In order to create an assurance case for the BlueROV2 system using the given assurance case pattern, we need to instantiate the various elements (placeholders) within the goals, strategies, and contextual information according to the BlueROV2 system specifics provided in the domain information. Below is the instantiated hierarchical tree structure of the assurance case:

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- Goal (G1, Hazards for BlueROV2 system addressed in accordance with ALARP principle.)

- Strategy (S1, Argument by risk reduction/elimination of each hazard)

- Goal (G2, No intolerable risks present in the system.)

- Goal (G3, Risk from obstacle encounter has been reduced as low as reasonably practicable.)

- Strategy (S4, Apply ReSonAte to estimate level of risk from hazard condition obstacle encounter)

- Goal (G4, Model obstacle encounter BTD accurately describes possible propagation of hazard obstacle encounter)

- Goal (G5, Quantitative risk estimates are accurate and below acceptable threshold)

- Goal (G9, State probability distribution used for risk estimation is an accurate representation of expected system states) [Undeveloped]

- Goal (G10, Estimated probability of collision is below allowable threshold for severity class Major.)

- Solution (Sn1, Estimated risk level 10^-3 per hour)

- Goal (G6, Possible hazard propagation paths correctly captured in BTD) [Undeveloped]

- Goal (G7, Barriers in the BTD correctly describe their respective control action including any required system functions) [Undeveloped]

- Goal (G8, All non-negligible threats have been identified) [Undeveloped]

- Context (C2, Assigned severity class is Major)

- Assumption (A1, Function avoidance logic required by obstacle encounter BTD is available) [Uninstantiated]

- Strategy (S2, Argue that risk posed by any remaining hazards is negligible) [Undeveloped]

- Strategy (S3, Argue that no other risks have been identified) [Undeveloped]

- Context (C1, Definition of "intolerable") [Uninstantiated]

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### Explanation of Instantiation and Organization:

1. \*\*Goal (G1)\*\* concerns the general assurance of hazard management within the BlueROV2 system concerning the ALARP principle.

2. \*\*Strategy (S1)\*\* supports \*\*G1\*\* by focusing on reducing or eliminating each identified hazard, leading to specific sub-goals:

- \*\*Goal (G2)\*\* ensures that no intolerable risks remain.

- \*\*Goal (G3)\*\* looks at the specific major hazard of obstacle encounters, supported by:

- \*\*Strategy (S4)\*\*, applying the specific risk estimation method.

- This supports further sub-goals (\*\*G4\*\* and \*\*G5\*\*), which assess the system's BTD and risk quantification, respectively.

3. \*\*Assumptions and Contexts\*\* are associated with these goals to ensure clarity in definitions and prerequisites like system functionalities are available.

4. Some goals and strategies are marked as [Undeveloped] indicating that further detail or resources need to be developed to fully support these claims. Similarly, elements marked as [Uninstantiated] need more specification or data.

This hierarchical tree structure visually illustrates the logical dependencies between goals, strategies, and supporting evidence or assumptions that form the full argumentation for the assurance of BlueROV2 according to the specified pattern.