### Hierarchical Tree Format of the Assurance Case 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.\*\* (undeveloped)

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

- \*\*G3: Risk from underwater collision hazard has been reduced as low as reasonably practicable.\*\*

- \*\*C2: Assigned severity class is critical.\*\*

- \*\*S4: Apply ReSonAte to estimate level of risk from underwater collision hazard.\*\*

- \*\*A1: Function collision avoidance required by BTD is available.\*\*

- \*\*G4: Model BlueROV2 Threat Detection (BTD) accurately describes possible propagation of hazard underwater collision.\*\* (uninstantiated)

- \*\*G6: Possible hazard propagation paths correctly captured in BTD.\*\* (undeveloped)

- \*\*G7: Barriers in the BTD 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 collision is below allowable threshold for severity class.\*\* (uninstantiated)

- \*\*Sn1: Estimated risk level 0.001%.\*\* (uninstantiated)

In this hierarchical tree structure, goals (G) and strategies (S) are shown with their respective context (C), assumption (A), and solution (Sn), where appropriate. Predicates such as "HasMultiplicity" and "HasChoice" are implicit in the tree structure and decomposition of elements. Uninstantiated elements and undeveloped elements are marked accordingly.