To create an assurance case for the BlueROV2 system using the provided assurance case pattern, I'll instantiate the placeholders with domain-specific information and follow the three steps:

### Step 1: Create the Assurance Case Using Only Elements and Decorators Defined for Assurance Cases

#### Goal 1 (G1):

"Goal(Hazards for the BlueROV2 system addressed in accordance with the ALARP principle.)"

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

- Goal 2 (G2): No intolerable risks present in the system

- Goal 3 (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

- Goal 4 (G4): Model obstacle encounter BTD accurately describes possible propagation of hazard obstacle encounter

- Goal 6 (G6): Possible hazard propagation paths correctly captured in BTD

- Goal 7 (G7): Barriers in the BTD correctly describe their respective control action including any required system functions

- Goal 8 (G8): All non-negligible threats have been identified

- Goal 5 (G5): Quantitative risk estimates are accurate and below acceptable threshold

- Goal 9 (G9): State probability distribution used for risk estimation is an accurate representation of expected system states

- Goal 10 (G10): Estimated probability of collision is below allowable threshold for severity class

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

- Assumption (A1): Function avoidance logic required by obstacle encounter BTD is available

- Strategy (S2): Argument by negligible risks

- Strategy (S3): Argument by no unidentified risks

- Context (C1): Definition of "intolerable"

### Step 2: Remove All Assurance Case Pattern Decorators

### Step 3: Replace All Placeholders with System-Specific Information

#### Instantiated Assurance Case for BlueROV2

- \*\*Goal (G1): Hazards for the BlueROV2 system addressed in accordance with the 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): Argument by negligible risks\*\* \*(Undeveloped)\*

- \*\*Strategy (S3): Argument by no unidentified risks\*\* \*(Undeveloped)\*

- \*\*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\*\* \*(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)\*

- \*\*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\*\*

- \*\*Solution (Sn1): Estimated risk level 10^-3 per hour\*\*

### Final Hierarchical Tree Format

```

- G1: Hazards for the BlueROV2 system addressed in accordance with the ALARP principle.

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

- G2: No intolerable risks present in the system

- C1: Definition of "intolerable"

- S2: Argument by negligible risks \*(Undeveloped)\*

- S3: Argument by no unidentified risks \*(Undeveloped)\*

- G3: Risk from obstacle encounter hazard has been reduced as low as reasonably practicable

- C2: Assigned severity class is Major

- S4: Apply ReSonAte to estimate level of risk from hazard condition obstacle encounter

- A1: Function avoidance logic required by obstacle encounter BTD is available

- G4: Model obstacle encounter BTD accurately describes possible propagation of hazard obstacle encounter

- 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 collision is below allowable threshold for severity class

- Sn1: Estimated risk level 10^-3 per hour

```