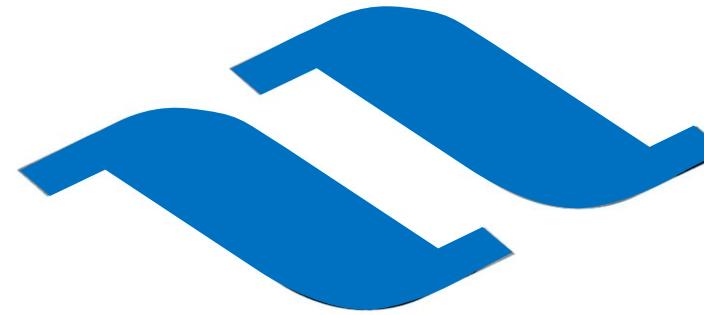


# The S80 Submarine Systems Engineering Journey

José Torres

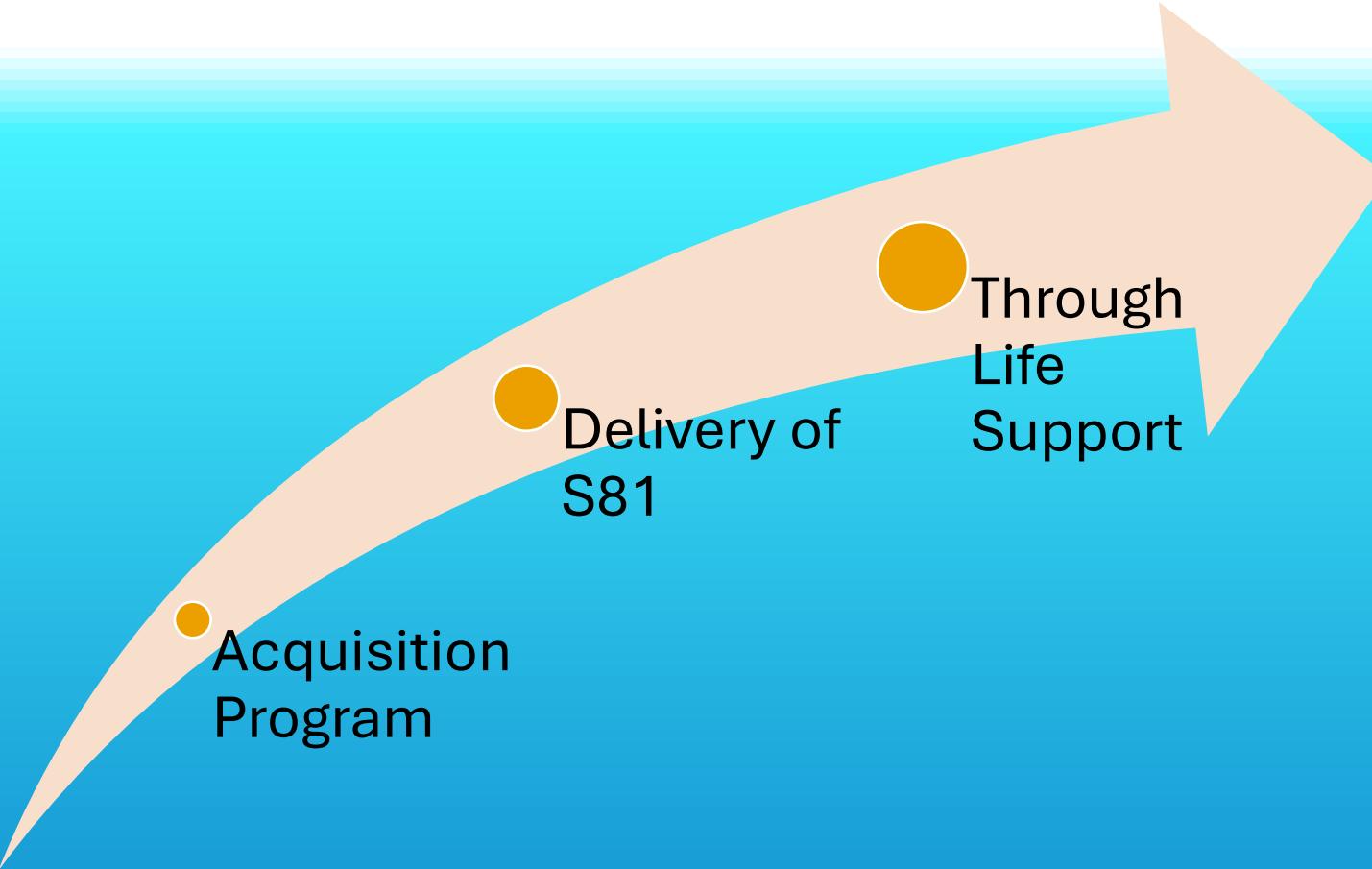
Digital Transformation Submarine Business  
Navantia



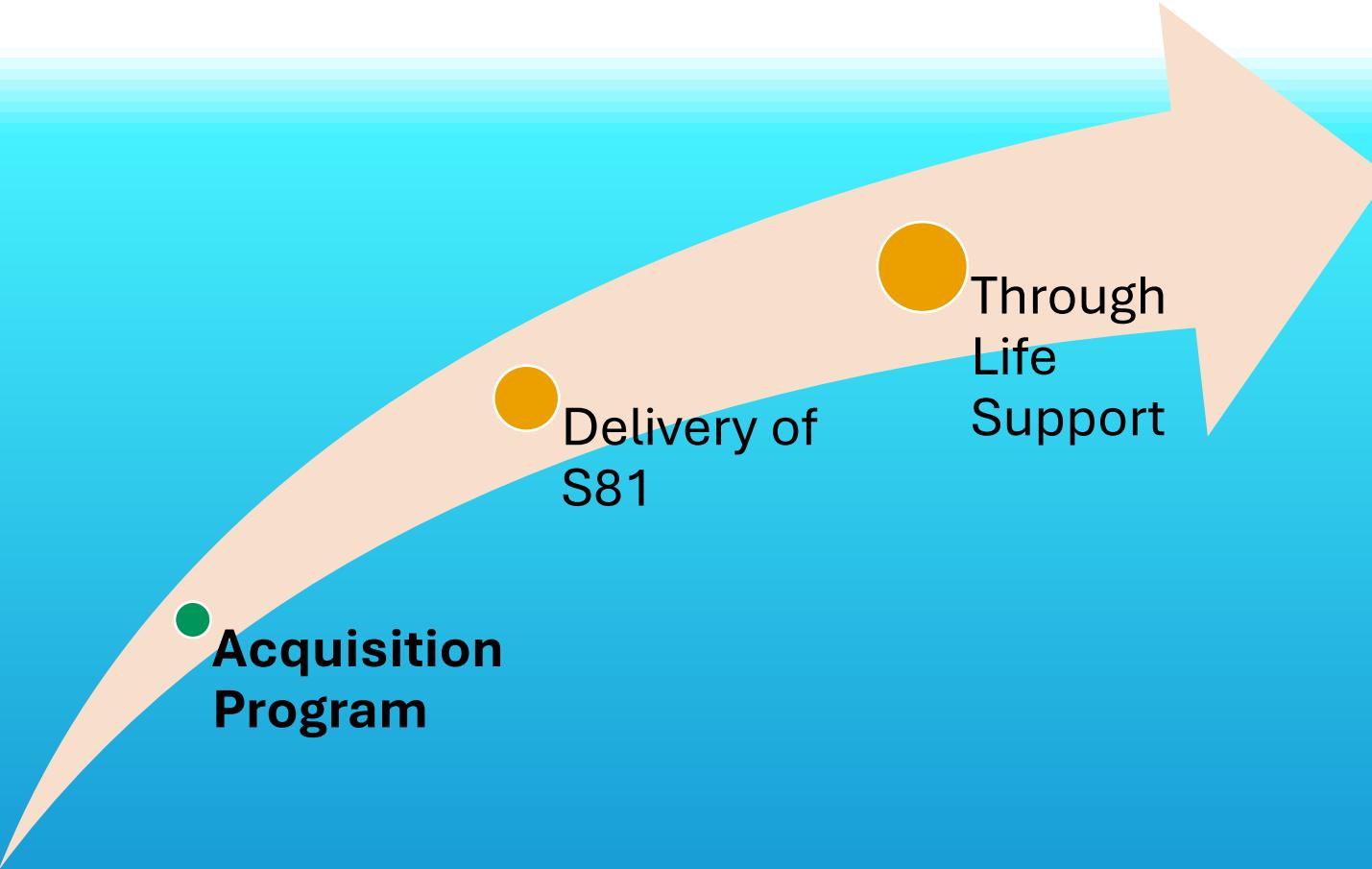


# Navantia

## The S80 Submarine Systems Engineering journey.



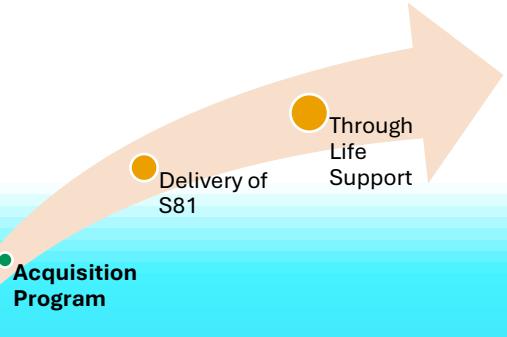
# The S80 Systems Engineering journey.

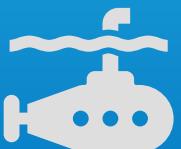
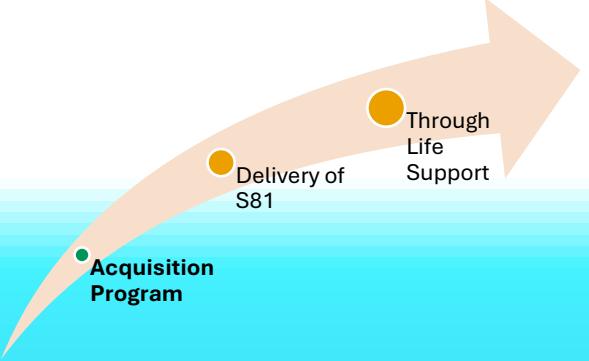


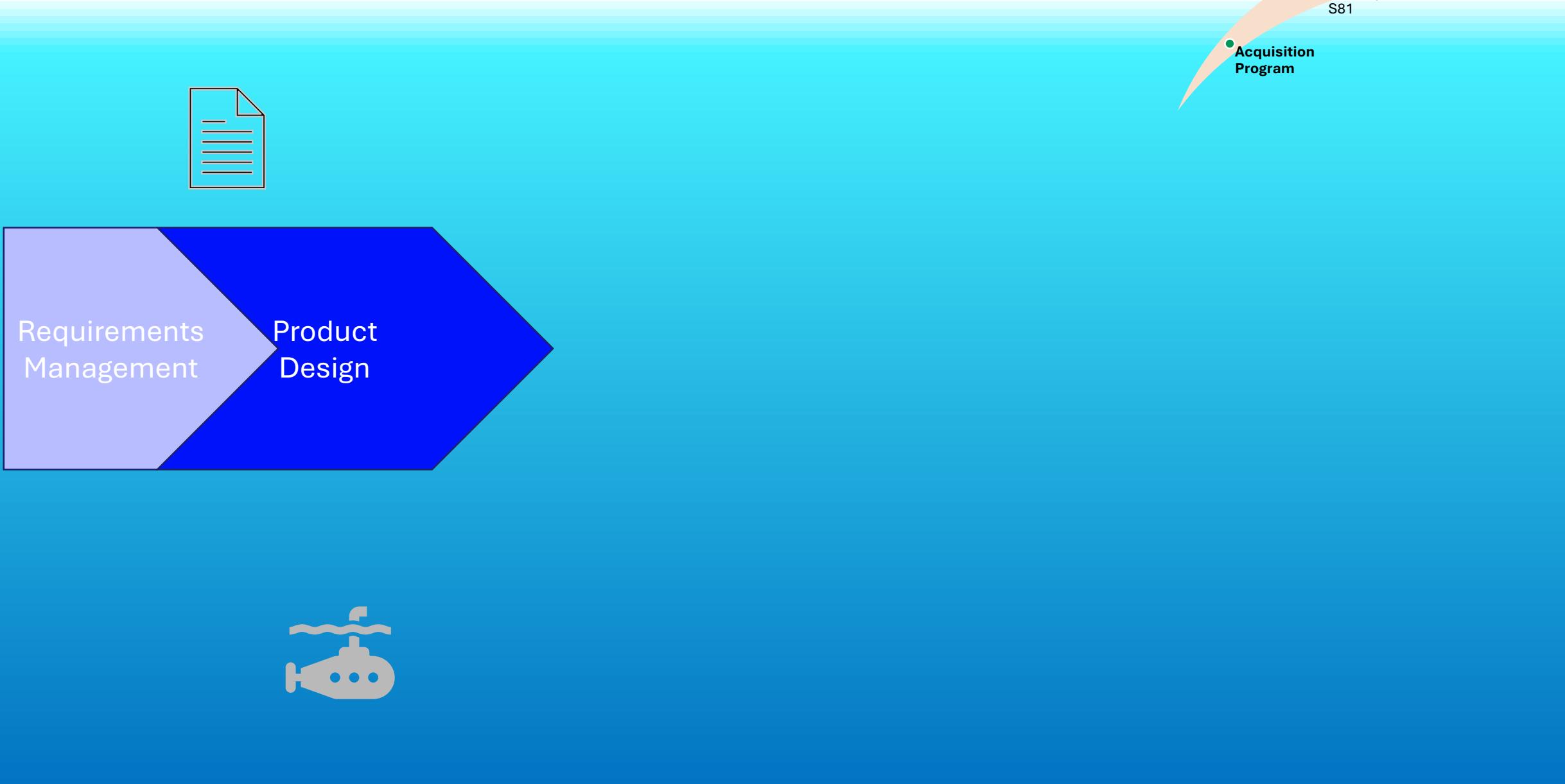
# The S80 Systems Engineering journey. The legacy

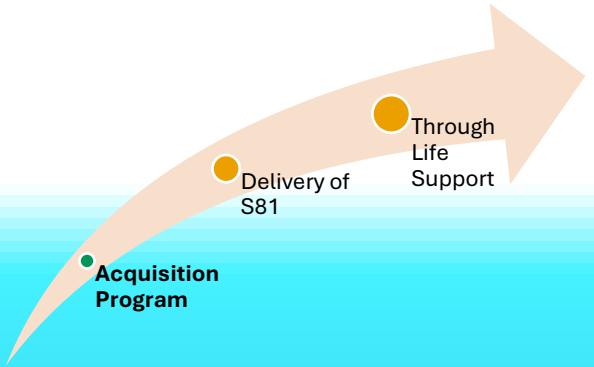
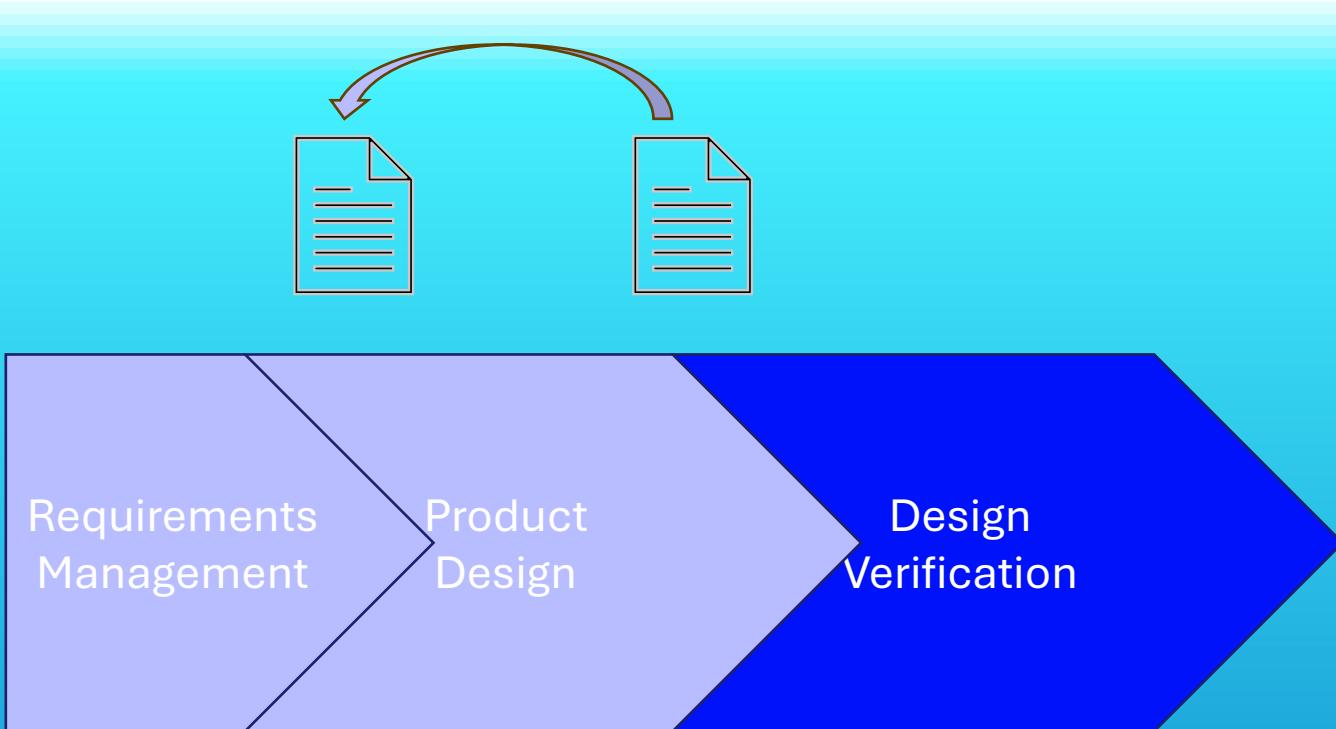


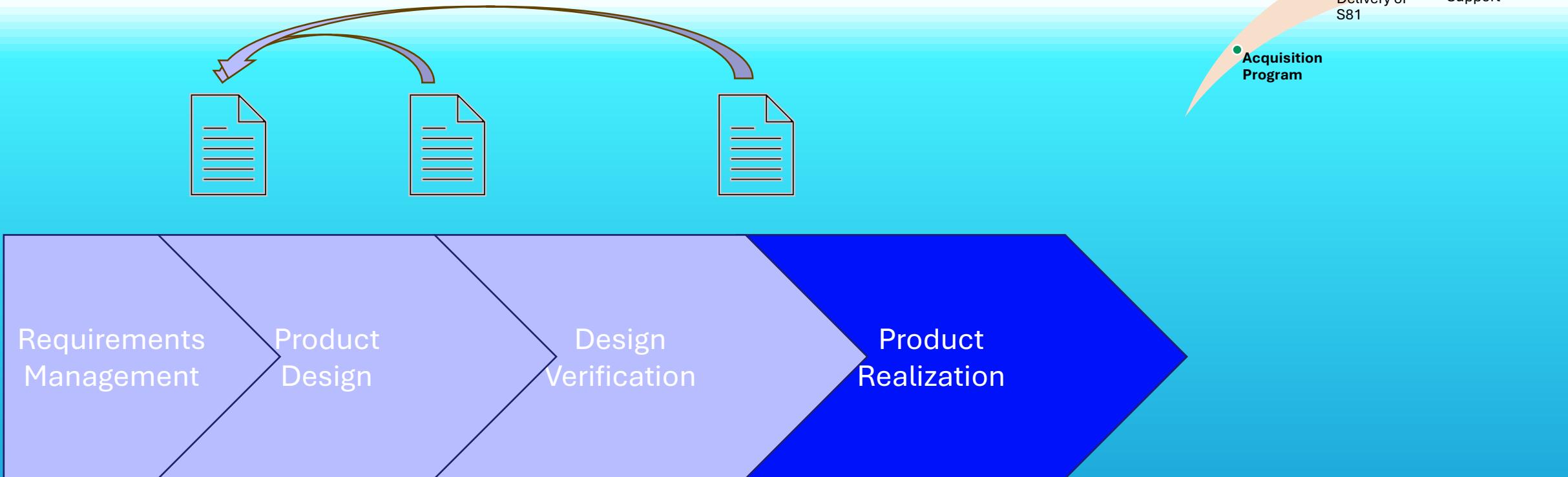
**The S80 Systems Engineering approach.**

