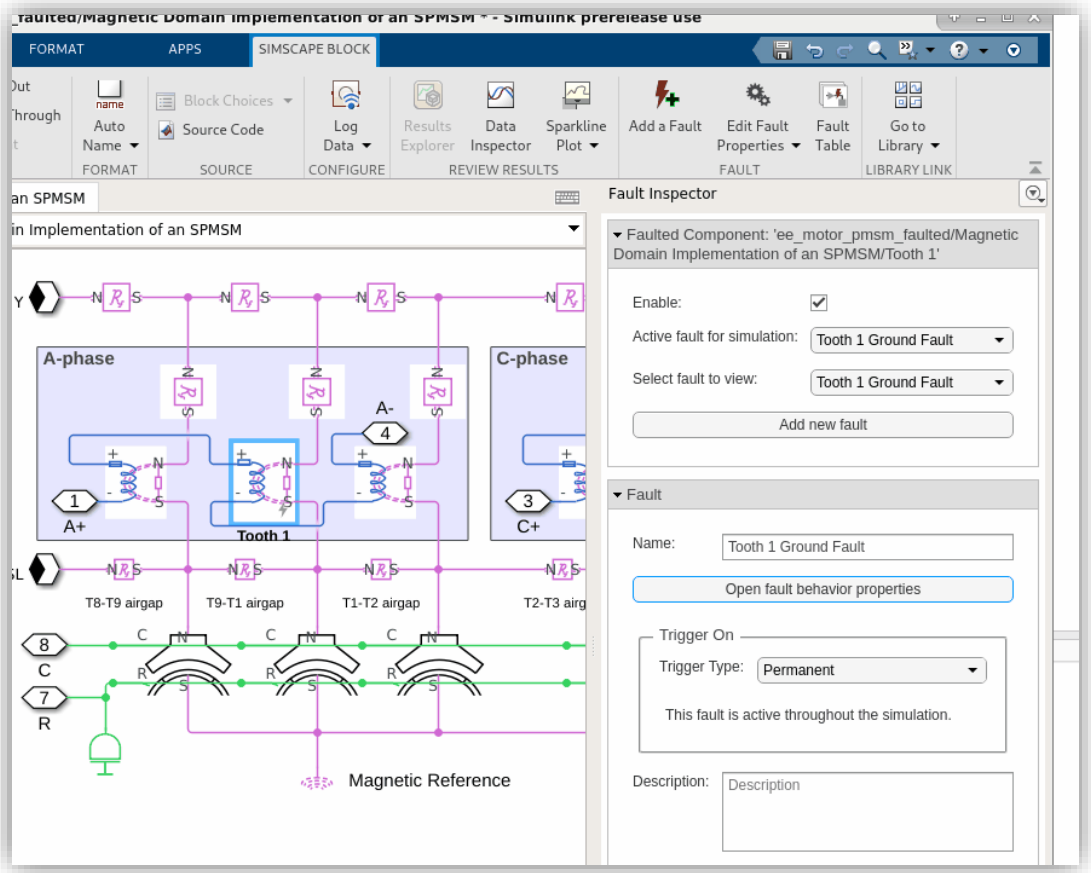
Model fault behaviour – custom

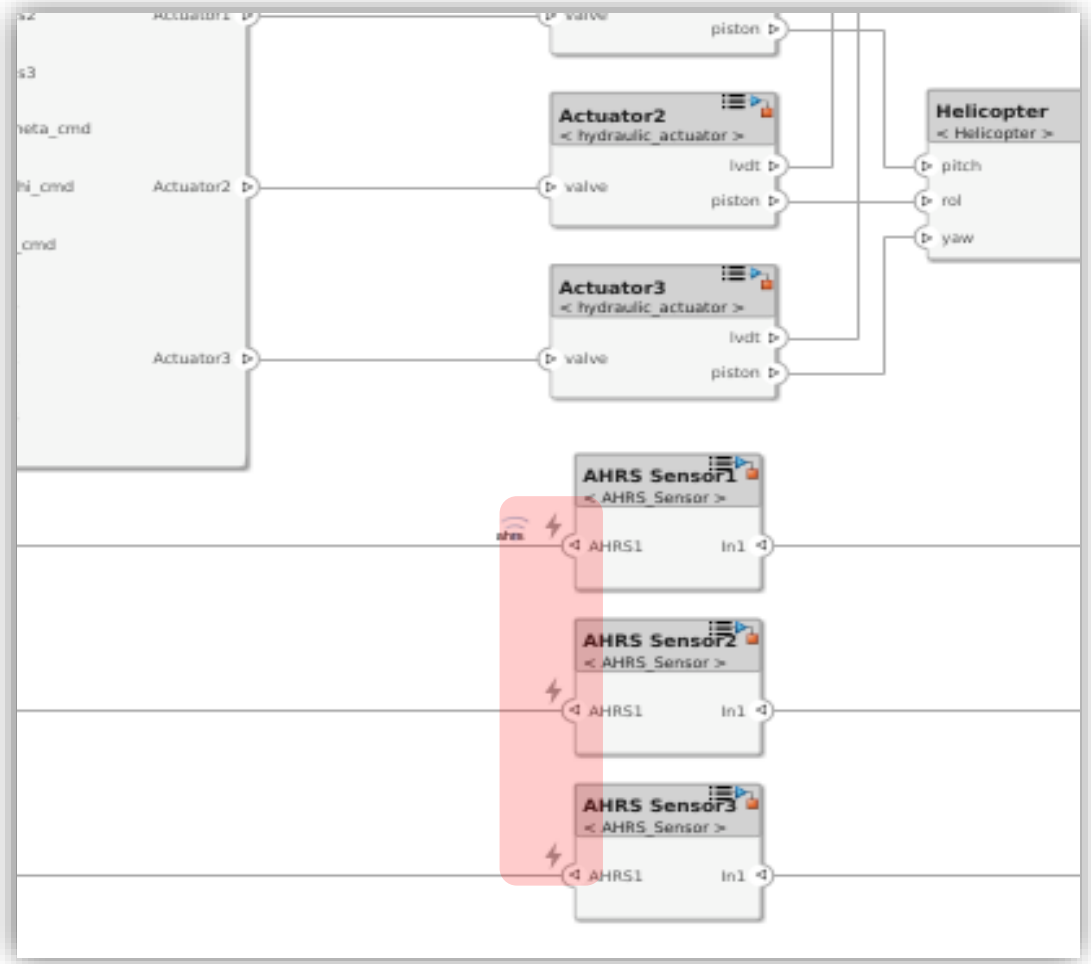


Configure trigger and run



Fault modeling framework across domains





What is Failure Mode and Effect Analysis (FMEA)

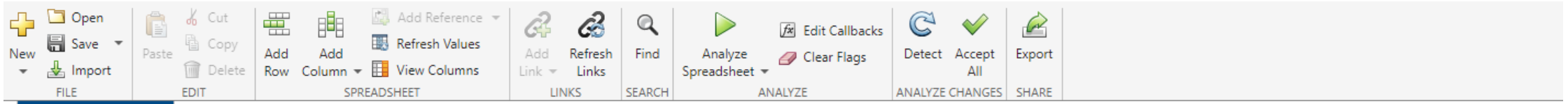
- Structured Methodology
- Identify and address potential failures in system
- Anticipate and mitigate failures
- Potential Causes? Potential Effects?

Proactive approach

FMEA bolsters integrity and robustness of designs

Systematic fault analysys – Safety Analysis Manager

- Link safety artifacts within MATLAB ecosystem (models, faults, requirements, tests)
- Use MATLAB to automate analysis and check for issues
- Validate assumptions using Simulink simulation results

