To create a security case for ACAS Xu based on the given security pattern, we need to replace placeholders with specific information applicable to ACAS Xu and address the uninitialized and undeveloped decorators as per the scenario provided. We will instantiate and develop the example as detailed below.

### Security Case for ACAS Xu

@Assurance\_case

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G0: ACAS Xu satisfies security requirements

S0: Argue through asset protection and secure development requirements

C0: Description of ACAS Xu

C1: SR are requirements about protecting the system from malicious entities

J0: The argumentation is based on the satisfaction of specific security requirements (SR1-SR4) for ACAS Xu

A0: The System SRS for ACAS Xu are complete, adequate, and consistent

G1: ACAS Xu satisfies the asset protection requirements

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

A1: Asset inventory for ACAS Xu is established

G3: Asset protection requirements are met during the architecture design phase of ACAS Xu

S2: Argue through deriving security threats from SRs

C2: Description of the architectural components of ACAS Xu (sensors, processors, planners, actuators)

G5: ACAS Xu architecture is protected against identified security threats

S3: Argue over each security threat

G0.1: ACAS Xu architecture is protected against ST1 (Tampering with GPS and processor)

G0.2: ACAS Xu architecture is protected against ST2 (Spoofing of sensor data to the processor)

G0.3: ACAS Xu architecture is protected against ST3 (Elevation of privileges within the Planning system)

A2: All relevant threats (ST1, ST2, ST3) have been identified and mapped to security requirements (SR1-SR3)

J1: Detection and mitigation of threats through architectural design effectively fulfills SR1-SR3

G6: ACAS Xu architecture is validated

C3: Description of formal methods used in validating the ACAS Xu architecture model

A3: ACAS Xu architecture model is well-defined in formal methods

G2: ACAS Xu satisfies secure development requirements (undeveloped)

J1: (inherits from above context for undeveloped strategy)

G4: Asset protection requirements are met during other phases of ACAS Xu development (undeveloped)

```

@End\_Assurance\_case

### Explanation:

- \*\*G0 to G6\*\* are instantiated with specific system information and steps in the security case related to ACAS Xu.

- \*\*S0 to S3\*\* outline the strategies used to argue the completion and defense against security threats.

- \*\*C0 to C3\*\* provide context clarifying the description of the system, its components, and its validation model.

- \*\*J0 and J1\*\* justify that the argumentation follows from the satisfaction of SRs and how the threats are handled.

- \*\*A0 to A3\*\* make assumptions about the completeness of requirements, asset inventory, threat identification, and model definition efficiency using formal methods.

- Gaps in G2 and the related goals indicate areas that need further development. The use of undeveloped and uninstantiated decorators indicates placeholders for future work on ensuring that secure development requirements are met thoroughly, complemented by a full validation of the phases involved.

This structured hierarchy effectively translates the generic pattern to a specific security assurance case tailored to the operational scenario of ACAS Xu.