To create the assurance case for the BlueROV2 system, we will instantiate the given assurance case pattern by replacing all the placeholders (“{}”) with specific information related to the BlueROV2 system, as provided in the domain information. We will also remove all the additional assurance case pattern decorators.

Below is the hierarchical tree representation of the assurance case using dashes (-) to denote different levels.

```

- 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.)

- Context (C1, Definition of "intolerable")

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

- Strategy (S3, Argue that no other risks have been identified) \*

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

- Context (C2, Assigned severity class is Major)

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

- Assumption (A1, Function avoidance logic required by Obstacle encounter BTD is available)

- Goal (G4, Model Obstacle encounter BTD accurately describes possible propagation of hazard Obstacle encounter) \*

- Goal (G6, Possible hazard propagation paths correctly captured in BTD) \*

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

- Goal (G8, All non-negligible threats have been identified) \*

- 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) \*

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

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

```

### Explanation

1. \*\*Goal G1\*\* is instantiated with "BlueROV2 system" replacing the placeholder `{A :: System}`.

2. \*\*Goal G3\*\* is instantiated with "Obstacle encounter hazard" replacing the placeholder `{B :: Hazard}`.

3. \*\*Context C2\*\* is instantiated with "Major" replacing the placeholder `{C :: Hazard.Severity}`.

4. \*\*Strategy S4\*\* is instantiated with "Obstacle encounter" replacing the placeholder `{R :: Hazard}`.

5. \*\*Assumption A1\*\* is instantiated with "avoidance logic" and "Obstacle encounter BTD" replacing the placeholders `{T: Function}` and `{S :: BTD}` respectively.

6. \*\*Goal G4\*\* is instantiated with "Obstacle encounter BTD" and "Obstacle encounter" replacing the placeholders `{S:: BTD}` and `{R:: Hazard}` respectively.

7. \*\*Goal G10\*\* is instantiated with "collision" replacing the placeholder `{U:: Consequence}`.

8. \*\*Solution Sn1\*\* is instantiated with "10^-3 per hour" replacing the placeholder `attr:RiskEst`.

The "undeveloped" elements are marked with an asterisk (\*), indicating parts of the argument that require further development. This tree structure reflects a safety case argument ensuring all identified hazards are addressed adequately and the risks are reduced to as low as reasonably practicable (ALARP) for the BlueROV2 system.