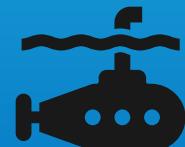
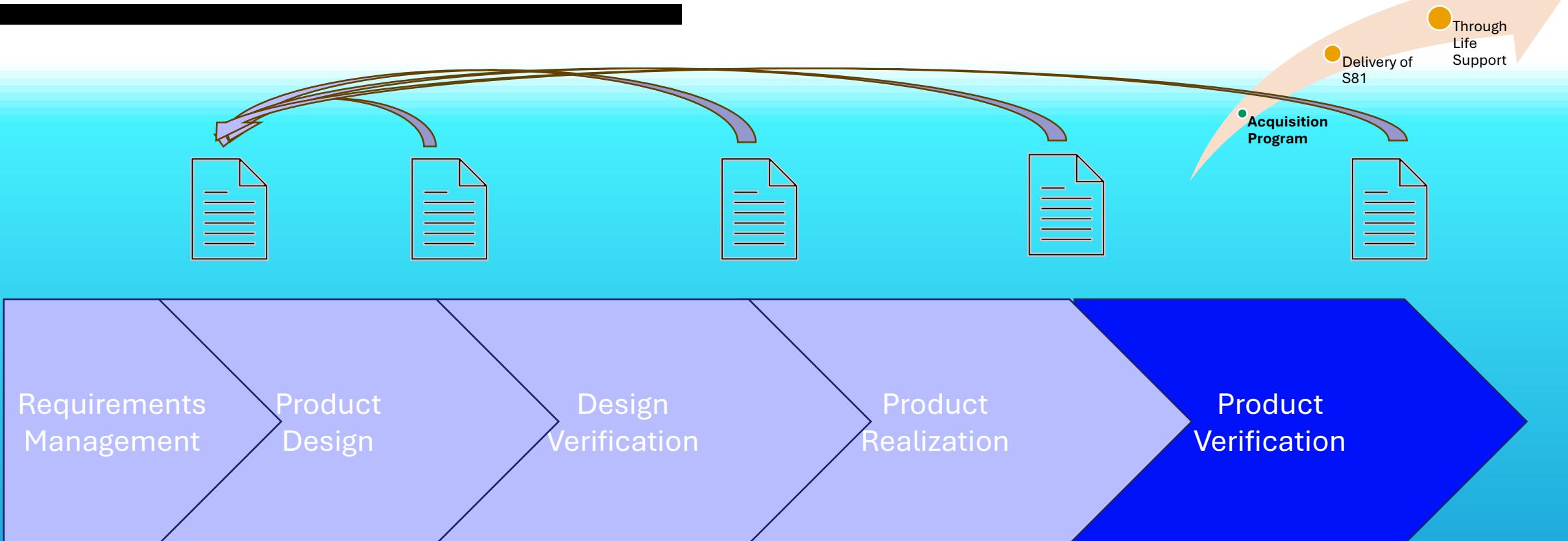


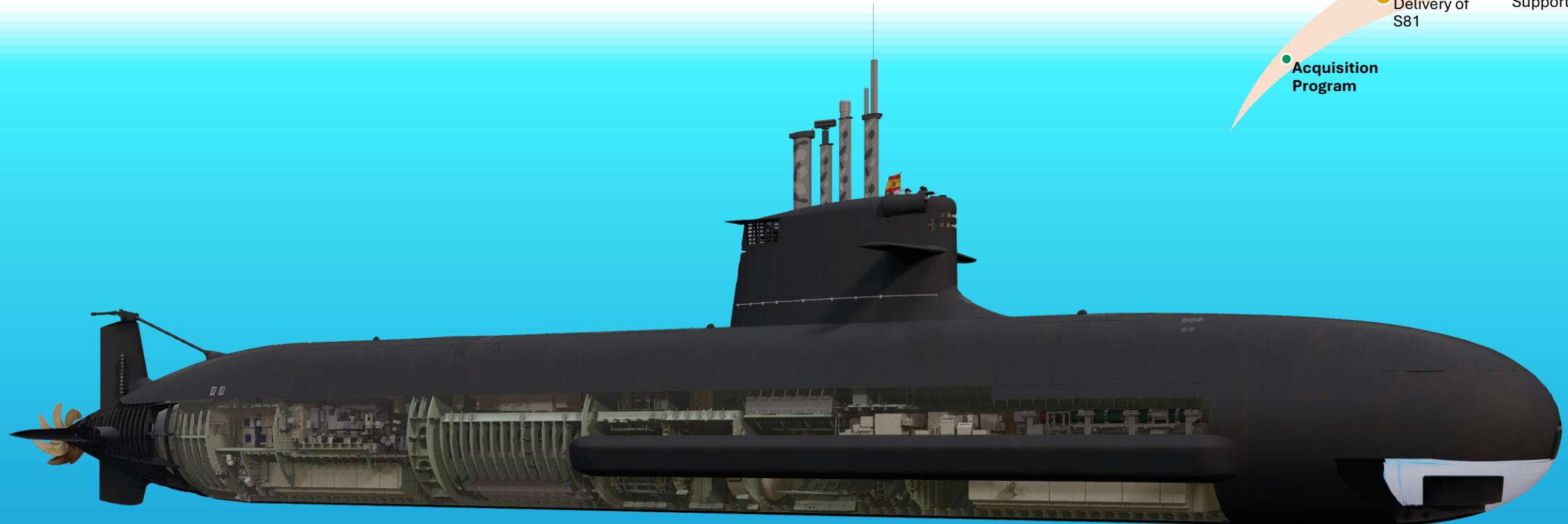












Delivery of  
S81

Through  
Life  
Support

Acquisition  
Program



Delivery of  
S81

Through  
Life  
Support

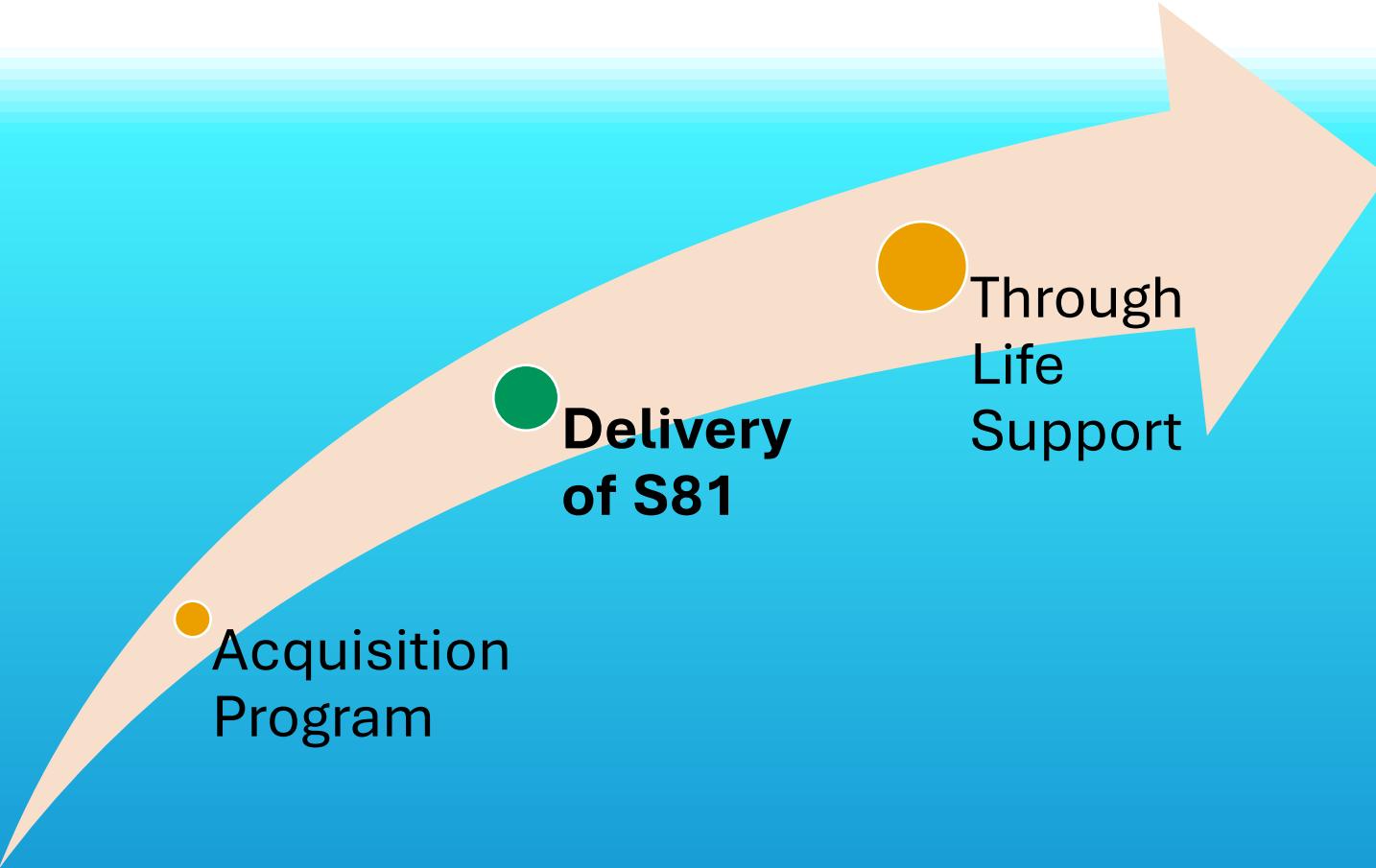
Acquisition  
Program



Delivery of  
S81

Through  
Life  
Support

Acquisition  
Program



# The S80 Systems Engineering journey. The breakthrough



## The Navantia Through Life Support current situation

- Navantia is currently providing through life Support to the Spanish Navy and other navies using a preventive methodology.
- Current maintenance of the units based on a detailed scope, prepared by the Spanish Navy concurrent with the scheduled maintenance.
- Scheduled maintenance of every unit is a deliverable of the respective Acquisition Program

Through  
Life  
SupportDelivery of  
S81Acquisition  
Program

## The Navantia Through Life Support Services

### Some navies that already trust us:



"I am extremely impressed by the cooperation and teamwork between the U.S. and Spain. I spoke with a few individuals before the ribbon cutting ceremony, and there was a common trait of each conversation; hard work and dedication. I have complete confidence in the success of forward deployed naval forces (FDNF) in Rota"

NAVSEA Commander Vice-Admiral William Hilarides

Velazquez, 132. 28006 Madrid . España  
Teléfono: +34913358 400  
E-mail: [acy@navantia.es](mailto:acy@navantia.es)  
[www.navantia.es](http://www.navantia.es)



### THROUGH LIFE SUPPORT SERVICES



## The vision of the Spanish Navy Sustainement Admiralty

III. La eficacia operativa y la eficiencia en la gestión como objetivos permanentes del arsenal. En tres vertientes diferenciadas (3E):

- *Eficacia Operativa*, con el objeto de mantener el más alto nivel posible de disponibilidad operativa de las unidades y de sus sistemas, equipos y componentes. La calidad de las acciones de sostenimiento y el menor consumo del recurso "tiempo", en mantenimiento o para la restauración de una capacidad, darán una buena medida de esta.
- *Eficiencia Económica*, de forma que se maximice el rendimiento de la disponibilidad presupuestaria para cubrir las necesidades de las unidades a sostener y del propio arsenal. El rendimiento obtenido de los créditos asignados será el factor más relevante para su medida.
- *Eficiencia Medioambiental*, con objeto de lograr una óptima gestión de residuos (conforme a los estándares más exigentes) y aumentar la eficiencia energética, incluso mediante la autogeneración de energía no contaminante, para tratar de alcanzar al objetivo de una huella cero de CO2. Los factores "contaminación" y "mínimo gasto energético" son los de mayor relevancia.

VII. El conocimiento preciso en todo momento de la situación logística de las unidades y la predicción de su evolución, que permita adelantarse a sus necesidades de sostenimiento mediante la "prescripción" de soluciones.

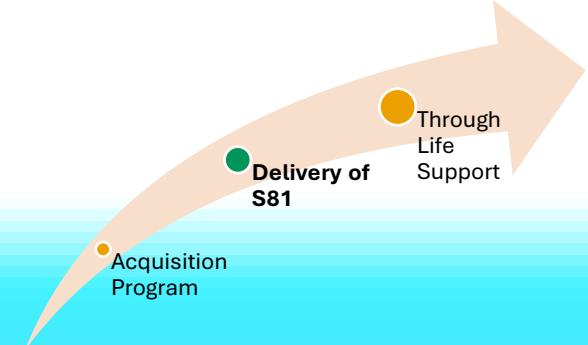
- Availability

- Efficiency

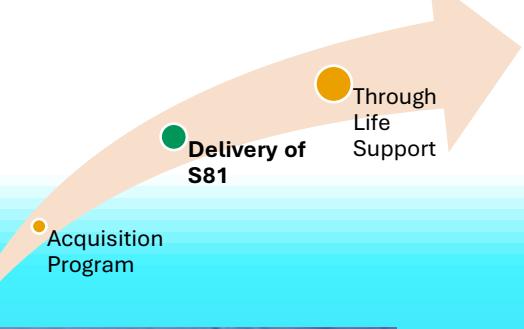
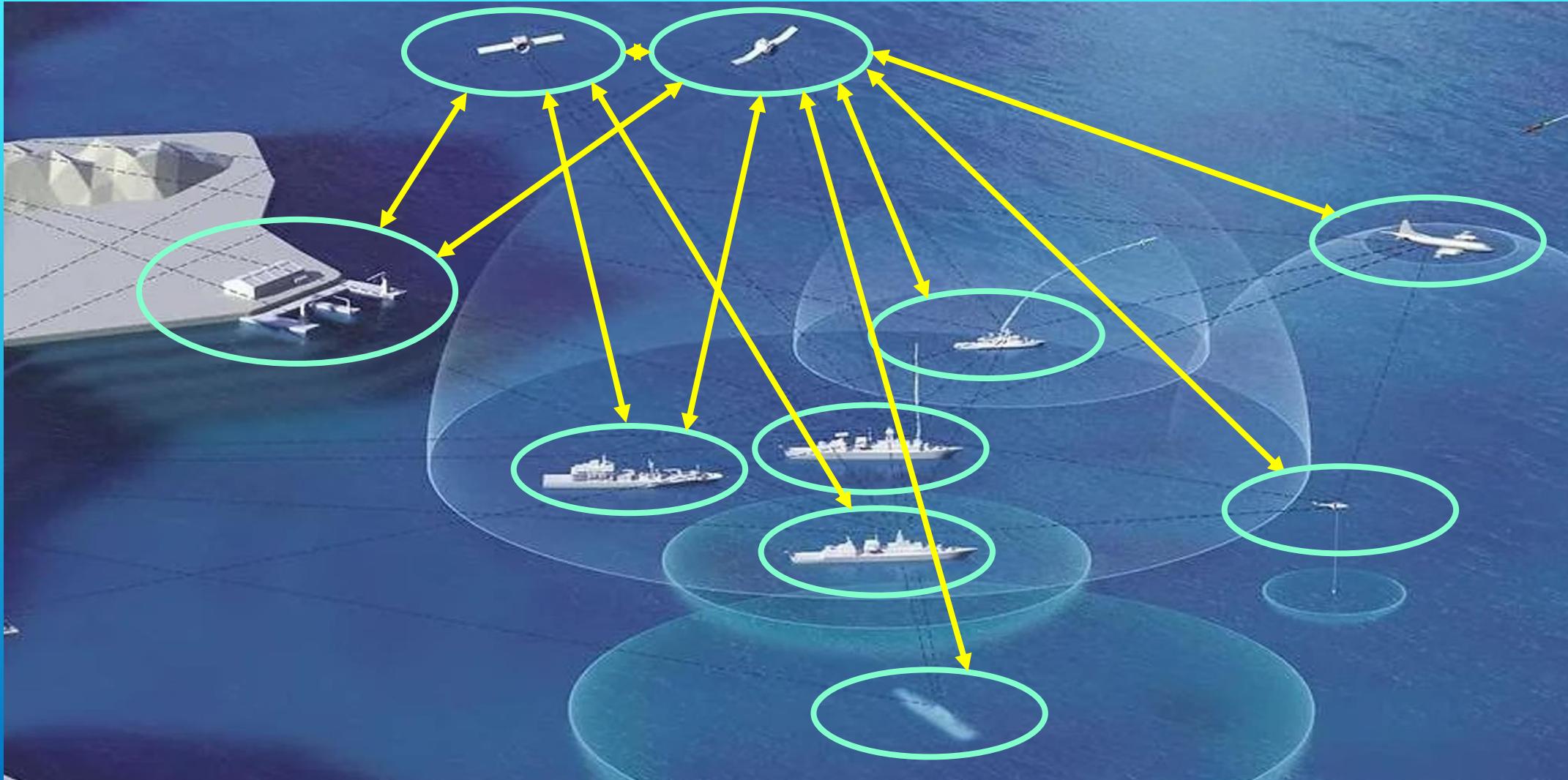
- Environmental friendly

