For developing an assurance case for the BlueROV2 system using Goal Structuring Notation (GSN), I'll outline the key goals, context, evidence, and sub-goals necessary to substantiate the claim that the BlueROV2 is safe and reliable for underwater operations. The BlueROV2, used for tasks like research, inspection, and exploration under water, must demonstrate reliability in its mechanical, electrical, software, and operational aspects.

### Top Level Goal

- G1: \*\*Ensure BlueROV2 operates safely and reliably in underwater environments\*\*

### Sub-goals

- G1.1: \*\*Ensure mechanical integrity of BlueROV2\*\*

- C1.1: Context describing mechanical design specifications

- Sn1.1: Strategy based on compliance to international underwater equipment standards

- G1.1.1: Validate material selection for pressure and corrosion resistance

- E1.1.1: Material test reports and certificates

- G1.1.2: Validate structural design under simulated operational pressures

- E1.1.2: Structural simulation reports

- G1.2: \*\*Ensure electrical systems perform consistently and safely\*\*

- C1.2: Context describing electrical design and components used

- Sn1.2: Strategy based on conformity to electrical safety standards

- G1.2.1: Ensure all electrical components are waterproof and appropriate for rated depths

- E1.2.1: Waterproof certification of components

- G1.2.2: Ensure electrical circuit integrity and reliability

- E1.2.2: Test logs of electrical system functionality from field tests

- G1.3: \*\*Ensure software running on BlueROV2 is robust and secure\*\*

- C1.3: Context regarding software development practices and overview

- Sn1.3: Strategy based on software development life cycle adherence

- G1.3.1: Software code meets coding standards and is peer-reviewed

- E1.3.1: Peer review reports and coding standard compliance checks

- G1.3.2: Software has been rigorously tested under simulated and real operating conditions

- E1.3.2: System test and field test reports

- G1.4: \*\*Ensure operational procedures for BlueROV2 enhance safety and reliability\*\*

- C1.4: Context detailing training, operational guidelines, and emergency procedures

- Sn1.4: Strategy based on thorough training and adherence to established operational procedures

- G1.4.1: Operators are adequately trained

- E1.4.1: Training session records and operator certifications

- G1.4.2: Comprehensive set of operational and emergency procedures are established and practiced

- E1.4.2: Documentation of procedures and incident logs

### Supporting Evidence

- E1: \*\*Test reports and certification documents for all sub-components\*\*

- E2: \*\*Logs and records of operational procedures and outcomes\*\*

This GSN tree structure provides a hierarchical breakdown of how each element contributes to the overall goal through more specific goals supported by contextual information and tangible evidence. This structure aids in thorough evaluation and confidence in the BlueROV2 system’s operational safety and reliability.