Based on the assurance case pattern provided, here is a tailored assurance case for the BlueROV2 system. This example fills in the placeholders with specific information about the BlueROV2 system and removes undeveloped or uninstantiated decorators where applicable.

### Assurance Case Hierarchical Structure for BlueROV2 System:

- \*\*G1: Hazards for BlueROV2 system addressed in accordance with ALARP principle\*\*

- \*\*S1: Argument by risk reduction/elimination of each hazard\*\*

- \*\*G2: No intolerable risks present in the system\*\*

- \*\*C1: Definition of "intolerable"\*\*

- \*\*S2: Argue that risk posed by any remaining hazards is negligible\*\* (Uninstantiated)

- \*\*S3: Argue that no other risks have been identified\*\* (Uninstantiated)

- \*\*G3: Risk from mechanical failures has been reduced as low as reasonably practicable\*\*

- \*\*C2: Assigned severity class is high\*\*

- \*\*S4: Apply ReSonAte to estimate level of risk from hazard condition mechanical failures\*\*

- \*\*A1: Function pressure containment is available\*\*

- \*\*G4: Model failure analysis accurately describes possible propagation of hazard mechanical failures\*\*

- \*\*G6: Possible hazard propagation paths correctly captured in failure analysis\*\* (Undeveloped)

- \*\*G7: Barriers in the failure analysis correctly describe their respective control action including any required system functions\*\* (Undeveloped)

- \*\*G8: All non-negligible threats have been identified\*\* (Undeveloped)

- \*\*G5: Quantitative risk estimates are accurate and below acceptable threshold\*\*

- \*\*G9: State probability distribution used for risk estimation is an accurate representation of expected system states\*\* (Undeveloped)

- \*\*G10: Estimated probability of catastrophic consequences is below allowable threshold for severity class high\*\*

- \*\*Sn1: Estimated risk level 0.002 (per operation hour)\*\*

This hierarchical structure represents the instantiation of the assurance case pattern to a specific system, the BlueROV2, used in undersea operations. It addresses the core concern of hazard management within a risk context governed by the "As Low As Reasonably Practicable" (ALARP) principle and involves strategies that ensure the system is operated within safe thresholds.

\*\*Note\*\*:

- Undeveloped nodes indicate areas that require further elaboration either due to insufficient data or pending analysis.

- Uninstantiated reflects the areas which are conceptual in the assurance case but not yet specific to the system.

- Assumptions (like A1), solutions (like Sn1), and contexts (like C1, C2) directly feed into the goals and strategies, establishing foundational definitions or evidence needed to support the higher-level claims.