- Current status of fleet

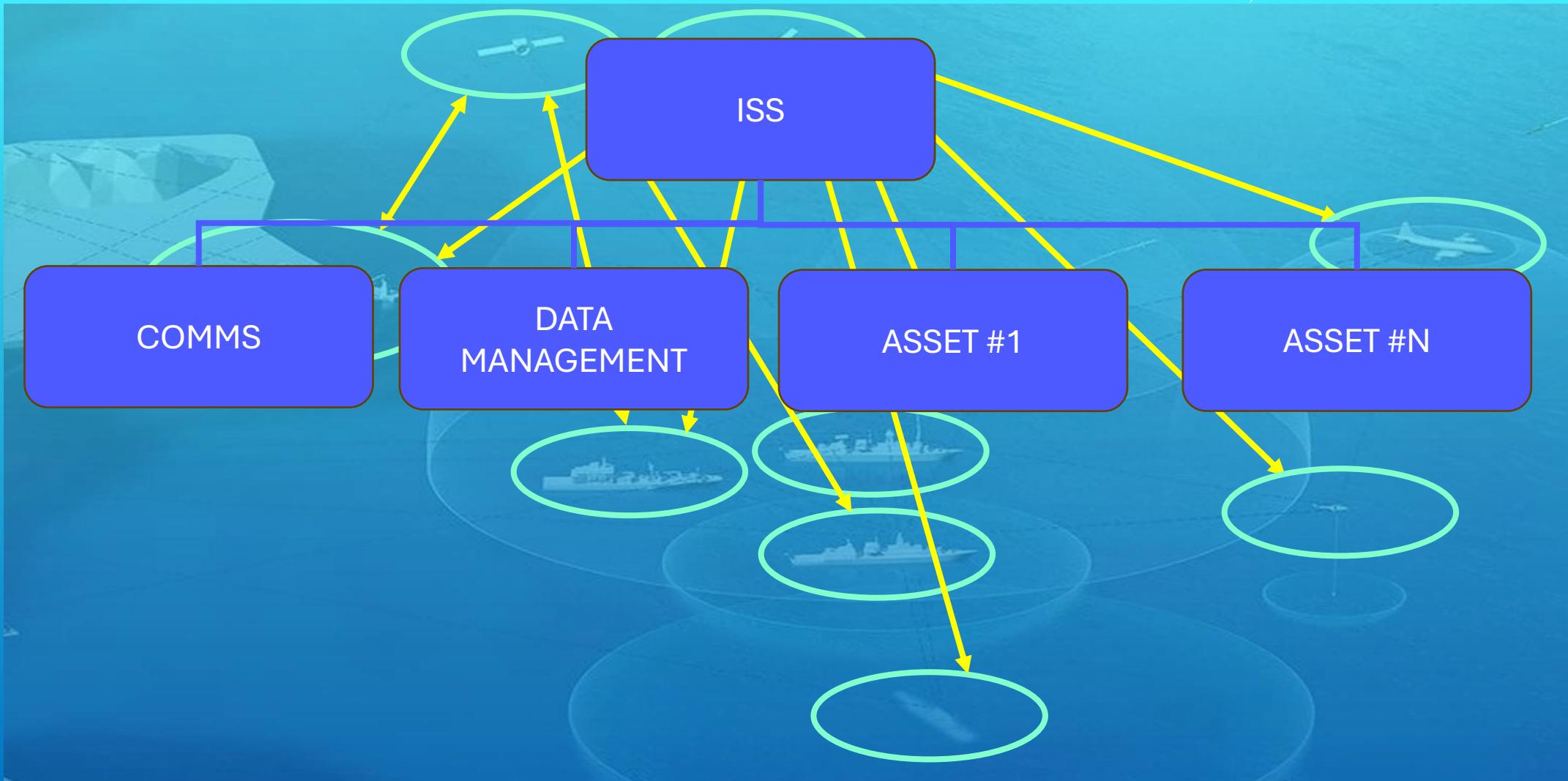
- Prediction



## The vision of the Spanish Navy Sustainment System



## The vision of the Spanish Navy Sustainment System

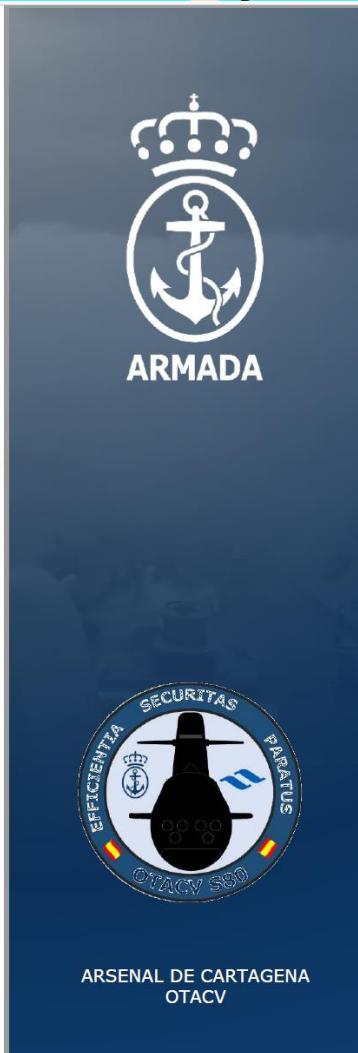
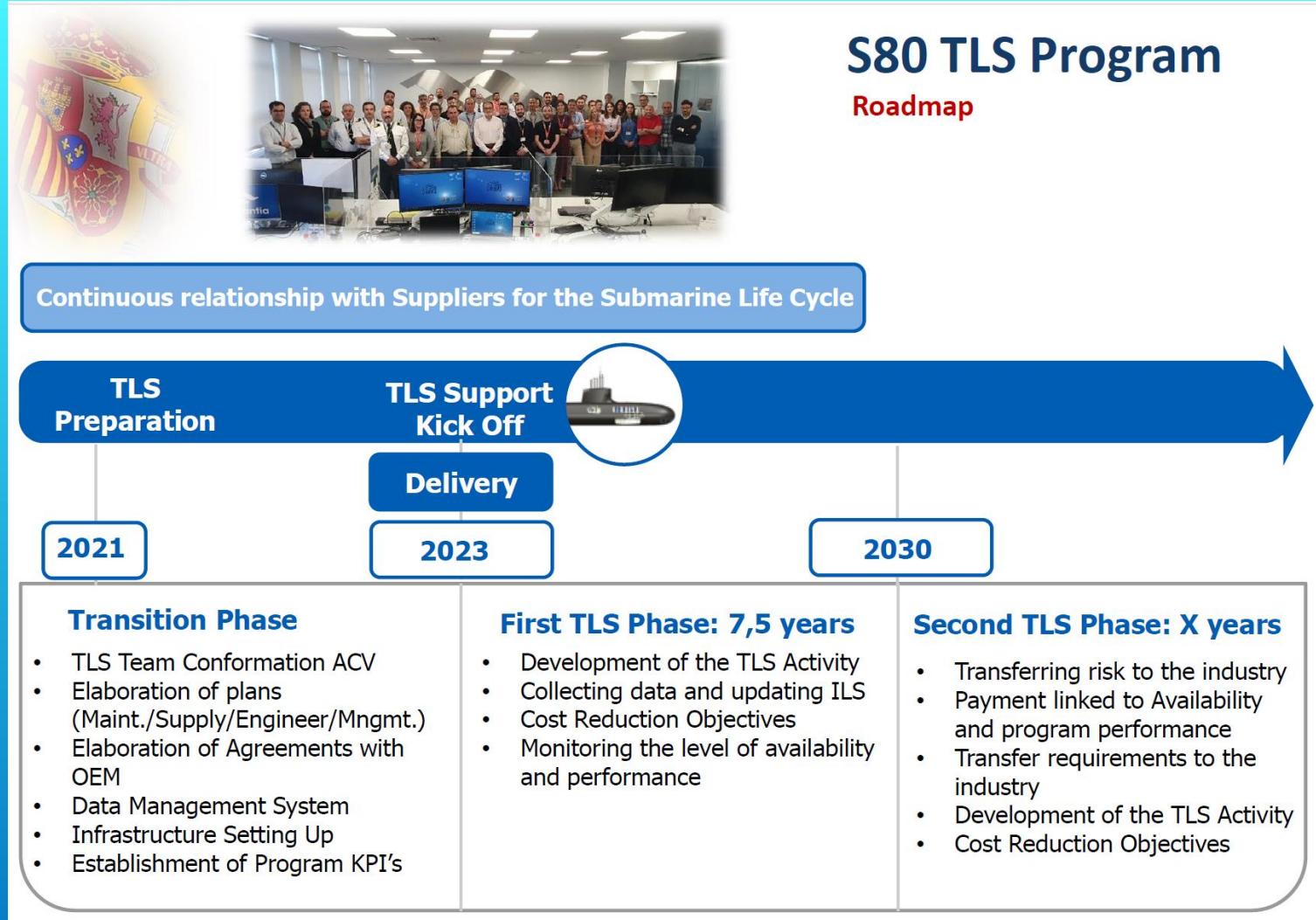


Delivery of  
S81

Acquisition  
Program

Through  
Life  
Support

## The vision of the S80 Sustainment Program



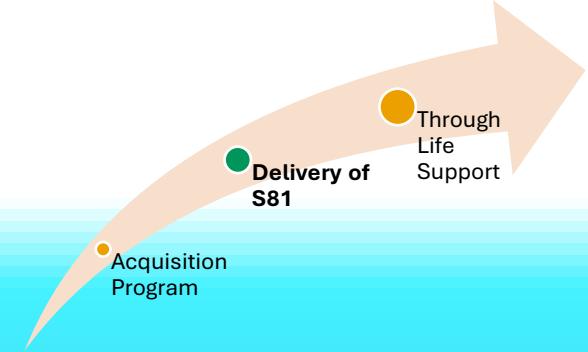


## The S80 Sustainment Program Proposed Solution

# TEAM



## The S80 Sustainment Program Proposed Solution



# TEAM

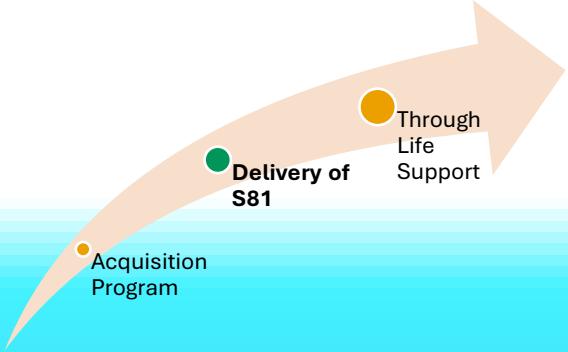
Safety



Efficiency

Availability

## The S80 Sustainment Program Proposed Solution



## OBJECTIVE

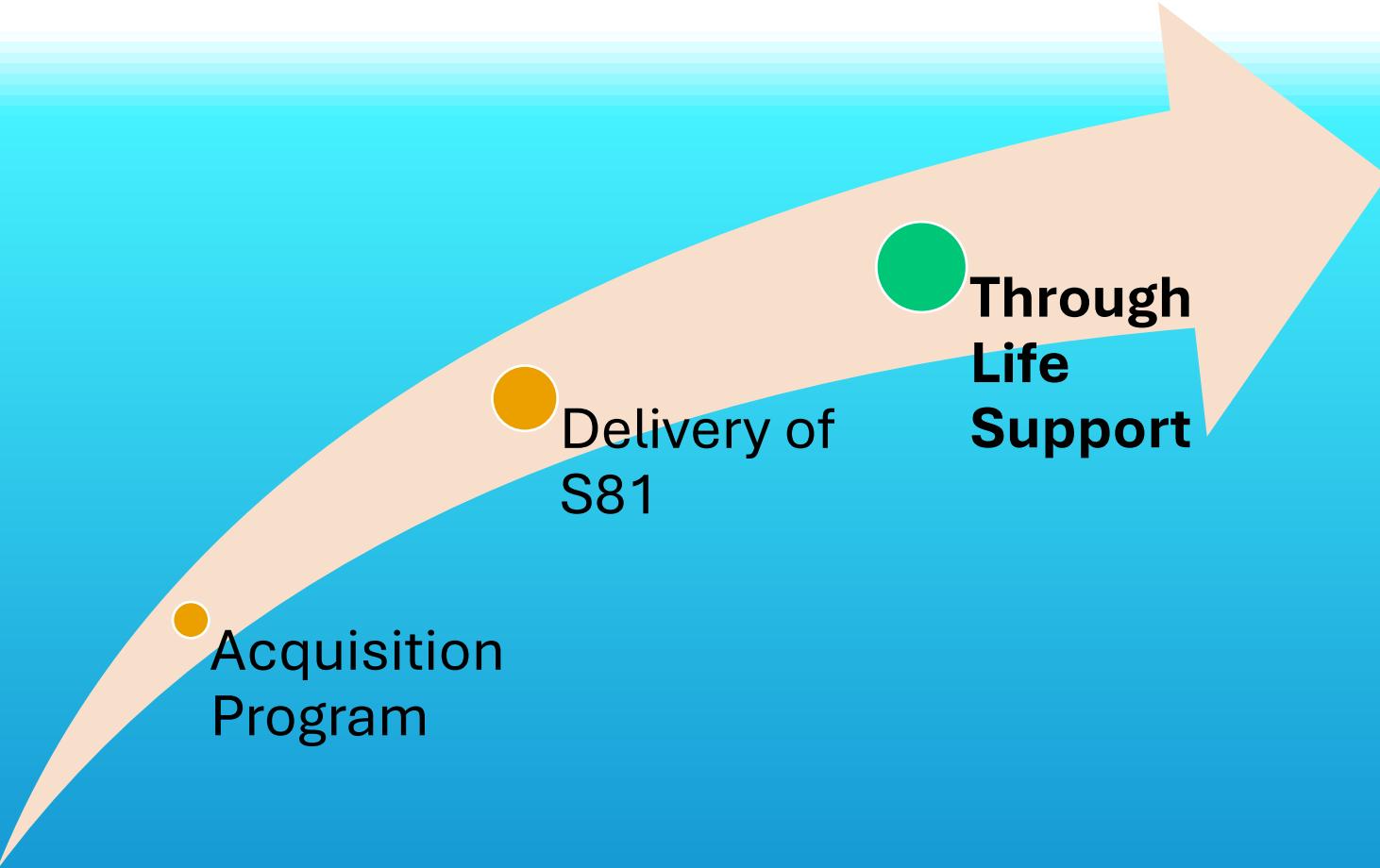
Provide an **efficient** sustainment based on **safety** and **availability** of the fleet by assessing the **unit status** and **predicting the performance** in terms of the executed maintenance.



## The S80 Sustainement Program Situation

- Life cycle Support starts after S81 (Isaac Peral) is delivered
- Current Navantia Support to Spanish Navy Program is a set of documents related to the “as delivered” configuration.
- New Through Life Support Model from the Spanish Navy
  - Availability and performance as KPI for the sustainment
  - Risk transferred to the Industry
  - Efficiency as key objective
  - “As maintained” safety assessment

A predictive model including current unit status parameters is required



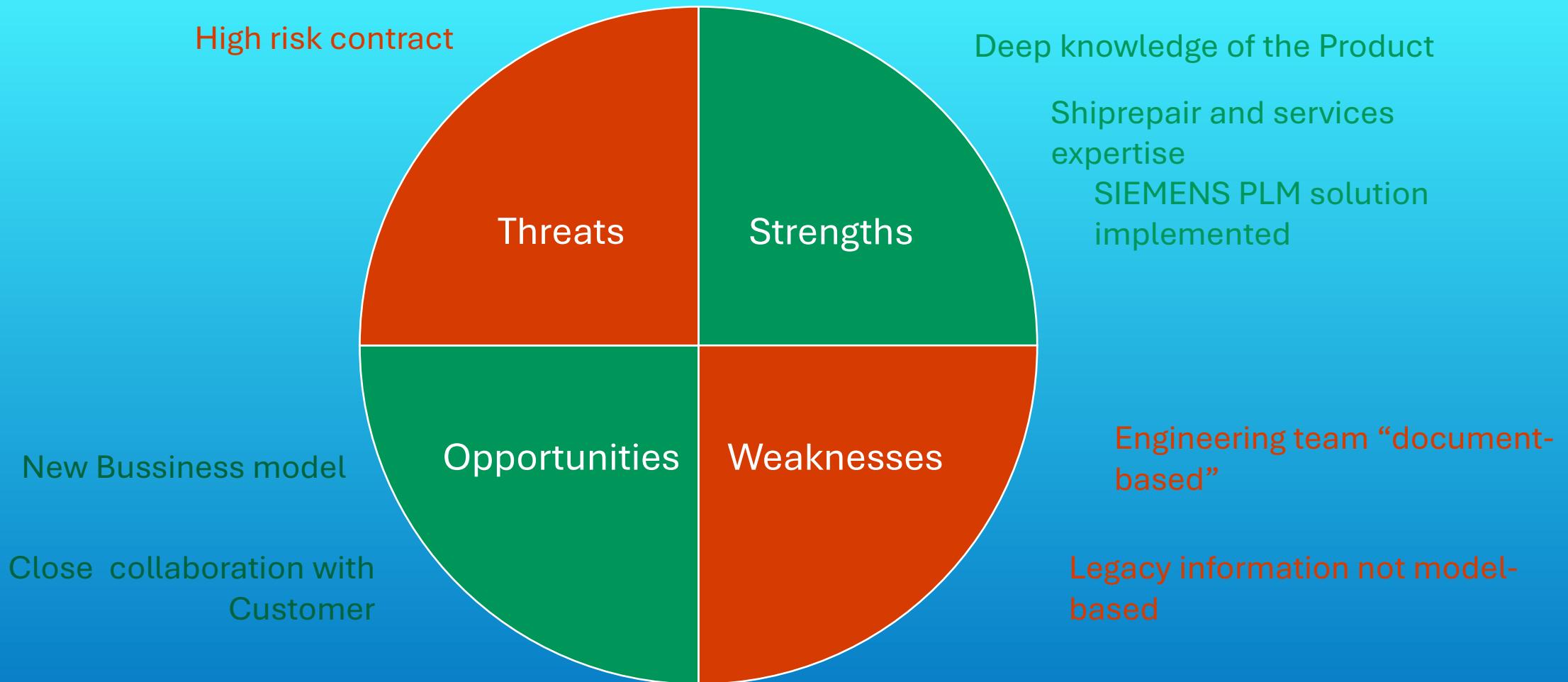
# **The S80 Systems Engineering journey. The new path**

## The S80 Sustainment Program. The Navy needs

- Availability prediction
- Performance and safety assessment prediction
- Current asset Status as input
- Cost of maintenance linked to asset availability
- Model Based Product Support from US Navy is the reference



## The S80 Sustainment Program. The Navantia situation



## The S80 Sustainment Program. The Challenges

High risk contract

- Availability assessment to be agreed
- Contract price of maintenance not related to preventive maintenance tasks but to capabilities

Engineering team “document-based”

- Training is needed in new tools and methodology
- Engineering culture to change from “sub-system document-based” to “capability model-based”

Legacy information not model-based

- Acquisition engineering and simulation not focused on capabilities and safety but in functionalities

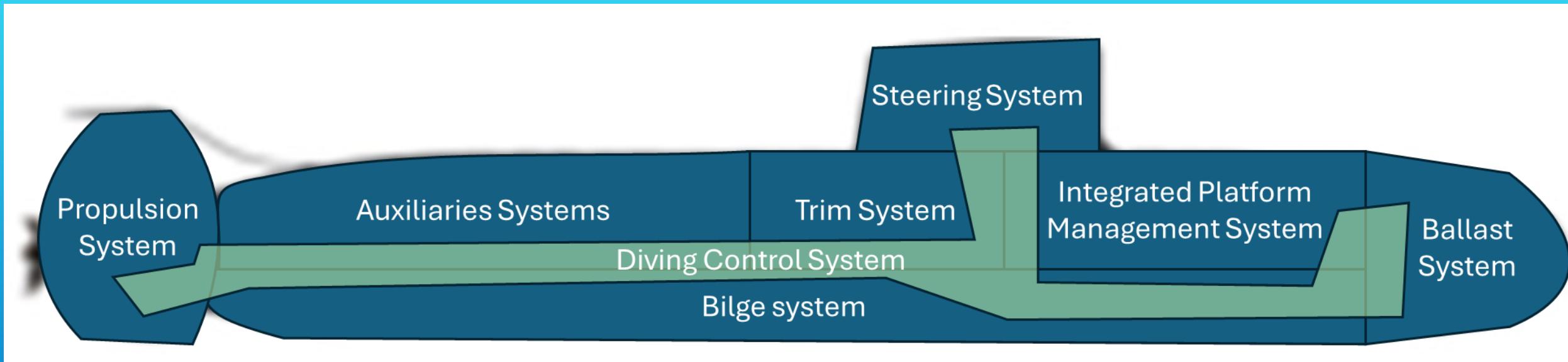


## The S80 Sustainment Program. The Diving Control System

Delivery of S81

Acquisition Program

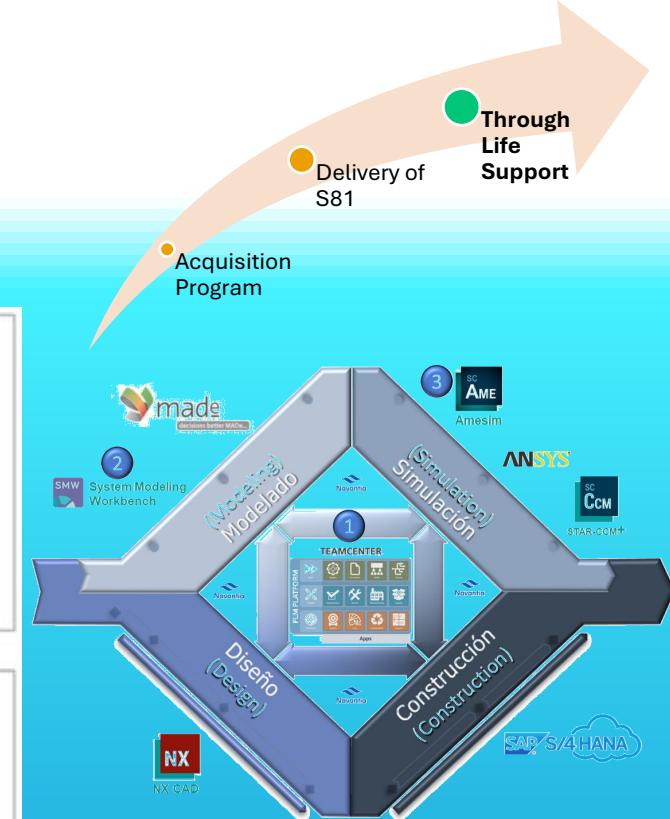
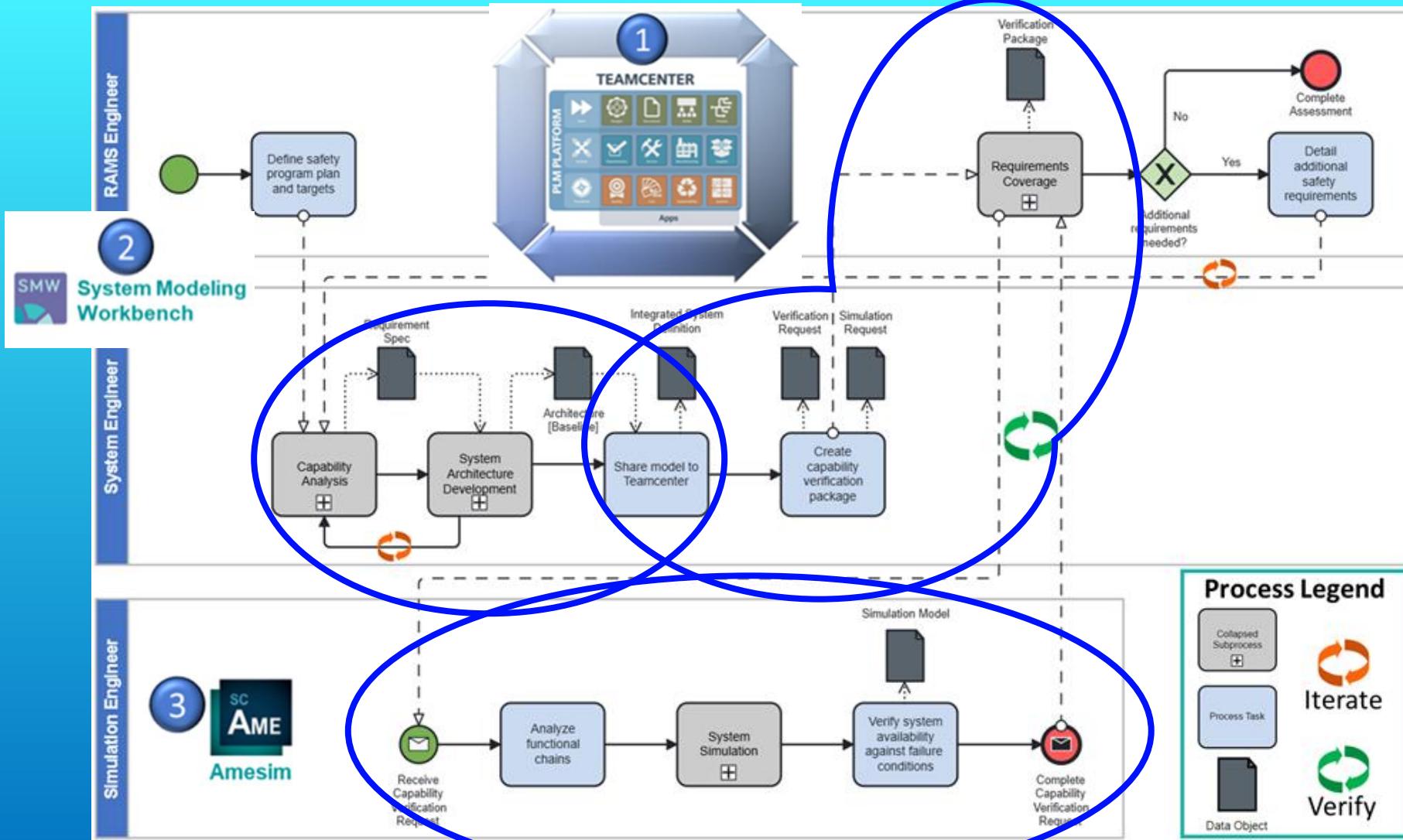
Through Life Support