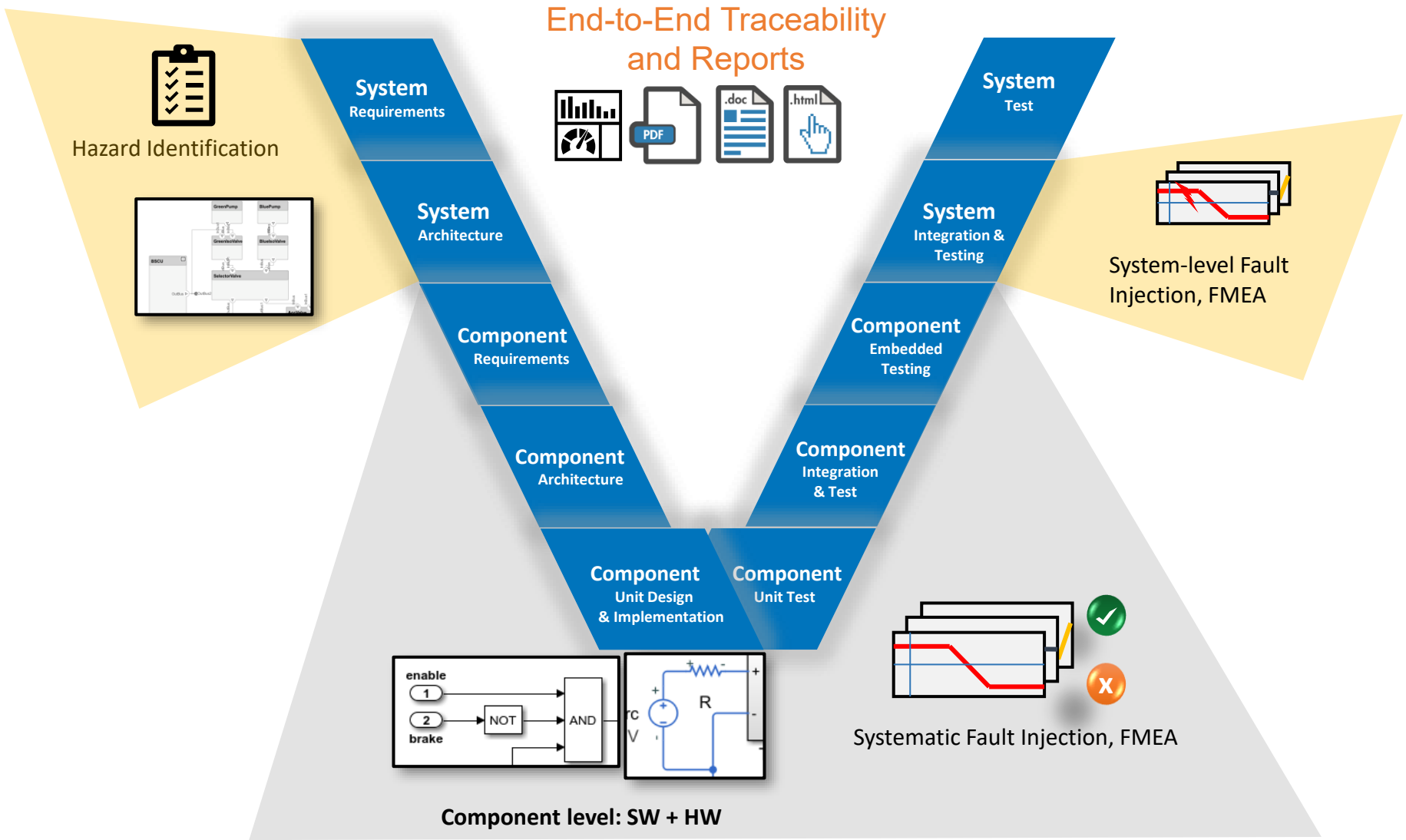


AircraftElevatorFMEA

	Function Name	Failure Mode	Failure Rate (E-06)	Flight Phase	Failure Effect	Detection Method	Severity	Occurrence	Detectability	Risk Priority Number (RPN)
1	Left Elevator Control	Hydraulic System 1 Failure	1000	Landing	Loss of Left Outer Actuator	Hydraulic System 1 Monitor	4	3	3	36
2	Left Elevator Control	Hydraulic System 2 Failure	1000	Landing	Loss of Left Inner Actuator	Hydraulic System 2 Monitor	4	3	3	36
3	Left Elevator Control	Hydraulic System 1 Failure and Hydraulic System 2 Failure	1	Landing	Loss of Control of Left Elevator	Hydraulic System 1 Monitor Hydraulic System 2 Monitor	9	1	3	27
4	Right Elevator Control	Right Inner Actuator Position Failure	1000	Landing	Degraded Control of Right Elevator	Right Inner Position Monitor	4	3	3	36
5	Right Elevator Control	Right Outer Actuator Position Failure	1000	Landing	Degraded Control of Right Elevator	Right Outer Position Monitor	4	3	3	36
6	Right Elevator Control	Right Inner Actuator Position Failure and Right Outer Actuator Position Failure	1	Landing	Loss of Control of Right Elevator	Right Inner Position Monitor Right Outer Position Monitor	9	1	3	27

© 2026 www.ont.com.pl

Simulink Fault Analyzer for End-to-End safety analysis



matlab.pl

ONT MATLAB

Oprogramowanie-
Naukowo-Techniczne

www.ont.com.pl

MATLAB EXPO

Konrad Kolski

Application Engineer, ONT

konrad.kolski@ont.com.pl

Oprogramowanie
Naukowo-Techniczne
sp. z o.o.

MathWorks®
Authorized Reseller