Using the described security case pattern, let's instantiate a security case for ACAS Xu, by adapting the placeholders to the specific details of the ACAS Xu system. Since the main challenge is ensuring that the system's architecture is protected against identified security threats, the security threats mentioned in the domain information (ST1: Tampering, ST2: Spoofing, ST3: Elevation of privileges) will be used to instantiate the security goals G0.X.

### Assurance Case for ACAS Xu

```

@Assurance\_case

- G0: ACAS Xu satisfies security requirements

- C0: ACAS Xu is an unmanned aerial vehicle collision avoidance system.

- C1: Security requirements focus on protection against malicious tampering, spoofing, and unauthorized access.

- J0: The argumentation is based on the satisfaction of security requirements decomposed from asset protection and secure system development.

- A0: The system security requirements for ACAS Xu are complete, adequate, and consistent.

- S0: Argue through asset protection and secure development requirements

- G1: ACAS Xu satisfies the asset protection requirements

- A1: An asset inventory for ACAS Xu is established.

- S1: Argue through the different stages of the system development life cycle

- G3: Asset protection requirements are met during the architecture design phase

- C2: ACAS Xu’s architecture includes components like sensors, processors, planner, and actuators.

- S2: Argue through deriving security threats from SRs

- G5: ACAS Xu architecture is protected against identified security threats (ST1, ST2, ST3)

- A2: All relevant threats to ACAS Xu have been identified.

- S3: Argue over each security threat

- G0.1: ACAS Xu architecture is protected against ST1 (Tampering)

- G0.2: ACAS Xu architecture is protected against ST2 (Spoofing)

- G0.3: ACAS Xu architecture is protected against ST3 (Elevation of privileges)

- G6: ACAS Xu architecture is validated (undeveloped)

- C3: Considerations include formal verification through architectural models and simulations.

- A3: ACAS Xu architectural model and simulation capabilities are assumed to be robust and accurate. (undeveloped)

- G4: Asset protection requirements are met during other phases (undeveloped)

- G2: ACAS Xu satisfies secure development requirements (undeveloped)

- IncontextOf (G0, [C0, C1, J0, A0], 1)

- IncontextOf (G1, A1, 3)

- IncontextOf (G3, C2, 5)

- IncontextOf (S2, J1, 6)

- IncontextOf (G5, A2, 7)

- IncontextOf (G6, [C3, A3], 7)

- HasMultiplicity (this section will be simplified in the textual representation for readability)

- IsOptional (This clause describes contingencies where some goals might not directly apply all the time)

@End\_Assurance\_case

```

This assurance case provides a hierarchical structure that demonstrates how each component of the ACAS Xu meets its security requirements and defends against identified security threats, instantiated based on theoretical patterns.