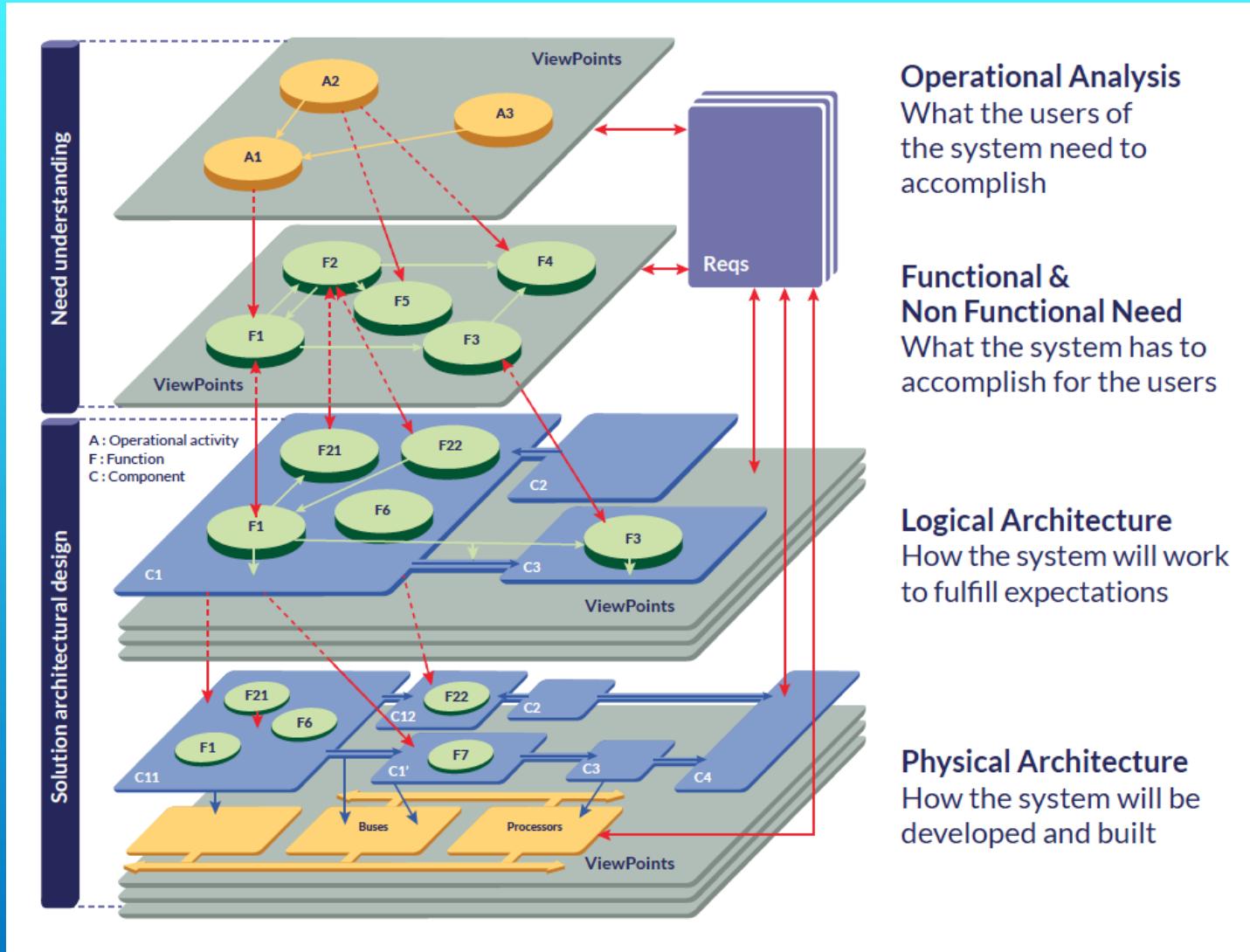
## The S80 Sustainment Program. The Navantia Engineering Solution



# The S80 Sustainment Program. The Navantia Engineering Solution



# The S80 Sustainment Program. The Methodology, Arcadia



## Operational Analysis

What the users of the system need to accomplish

## Functional & Non Functional Need

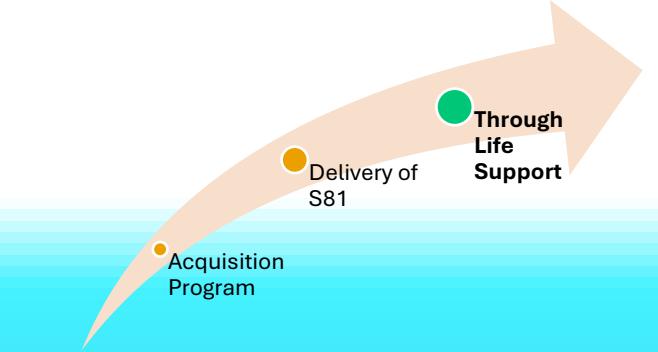
What the system has to accomplish for the users

## Logical Architecture

How the system will work to fulfill expectations

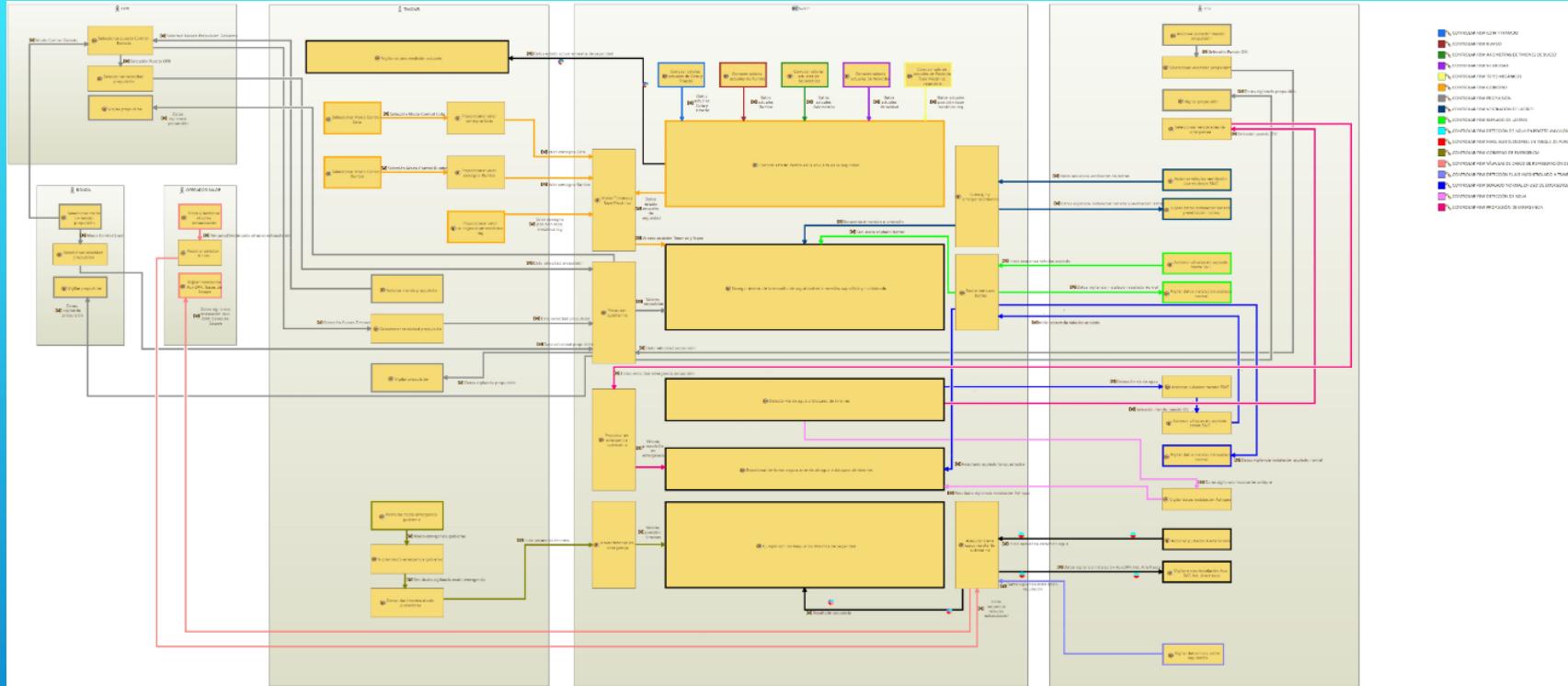
## Physical Architecture

How the system will be developed and built



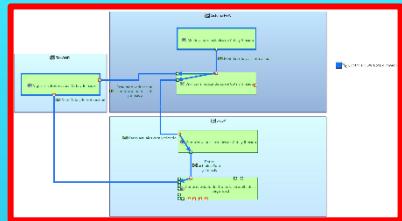
# The S80 Sustainment Program. The Diving Control System Operational Analysis

## Diving Control System. Operational architecture diagram

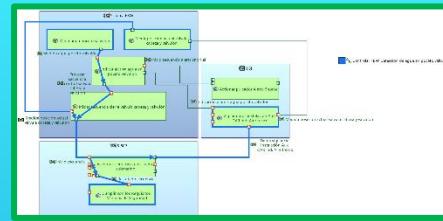


## The S80 Sustainment Program. The Diving Control System Analysis

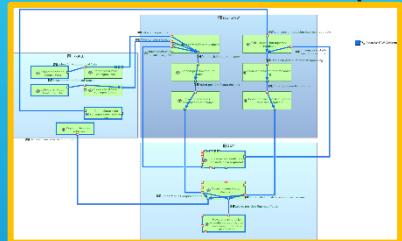
Control Depth (OC)



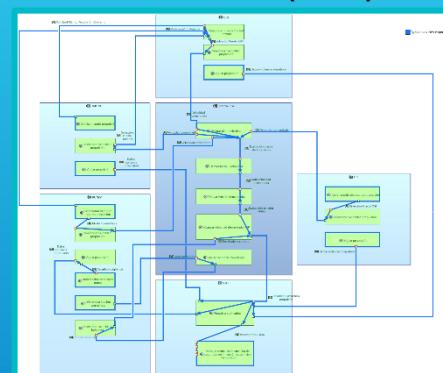
Control Speed (OC)



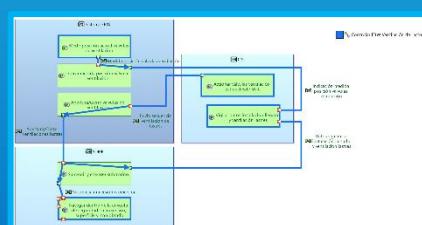
Control Rudders (OC)



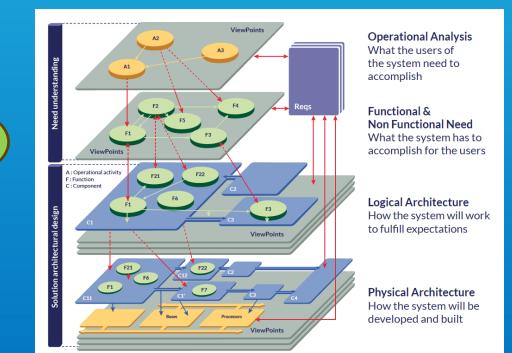
Control MBT (OC)



Control WT (OC)



SA



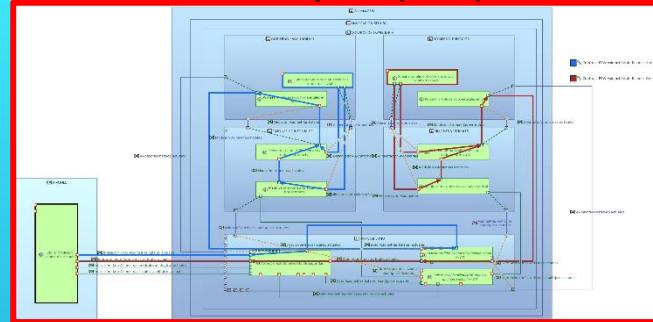
Through  
Life  
Support

Delivery of  
S81

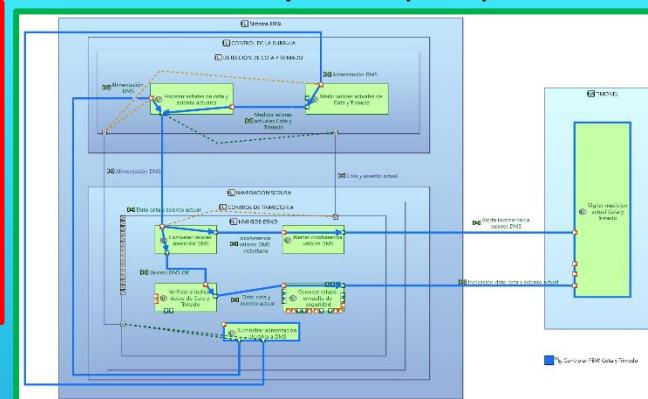
Acquisition  
Program

## The S80 Sustainment Program. The Diving Control System Logical Analysis

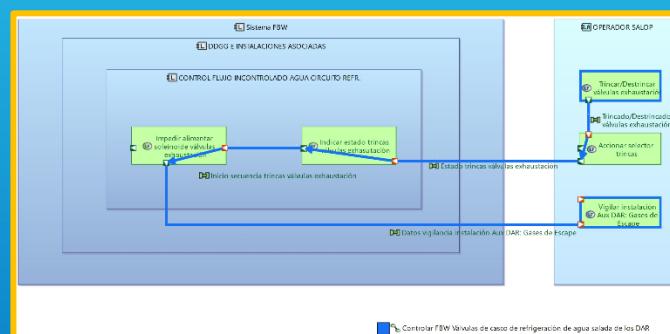
Control Depth (OC)



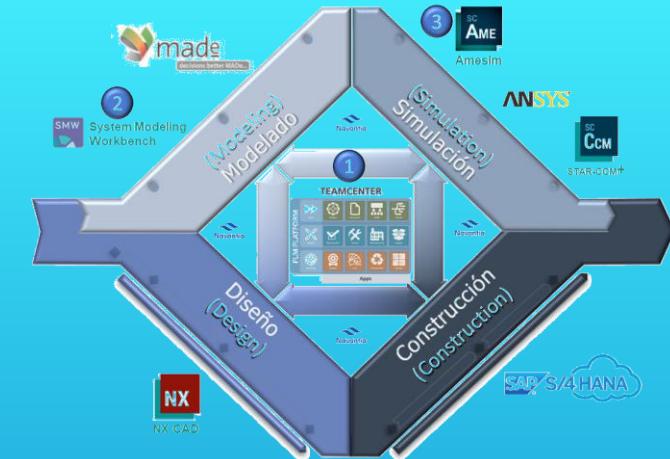
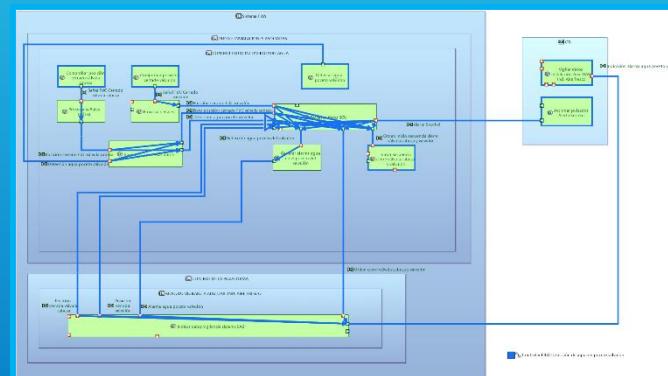
Control Speed (OC)



Control Rudders (OC)



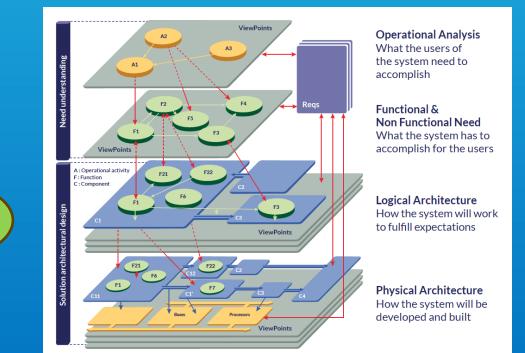
Control WT (OC)



LA

2

**SMW** System Modeling Workbench

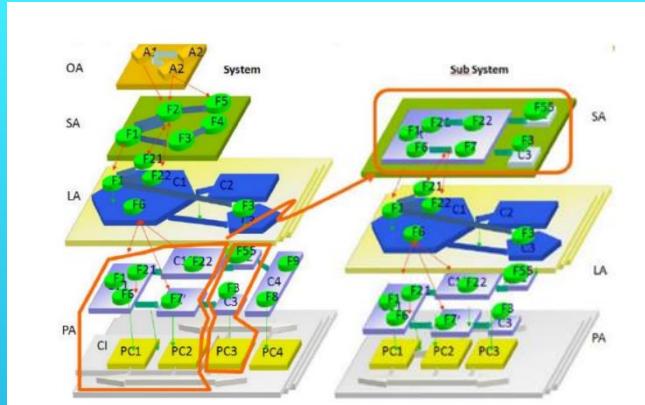


Through Life Support

Delivery of S81

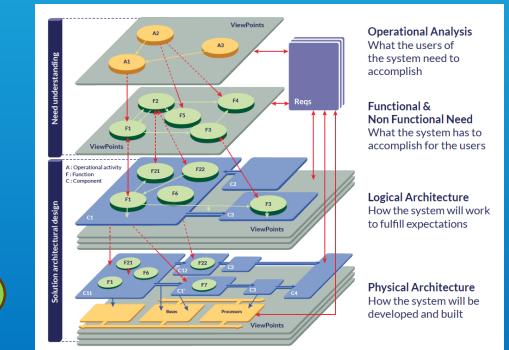
Acquisition Program

## The S80 Sustainment Program. The Diving Control System Physical Breakdown



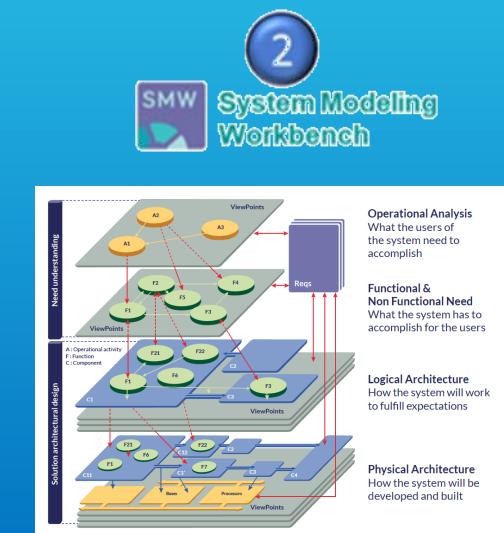
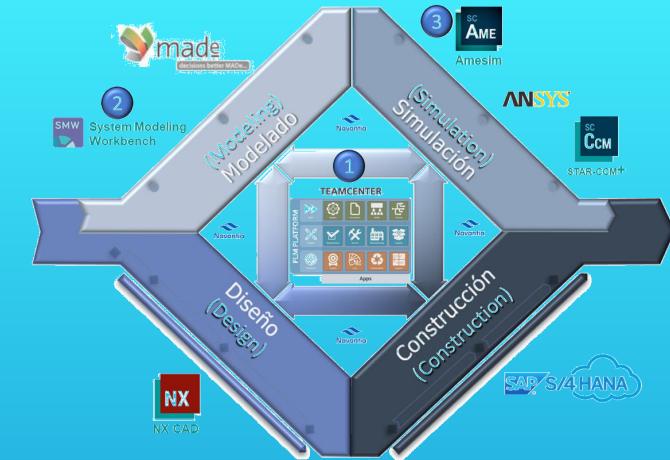
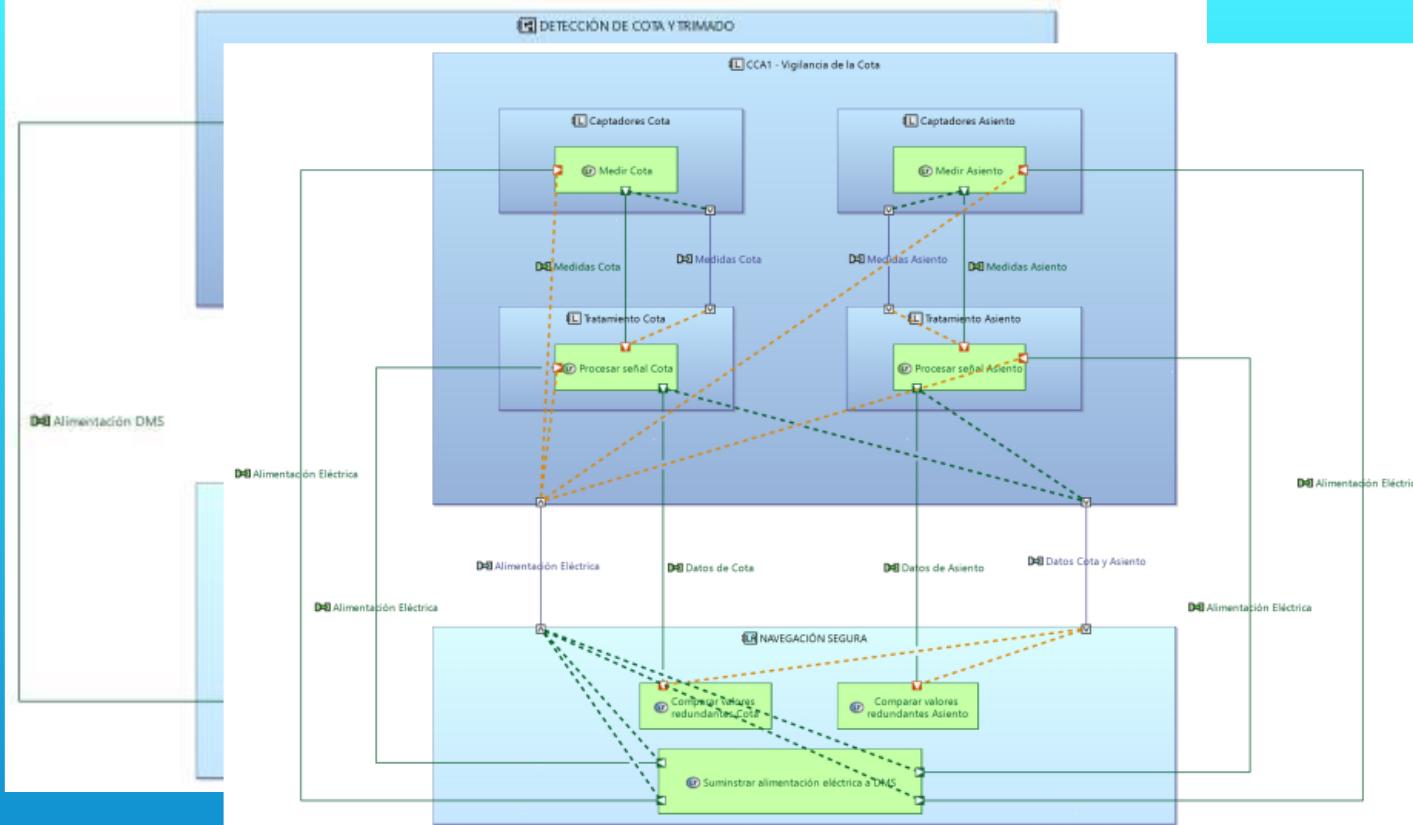
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**SMW** System Modeling Workbench

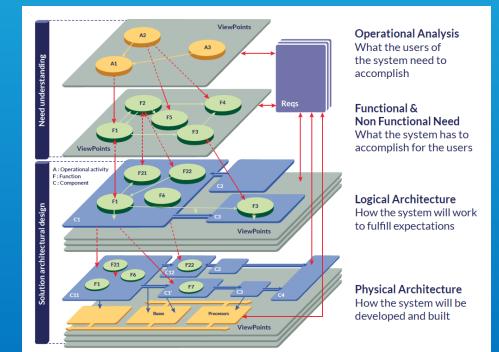
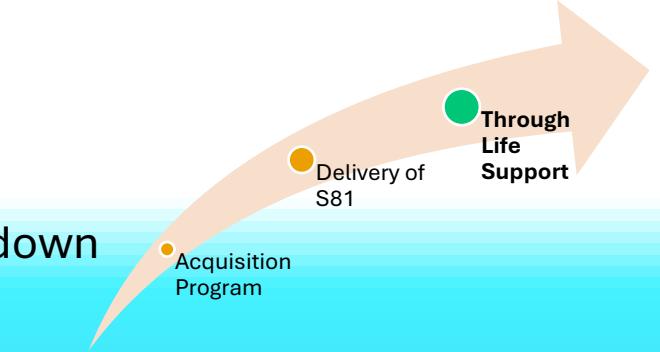
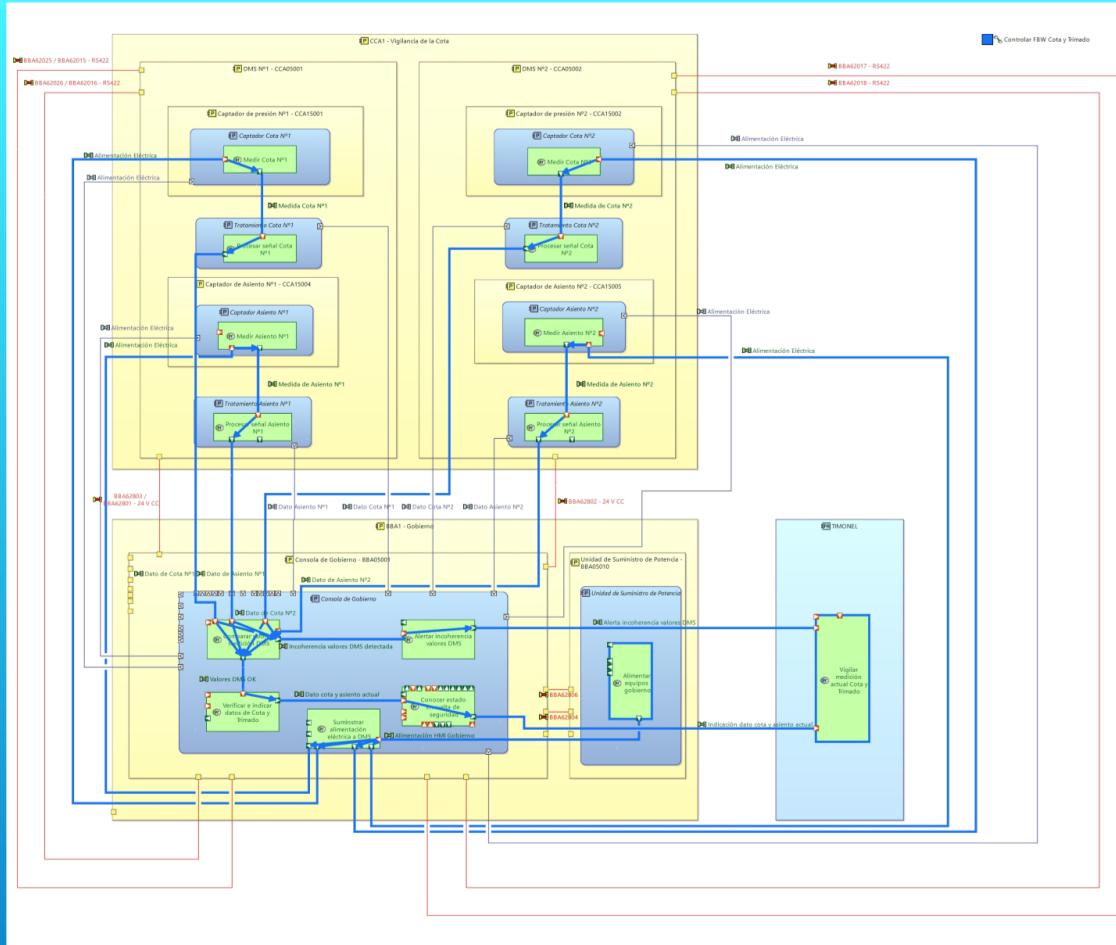


PA

# The S80 Sustainment Program. The Diving Control System Physical Breakdown



## The S80 Sustainment Program. The Diving Control System Physical Breakdown

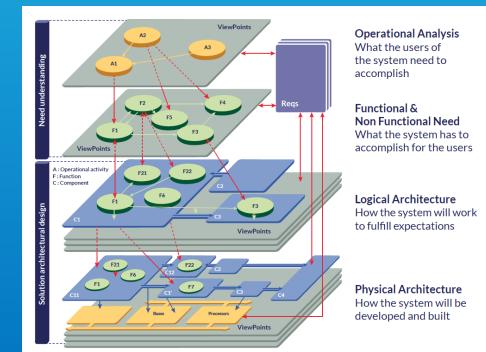
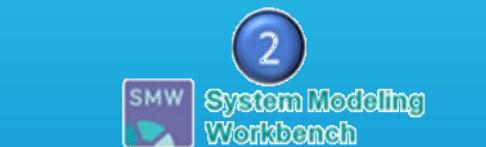
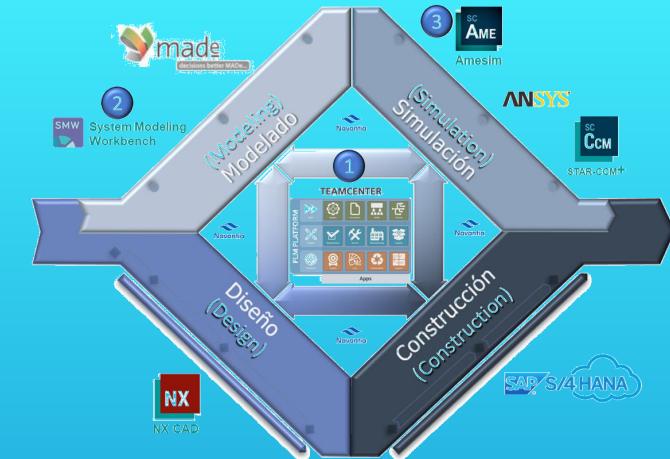
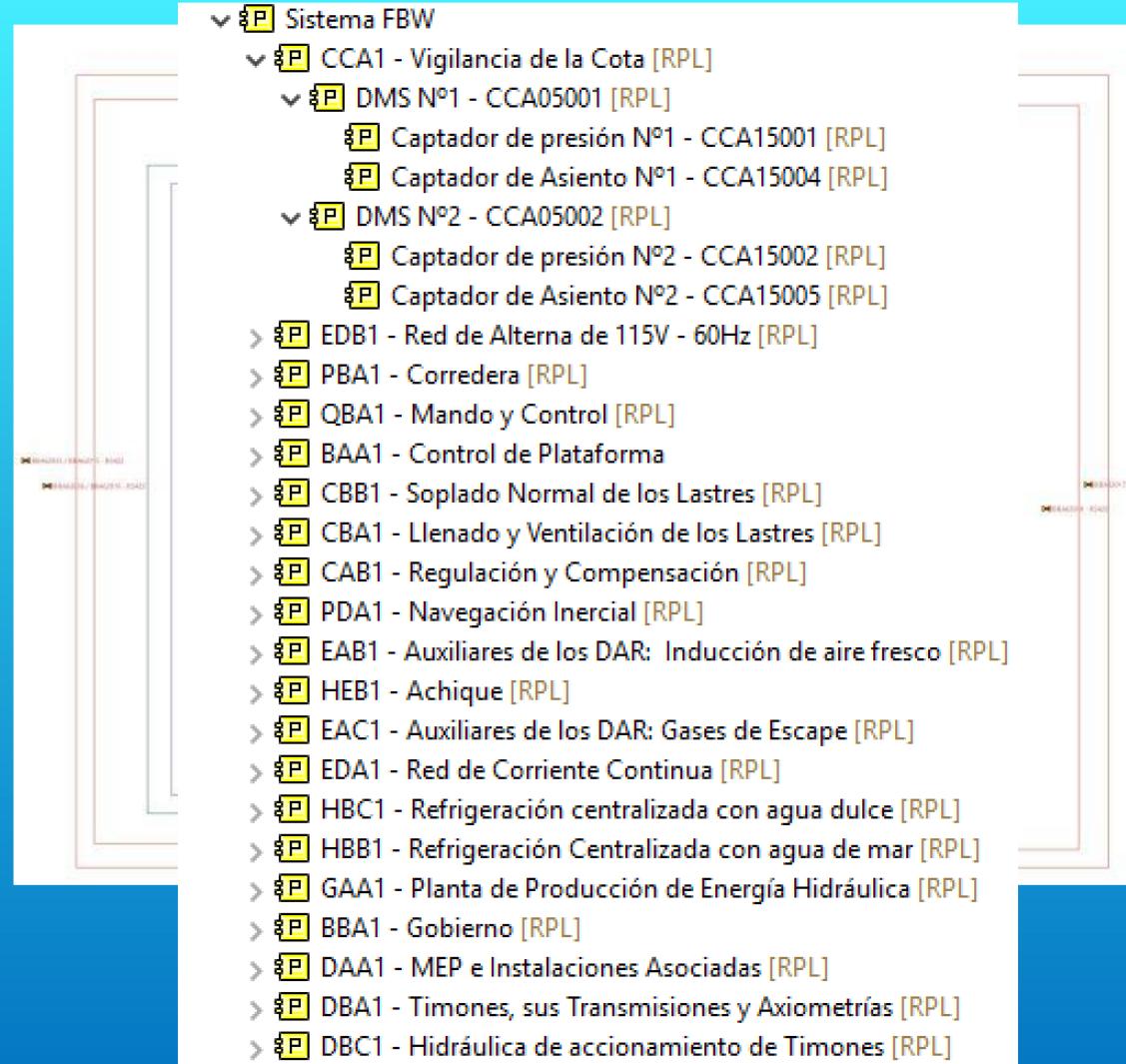


Through Life Support

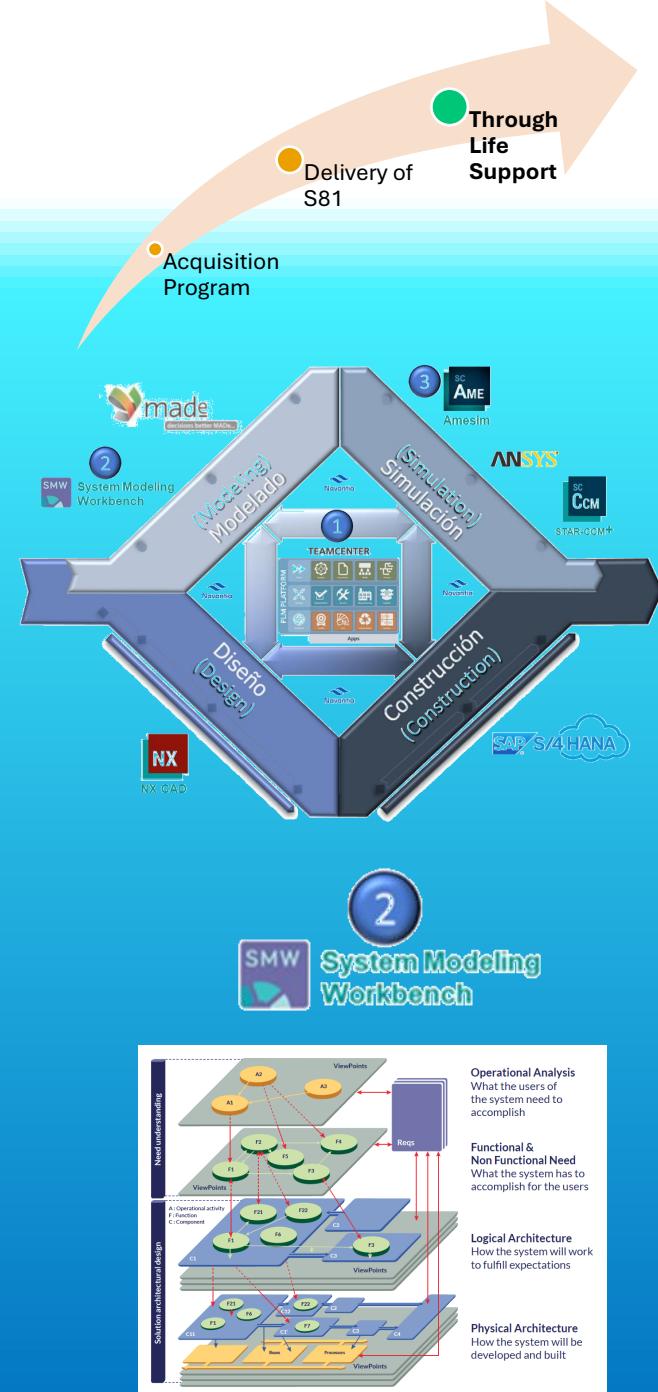
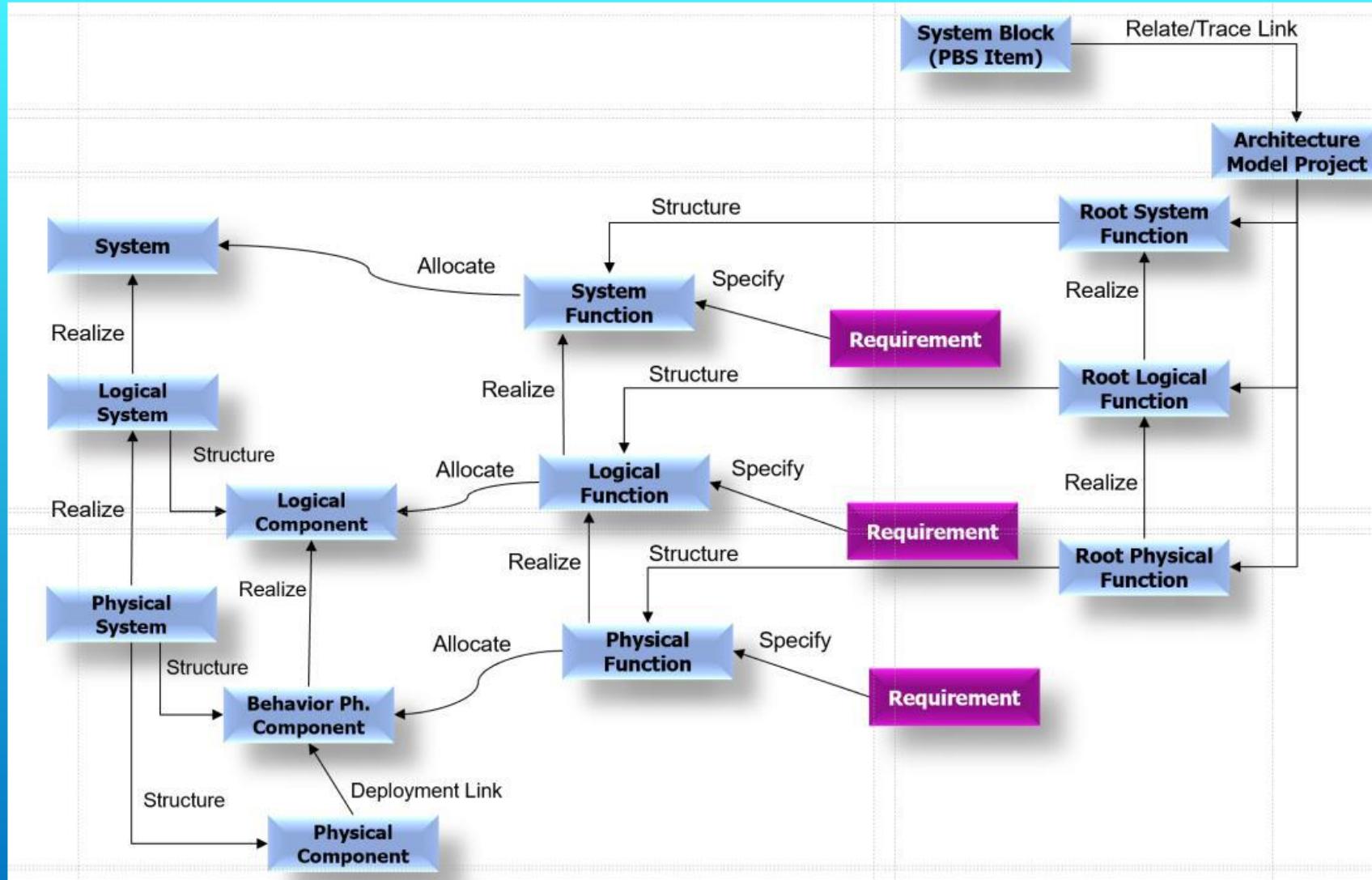
Delivery of S81

Acquisition Program

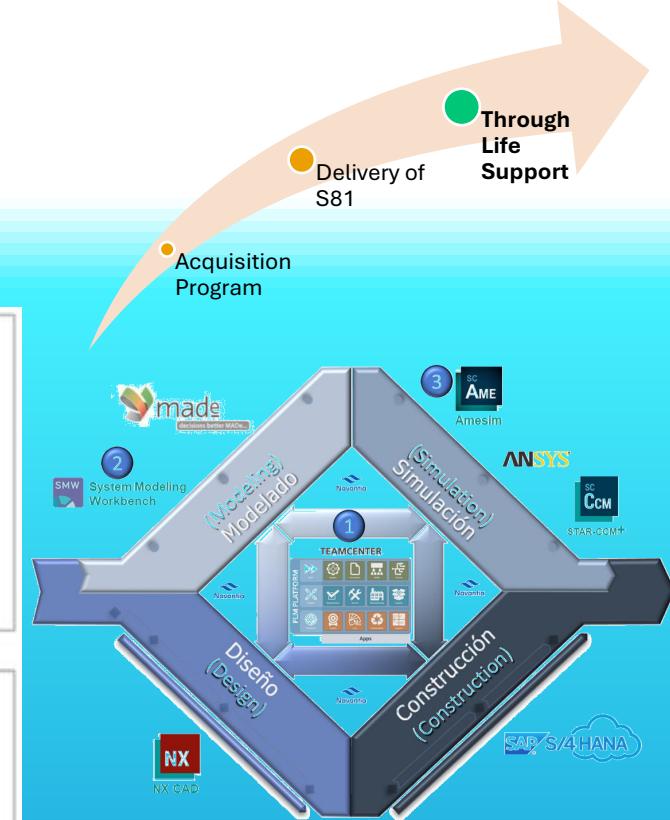
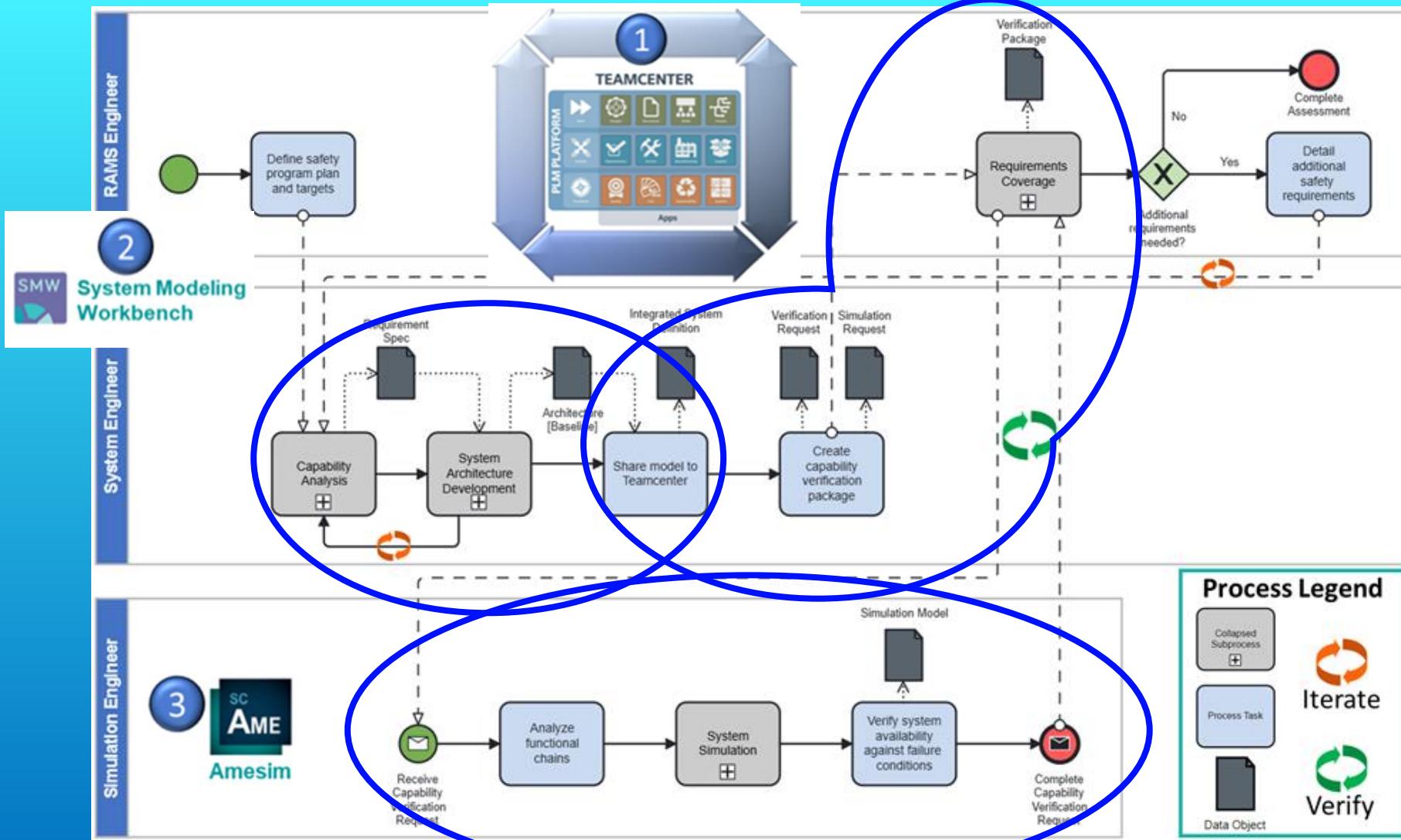
## The S80 Sustainment Program. The Diving Control System Physical Breakdown



## The S80 Sustainment Program. The Diving Control System Model Artifacts



# The S80 Sustainment Program. The Navantia Engineering Solution



## The S80 Sustainment Program. The Navantia Configuration Solution

This screenshot shows the Navantia Configuration Solution interface. On the left is a navigation sidebar with various tabs like Inicio, Discusiones, Carpetas, etc. The main area displays a hierarchical tree structure under 'Sistema FBW'.

- Sistema FBW**
  - CCA1 - Vigilancia de la Cota [RPL]**
    - DMS N°1 - CCA05001 [RPL]**
      - Captador de presión N°1 - CCA15001 [RPL]
      - Captador de Asiento N°1 - CCA15004 [RPL]
    - DMS N°2 - CCA05002 [RPL]**
      - Captador de presión N°2 - CCA15002 [RPL]
      - Captador de Asiento N°2 - CCA15005 [RPL]
  - EDB1 - Red de Alterna de 115V - 60Hz [RPL]**
  - PBA1 - Corredera [RPL]**
  - QBA1 - Mando y Control [RPL]**
  - BAA1 - Control de Plataforma**
  - CB1 - Soplado Normal de los Lastres [RPL]**
  - CBA1 - Llenado y Ventilación de los Lastres [RPL]**
  - CAB1 - Regulación y Compensación [RPL]**
  - PDA1 - Navegación Inercial [RPL]**
  - EAB1 - Auxiliares de los DAR: Inducción de aire fresco [RPL]**
  - HEB1 - Achique [RPL]**
  - EAC1 - Auxiliares de los DAR: Gases de Escape [RPL]**
  - EDA1 - Red de Corriente Continua [RPL]**
  - HBC1 - Refrigeración centralizada con agua dulce [RPL]**
  - HBB1 - Refrigeración Centralizada con agua de mar [RPL]**
  - GAA1 - Planta de Producción de Energía Hidráulica [RPL]**
  - BBA1 - Gobierno [RPL]**
  - DAA1 - MEP e Instalaciones Asociadas [RPL]**
  - DBA1 - Timones, sus Transmisiones y Axiometrías [RPL]**
  - DBC1 - Hidráulica de accionamiento de Timones [RPL]**

Screenshot of a configuration item details page for S80P-FBW-024809/A-Controlar Cota y Trimado.

**Propietario:** user1 (user1) **Fecha de modificación:** 15-Mayo-2024 **Estatus de liberación:** Revisión de Modelo de proyecto

**Descripción general** **Parámetros** **Peso y equilibrio** **Parámetros**

**FUNCIONES IMPLICADAS**

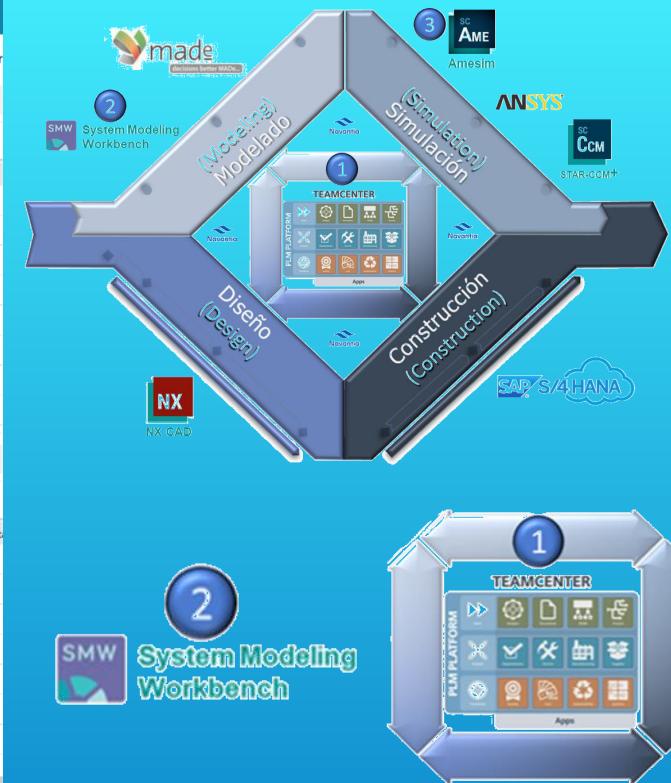
Objeto
S80P-FBW-023215/A-Medir Cota N°1
S80P-FBW-023709/A-Procesar señal Cota N°1
S80P-FBW-023229/A-Suministrar alimentación eléctrica a DMS
S80P-FBW-023990/A-Medir Asiento N°1
S80P-FBW-023140/A-Procesar señal Asiento N°1
S80P-FBW-023378/A-Comparar valores medición DMS
S80P-FBW-023131/A-Alimentar equipos gobierno
S80P-FBW-023869/A-Conocer estado envuelta de seguridad

**INTERCAMBIOS FUNCIONALES IMPLICADOS**

Objeto
S80P-FBW-027145/A-Valoreo DMS OK
S80P-FBW-026652/A-Medida de Cota N°2
S80P-FBW-027177/A-Medida de Asiento N°2
S80P-FBW-026632/A-Medida de Asiento N°1
S80P-FBW-027070/A-Medida Cota N°1
S80P-FBW-026004/A-Indicación dato cota y asiento actual
S80P-FBW-026439/A-Incoherencia valores DMS detectada
S80P-FBW-025817/A-Dato de Cota N°2

**CADERAS FUNCIONALES IMPLICADAS**

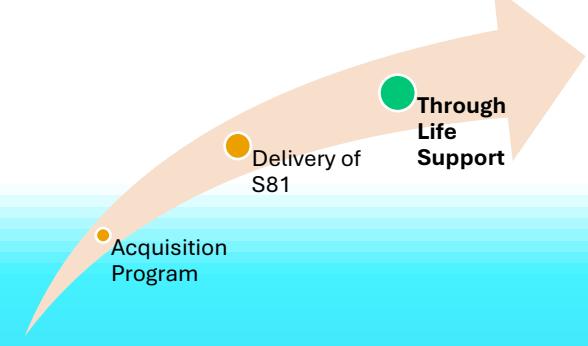
Objeto
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The S80 Sustainment Program. The Navantia Configuration Solution

Elemento		Id	Revisión	Nombre de la revisión
Sistema FBW		023077	A	Sistema FBW
S80P-FBW-024303/A-System Analysis		024303	A	System Analysis
S80P-FBW-024320/A-Logical Architecture		024320	A	Logical Architecture
S80P-FBW-024313/A-Physical Architecture		024313	A	Physical Architecture
S80P-FBW-024305/A-Physical Functions		024305	A	Physical Functions
PF Root Physical Function		023825	A	Root Physical Function
S80P-FBW-024317/A-Capabilities		024317	A	Capabilities
S80P-FBW-025309/A-CONTROLAR FBW VENTILACIÓN DE LASTRES		025309	A	CONTROLAR FBW VENTILACIÓN DE LASTRES
S80P-FBW-025338/A-CONTROLAR FBW DETECCIÓN DE AGUA		025338	A	CONTROLAR FBW DETECCIÓN DE AGUA
S80P-FBW-025333/A-CONTROLAR FBW GOBIERNO DE EMERGENCIA		025333	A	CONTROLAR FBW GOBIERNO DE EMERGENCIA
S80P-FBW-025337/A-CONTROLAR FBW VELOCIDAD		025337	A	CONTROLAR FBW VELOCIDAD
S80P-FBW-025310/A-CONTROLAR FBW VÁLVULAS DE CASCO DE REFRIGERACIÓN DE...		025310	A	CONTROLAR FBW VÁLVULAS DE CASCO DE REFRIGERACIÓN DE...
S80P-FBW-025336/A-CONTROLAR FBW GOBIERNO		025336	A	CONTROLAR FBW GOBIERNO
S80P-FBW-025299/A-CONTROLAR FBW COTA Y TRIMADO		025299	A	CONTROLAR FBW COTA Y TRIMADO
S80P-FBW-024809/A-Controlar FBW Cota y Trimado		024809	A	Controlar FBW Cota y Trimado
S80P-FBW-025332/A-CONTROLAR FBW COPIADO DE LASTRES		025332	A	CONTROLAR FBW COPIADO DE LASTRES



  
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SupportDelivery of  
S81Acquisition  
Program

## The S80 Sustainment Program. The Navantia Configuration Solution

Mayo-2024 Estatus de liberación: Tipo: Revisión de Modelo de proyecto

Editar

Descripción general Parámetros Peso y equilibrio Parámetros

▼ FUNCIONES IMPLICADAS

Tabla Modo de selección Seleccionar todo

Objeto	PF	S80P-FBW-023215/A-Medir Cota N°1
	PF	S80P-FBW-023709/A-Procesar señal Cota N°1
	PF	S80P-FBW-023229/A-Suministrar alimentación eléctrica a DMS
	PF	S80P-FBW-023990/A-Medir Asiento N°1
	PF	S80P-FBW-023140/A-Procesar señal Asiento N°1
	PF	S80P-FBW-023378/A-Comparar valores medición DMS
	PF	S80P-FBW-023131/A-Alimentar equipos gobierno
	PF	S80P-FBW-023869/A-Conocer estado envuelta de seguridad

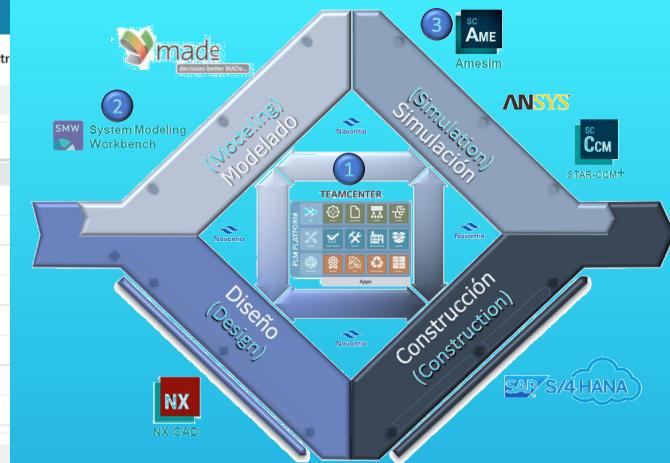


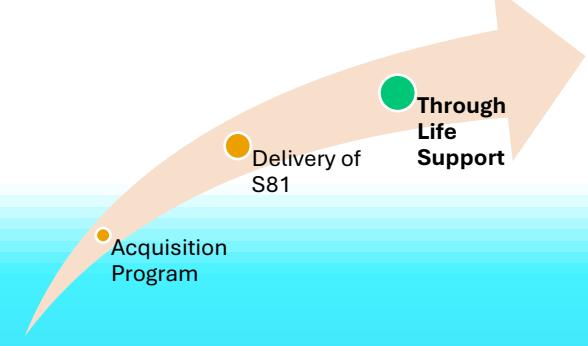
# The S80 Sustainment Program. The Navantia Configuration Solution

Sistema FBW > S80P-FBW-024313/A-Physical Architecture > S80P-FBW-024317/A-Capabilities > S80P-FBW-025299/A-CONTROLAR FBW COTA Y TRIMADO > S80P-FBW-024809/A-Controlar FBW Cota y Trimado

Revisión: Latest Working Fecha: Hoy Unidades: Ninguno Variante: Sin regla de variantes Expansión: BOMExpandSkipByCompPhysNodes Propietario: user1 (user1) Fecha de modificación: 15-Mayo-2024 Estatus de liberación: Tipo: Revisión de Modelo de proyecto

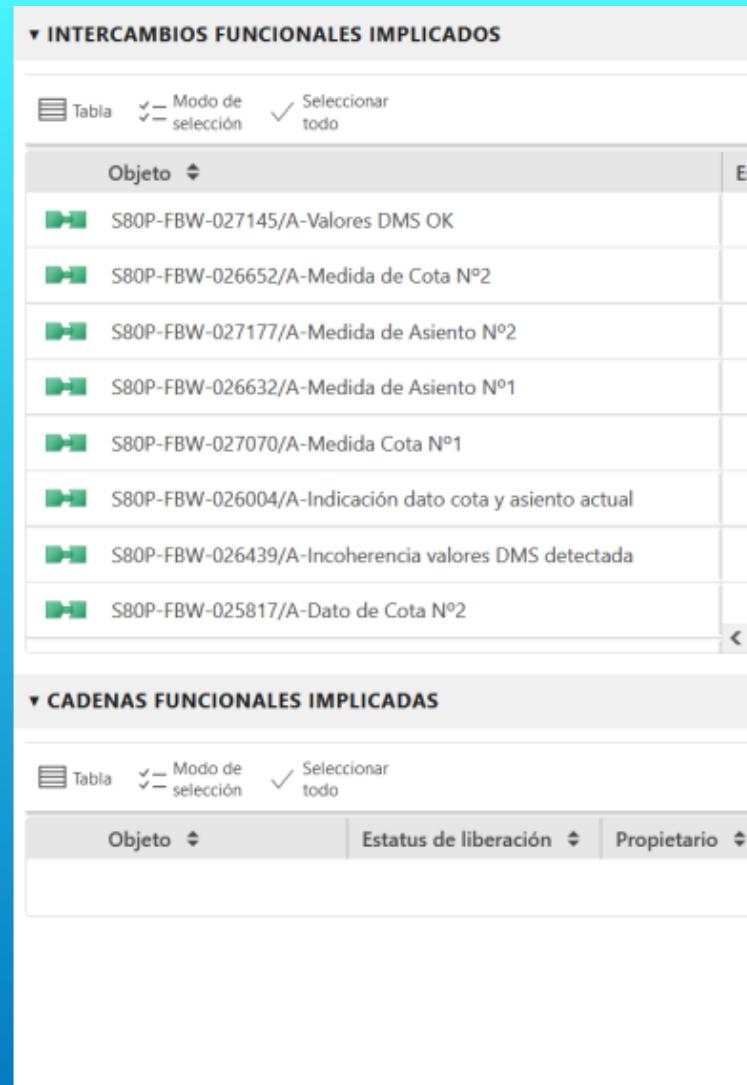
Elemento	Id	Revisión	Nombre de la revisión	Descripción	ID Secundaria	Des.
Sistema FBW	023077	A	Sistema FBW			
S80P-FBW-024303/A-System Analysis	024303	A	System Analysis			
S80P-FBW-024320/A-Logical Architecture	024320	A	Logical Architecture			
S80P-FBW-024313/A-Physical Architecture	024313	A	Physical Architecture			
S80P-FBW-024305/A-Physical Functions	024305	A	Physical Functions			
PF Root Physical Function	023825	A	Root Physical Function			
S80P-FBW-024317/A-Capabilities	024317	A	Capabilities			
S80P-FBW-025309/A-CONTROLAR FBW VENTILACIÓN DE LASTRES	025309	A	CONTROLAR FBW VENTILACIÓN DE LASTRES			
S80P-FBW-025338/A-CONTROLAR FBW DETECCIÓN DE AGUA	025338	A	CONTROLAR FBW DETECCIÓN DE AGUA			
S80P-FBW-025333/A-CONTROLAR FBW GOBIERNO DE EMERGENCIA	025333	A	CONTROLAR FBW GOBIERNO DE EMERGENCIA			
S80P-FBW-025337/A-CONTROLAR FBW VELOCIDAD	025337	A	CONTROLAR FBW VELOCIDAD			
S80P-FBW-025310/A-CONTROLAR FBW VÁLVULAS DE CASCO DE REFRIGERACIÓN DE...	025310	A	CONTROLAR FBW VÁLVULAS DE CASCO DE REFRIGE...			
S80P-FBW-025336/A-CONTROLAR FBW GOBIERNO	025336	A	CONTROLAR FBW GOBIERNO			
S80P-FBW-025299/A-CONTROLAR FBW COTA Y TRIMADO	025299	A	CONTROLAR FBW COTA Y TRIMADO			
S80P-FBW-024809/A-Controlar FBW Cota y Trimado	024809	A	Controlar FBW Cota y Trimado			
S80P-FBW-025323/A-CONTROLAR FBW SOPLADO DE LASTRES	025323	A	CONTROLAR FBW SOPLADO DE LASTRES			
S80P-FBW-025301/A-CONTROLAR FBW TOPES MECÁNICOS	025301	A	CONTROLAR FBW TOPES MECÁNICOS			
S80P-FBW-025327/A-CONTROLAR FBW AXIOMETRÍAS DE TIMONES DE BUCEO	025327	A	CONTROLAR FBW AXIOMETRÍAS DE TIMONES DE B...			
S80P-FBW-025343/A-CONTROLAR FBW SOPLADO NORMAL EN USO DE EMERGENCIA	025343	A	CONTROLAR FBW SOPLADO NORMAL EN USO DE E...			
S80P-FBW-025329/A-CONTROLAR FBW RUMBO	025329	A	CONTROLAR FBW RUMBO			
S80P-FBW-025341/A-CONTROLAR FBW PROPULSIÓN DE EMERGENCIA	025341	A	CONTROLAR FBW PROPULSIÓN DE EMERGENCIA			
S80P-FBW-025304/A-CONTROLAR FBW PROPULSIÓN	025304	A	CONTROLAR FBW PROPULSIÓN			
S80P-FBW-025314/A-CONTROLAR FBW DETECCIÓN FLUJO INCONTROLADO A TRAVÉ...	025314	A	CONTROLAR FBW DETECCIÓN FLUJO INCONTROLA...			
S80P-FBW-025328/A-CONTROLAR FBW NIVEL ALERTA SNORKEL EN TANQUE DE PUR...	025328	A	CONTROLAR FBW NIVEL ALERTA SNORKEL EN TAN...			
S80P-FBW-025313/A-CONTROLAR FBW DETECCIÓN DE AGUA EN POCETO VALVULÓN	025313	A	CONTROLAR FBW DETECCIÓN DE AGUA EN POCET...			
S80P-FBW-024302/A-Interfaces	024302	A	Interfaces			
S80P-FBW-024310/A-Data	024310	A	Data			
S80P-FBW-024312/A-Structure	024312	A	Structure			



  
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## The S80 Sustainment Program. The Navantia Configuration Solution



The screenshot displays two sections of the configuration solution interface:

- INTERCAMBIOS FUNCIONALES IMPLICADOS**: A table listing functional exchanges. The columns include Objeto, Estatus de liberación, and Propietario. The listed items are:
  - S80P-FBW-027145/A-Valores DMS OK
  - S80P-FBW-026652/A-Medida de Cota N°2
  - S80P-FBW-027177/A-Medida de Asiento N°2
  - S80P-FBW-026632/A-Medida de Asiento N°1
  - S80P-FBW-027070/A-Medida Cota N°1
  - S80P-FBW-026004/A-Indicación dato cota y asiento actual
  - S80P-FBW-026439/A-Incoherencia valores DMS detectada
  - S80P-FBW-025817/A-Dato de Cota N°2
- CADERAS FUNCIONALES IMPLICADAS**: A table listing functional chains. The columns include Objeto, Estatus de liberación, and Propietario. The table is currently empty.



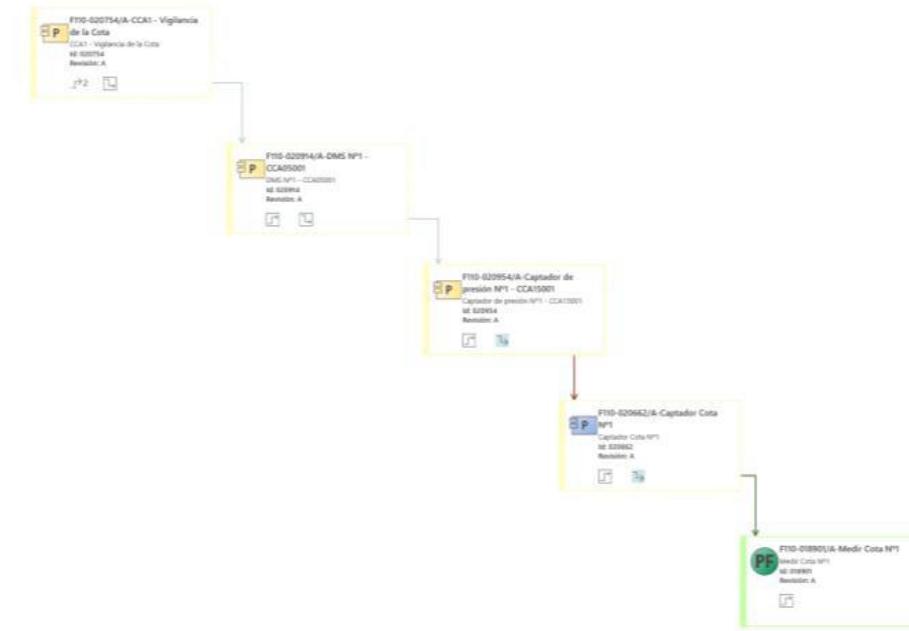
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Program

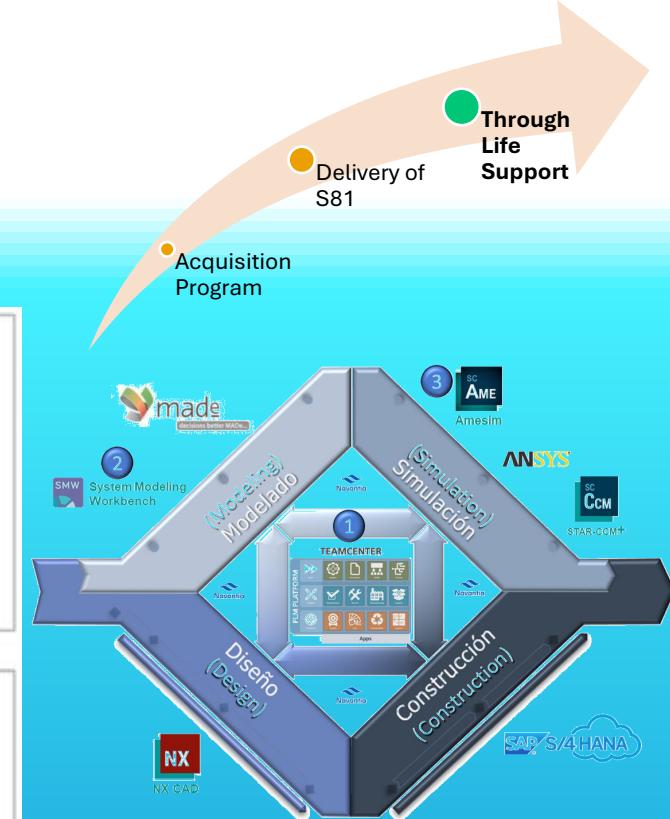
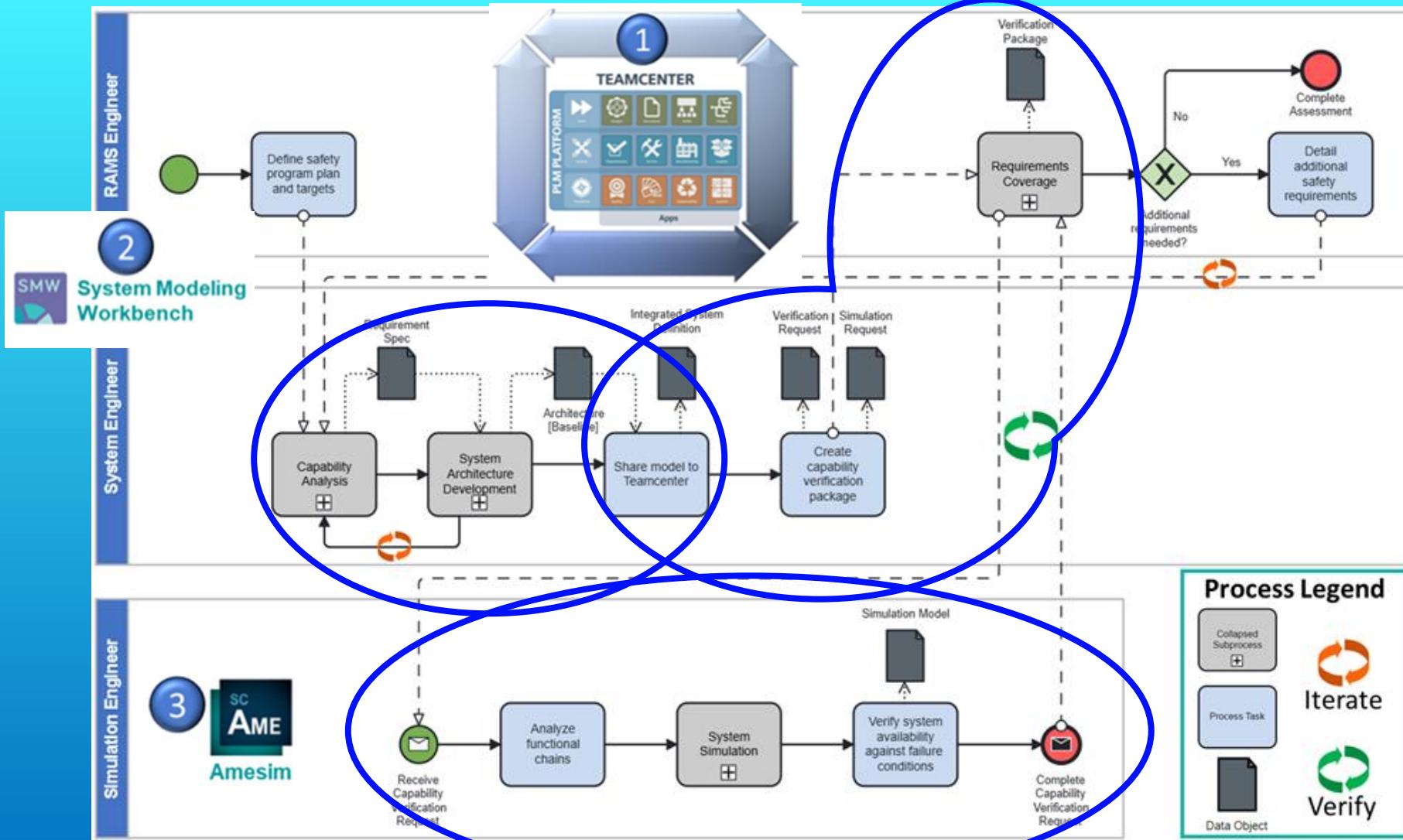


## The S80 Sustainment Program. The Navantia Configuration Solution

Sistema FBW	020612	A	Sistema FBW
PBA1 - Corredora	020748	A	PBA1 - Corredora
EAB1 - Auxiliares de los DAR: Inducción de a... EA1	020514	A	EAB1 - Auxiliares de los DAR: Inducción de aire frío
GAA1 - Planta de Producción de Energía Hidráulica	020570	A	GAA1 - Planta de Producción de Energía Hidráulica
HBB1 - Refrigeración Centralizada con agua mar	020661	A	HBB1 - Refrigeración Centralizada con agua de mar
CB1 - Soplado Normal de los Lástres	020601	A	CB1 - Soplado Normal de los Lástres
DA1 - MEP e Instalaciones Asociadas	020906	A	DA1 - MEP e Instalaciones Asociadas
CCA1 - Vigilancia de la Cota	020754	A	CCA1 - Vigilancia de la Cota
DMS NP2 - CCA05002	020888	A	DMS NP2 - CCA05002
DMS NP1 - CCA05001	020914	A	DMS NP1 - CCA05001
Captador de presión NP1 - CCA15001	020954	A	Captador de presión NP1 - CCA15001
Captador de Altura NP1 - CCA15004	020824	A	Captador de Altura NP1 - CCA15004
HEB1 - Achique	020521	A	HEB1 - Achique
EAC1 - Auxiliares de los DAR: Gases de Escape	020678	A	EAC1 - Auxiliares de los DAR: Gases de Escape
BA1 - Control de Plataforma	020662	A	BA1 - Control de Plataforma
PDA1 - Navegación Inercial	020698	A	PDA1 - Navegación Inercial
QBA1 - Mando y Control	020707	A	QBA1 - Mando y Control
BB1 - Gobierno	020624	A	BB1 - Gobierno
HBC1 - Refrigeración centralizada con agua dulce	020975	A	HBC1 - Refrigeración centralizada con agua dulce
EDA1 - Red de Corriente Continua	020741	A	EDA1 - Red de Corriente Continua
EDB1 - Red de Alta de 115V - 60Hz	020725	A	EDB1 - Red de Alta de 115V - 60Hz
CAB1 - Regulación y Compensación	020819	A	CAB1 - Regulación y Compensación
DBC1 - Hidráulica de accionamiento de Timones	020895	A	DBC1 - Hidráulica de accionamiento de Timones
CBA1 - Llenado y Ventilación de los Lástres	020546	A	CBA1 - Llenado y Ventilación de los Lástres
DBA1 - Timones, sus Transmisiones y Axiométricas	020803	A	DBA1 - Timones, sus Transmisiones y Axiométricas



# The S80 Sustainment Program. The Navantia Engineering Process

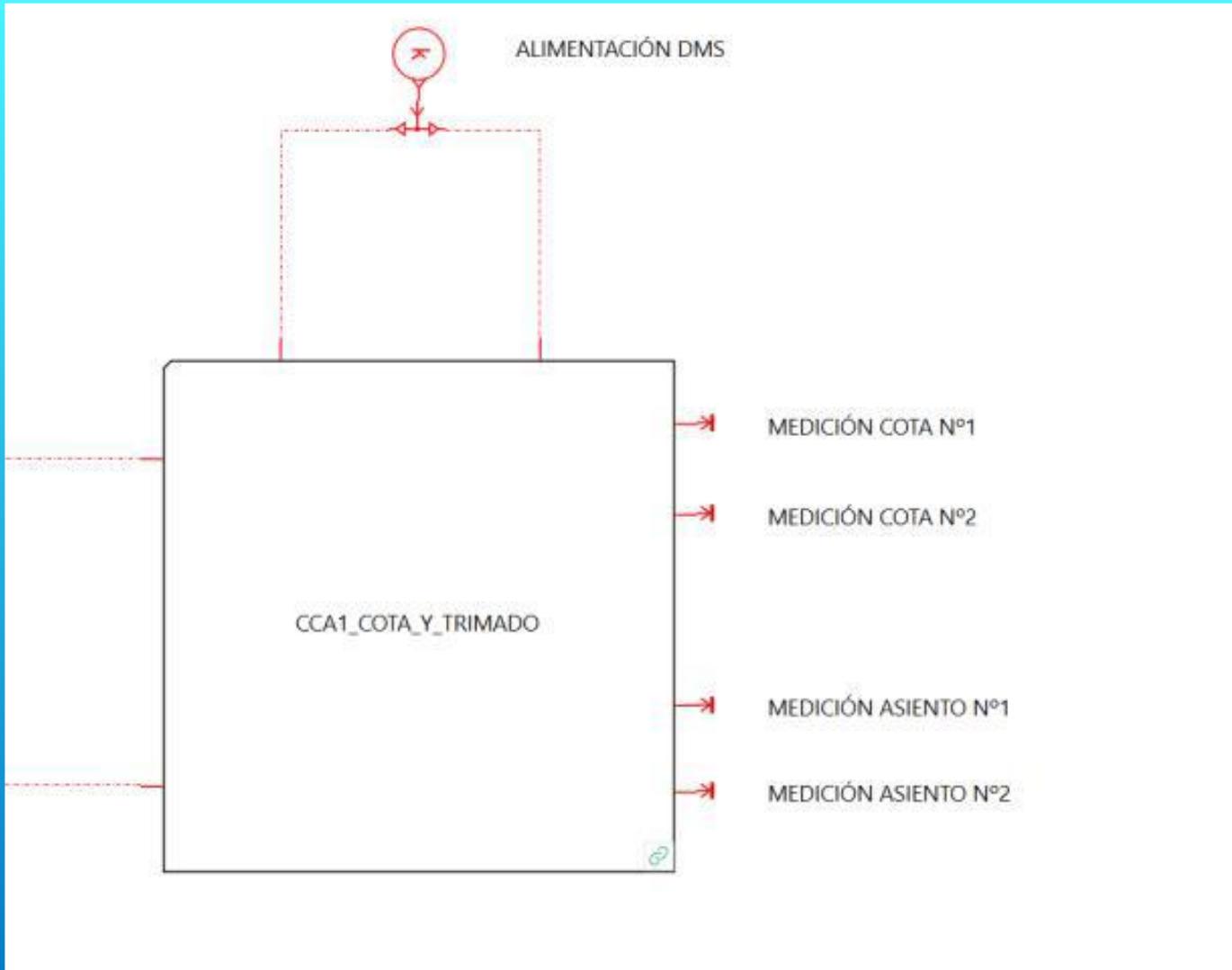


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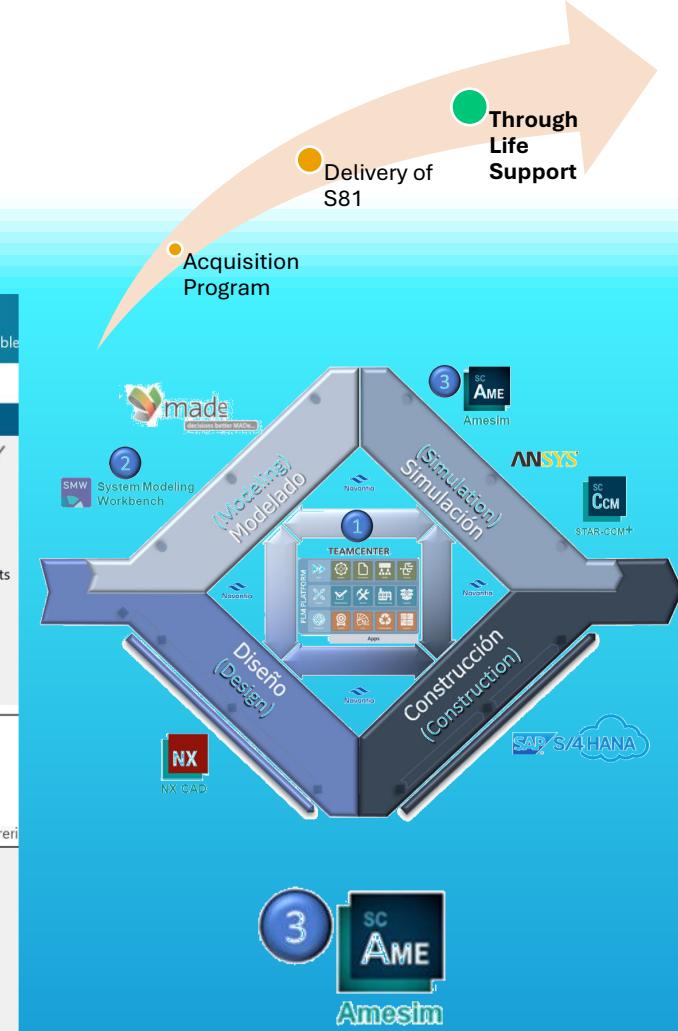
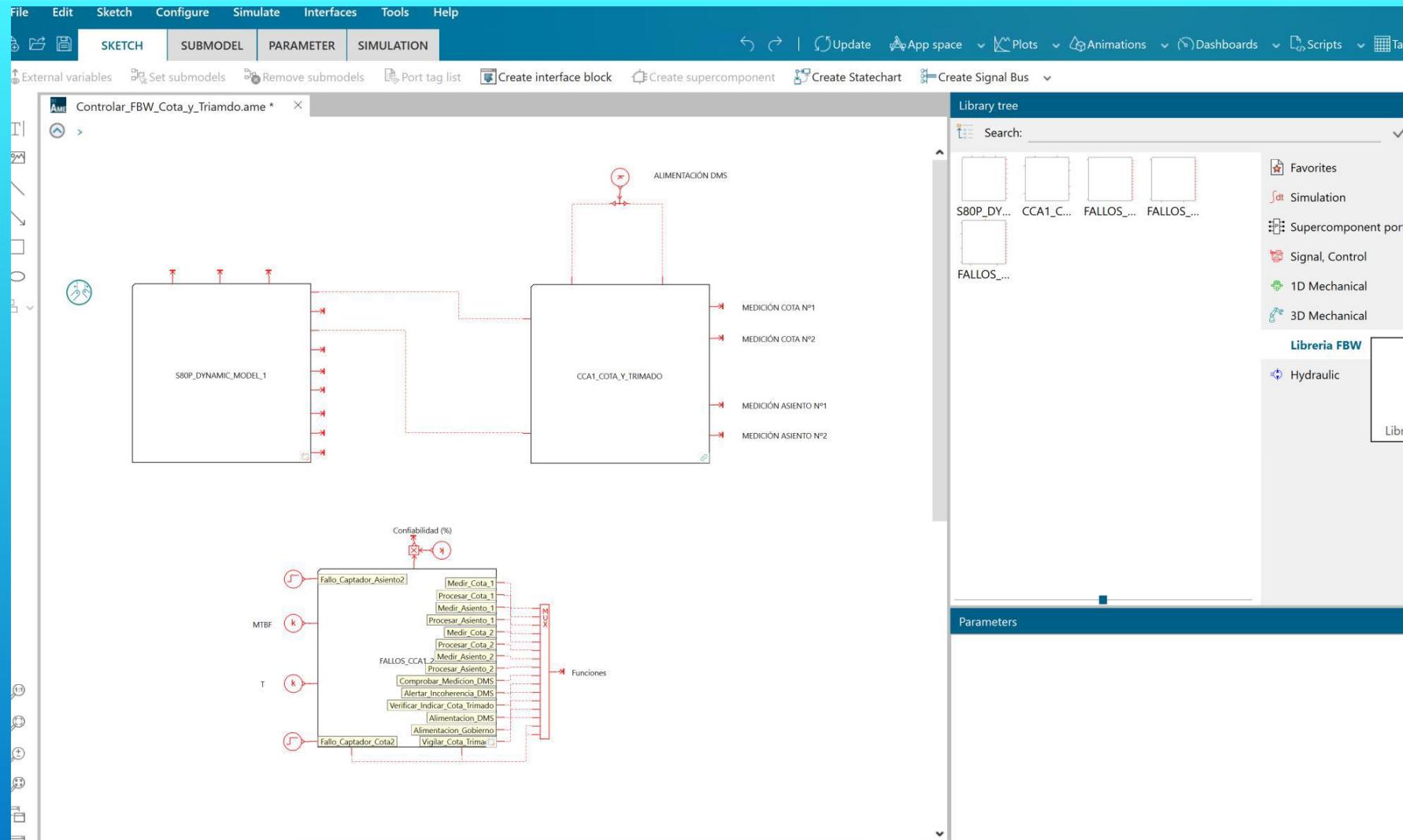
Acquisition Program

Through Life Support

## The S80 Sustainment Program. The Navantia Simulation Solution



# The S80 Sustainment Program. The Navantia Simulation Solution

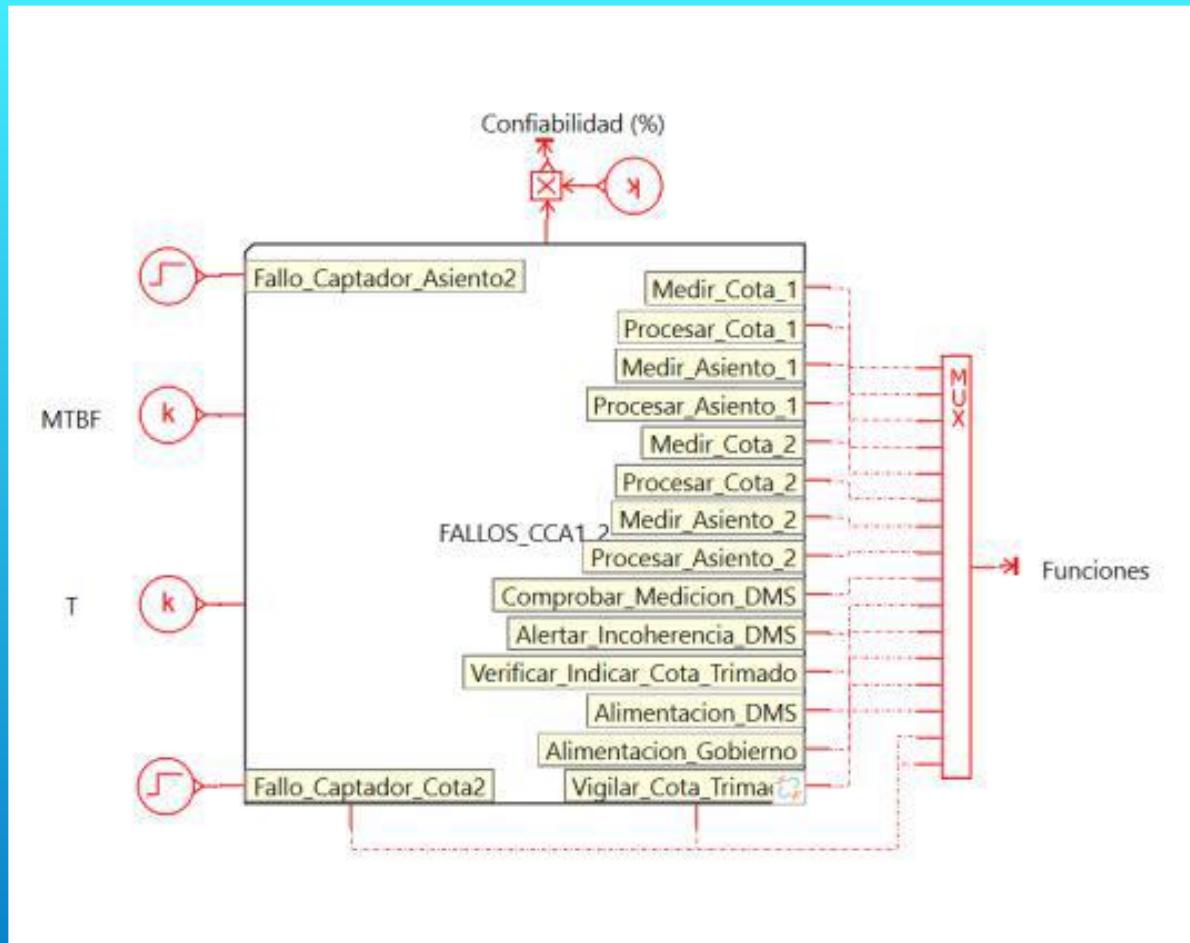


Through  
Life  
Support

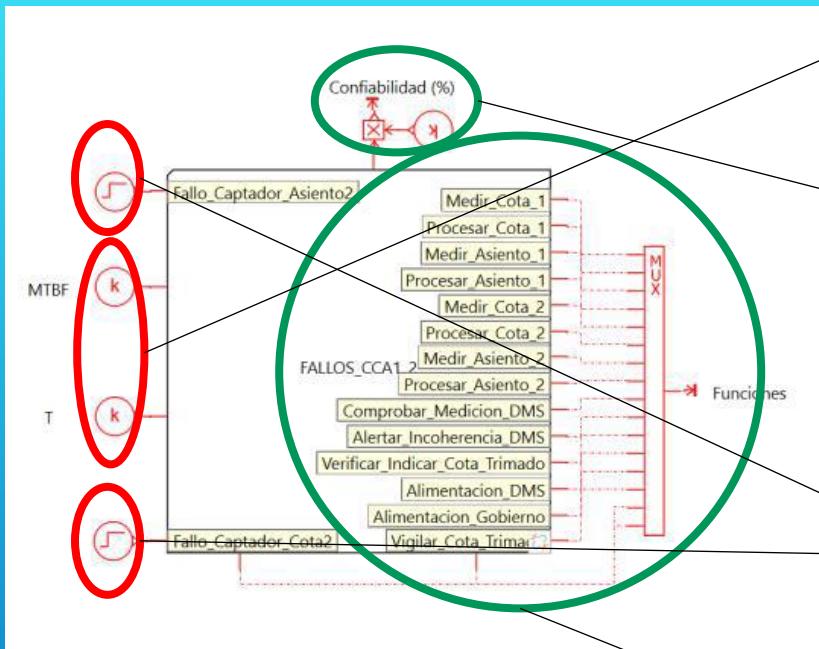
Delivery of  
S81

Acquisition  
Program

## The S80 Sustainment Program. The Navantia Simulation Solution



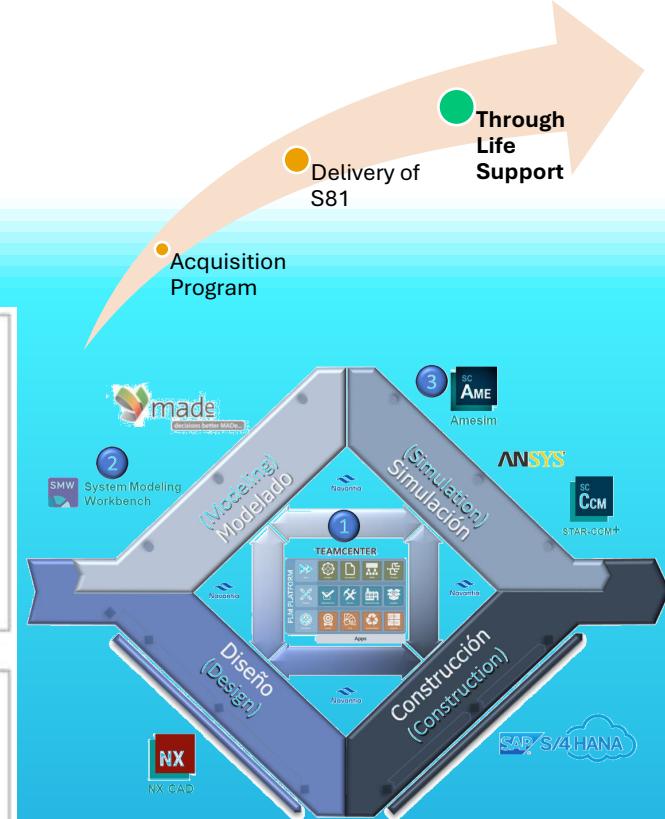
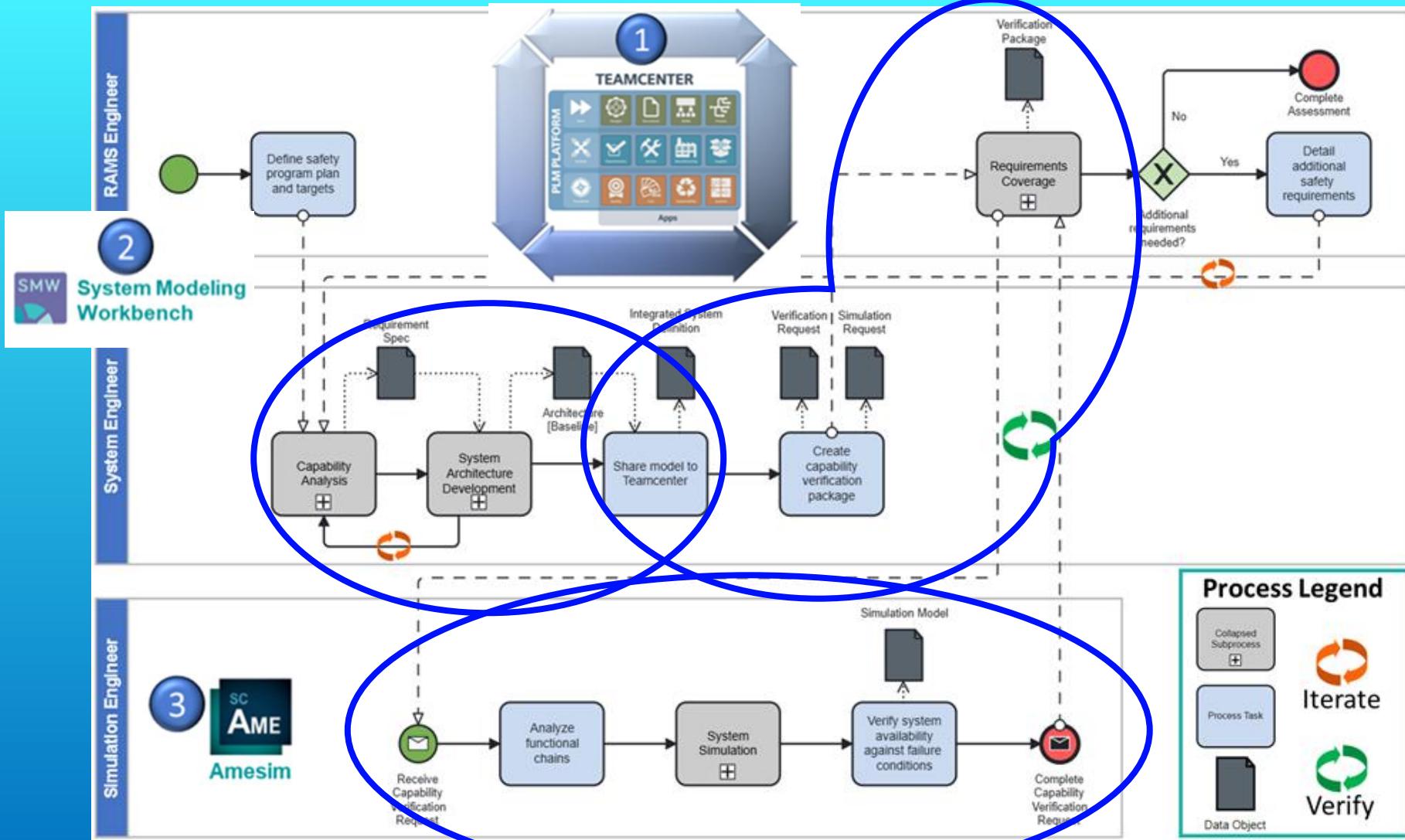
## The S80 Sustainment Program. The Navantia Simulation Solution

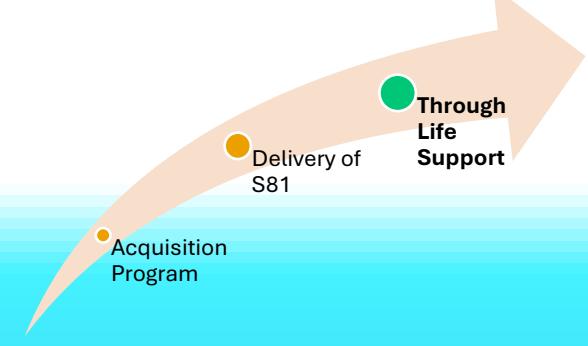


- Input parameters
  - MTBF (reliability metric)
  - Operating time
- Output parameter
  - Reliability
- Failure Triggers
- Output functions



# The S80 Sustainment Program. The Navantia Simulation Solution




  
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Acquisition Program


## The S80 Sustainment Program. The Navantia Verification Solution

This section displays three tables representing the verification status of different components across three categories: Systems, Simulation Models, and Components.

**SYSTEMS:**

Name	Revisi...	Target	Result	Owner	Type
Medir Asiento N°1	A	True	Pass	user1 (user1)	Physical Component
Medir Asiento N°2	A	True	Pass	user1 (user1)	Physical Component
Medir Cota N°1	A	True	Pass	user1 (user1)	Physical Component
Medir Cota N°2	A	True	Fail	user1 (user1)	Physical Component
Procesar señal Asiento N°1	A	True	Pass	user1 (user1)	Physical Component
Procesar señal Asiento N°2	A	True	Pass	user1 (user1)	Physical Component
Procesar señal Cota N°1	A	True	Pass	user1 (user1)	Physical Component
Procesar señal Cota N°2	A	True	Fail	user1 (user1)	Physical Component
Suministrar alimentación eléctrica a DMS	A	True	Pass	user1 (user1)	Physical Component
Verificar e indicar datos de Cota y Trimado	A	True	Pass	user1 (user1)	Physical Component

**SIMULATION MODELS:**

Name	Revisi...	Target	Result	Owner	Type
Controlar FBW Cota y Trimado	A	True	Pass	user1 (user1)	CAE 3D Analysis R...

**Components:**

Name	Revisi...	Target	Result	Owner	Type
BBA1 - Gobierno	A	True	Pass	user1 (user1)	Physical Component
Captador de presión N°2 - CCA15002	A	True	Fail	user1 (user1)	Physical Component
CCA1 - Vigilancia de la Cota	A	True	Pass	user1 (user1)	Physical Component

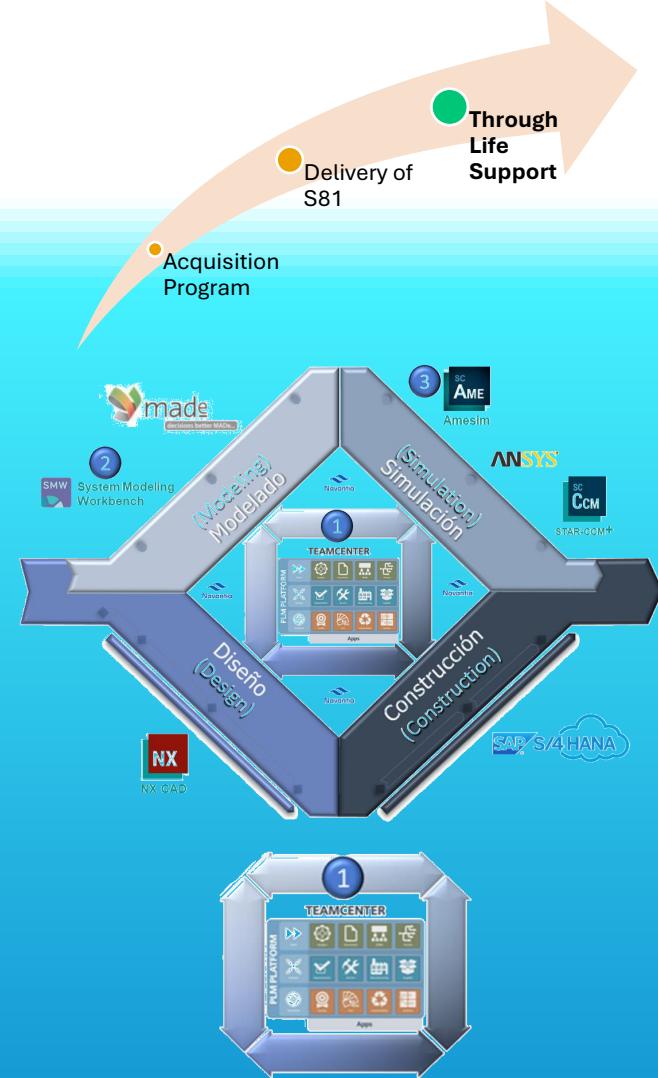
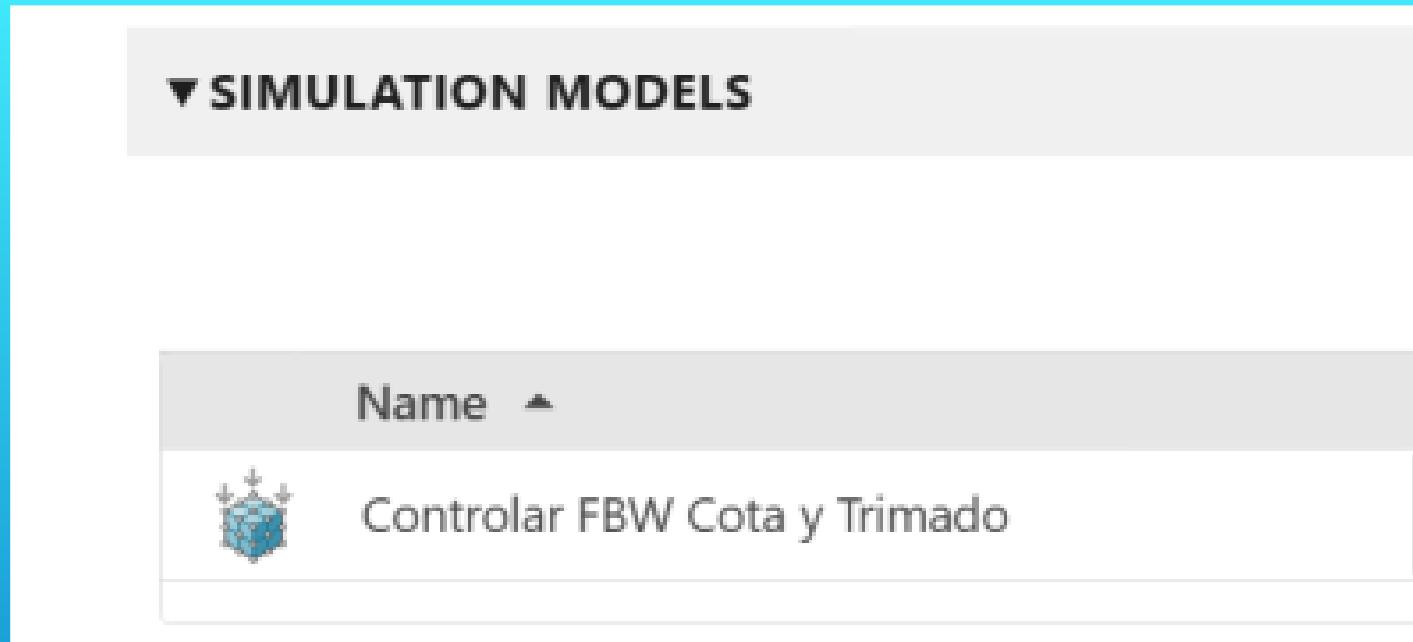
Below each table is a pie chart showing the distribution of results:

- Systems:** 1 Pass, 0 Fail, 0 Blocked, 0 Caution.
- Simulation Models:** 1 Pass, 0 Fail, 0 Blocked, 0 Caution.
- Components:** 1 Pass, 0 Fail, 0 Blocked, 0 Caution.

Legend for results:

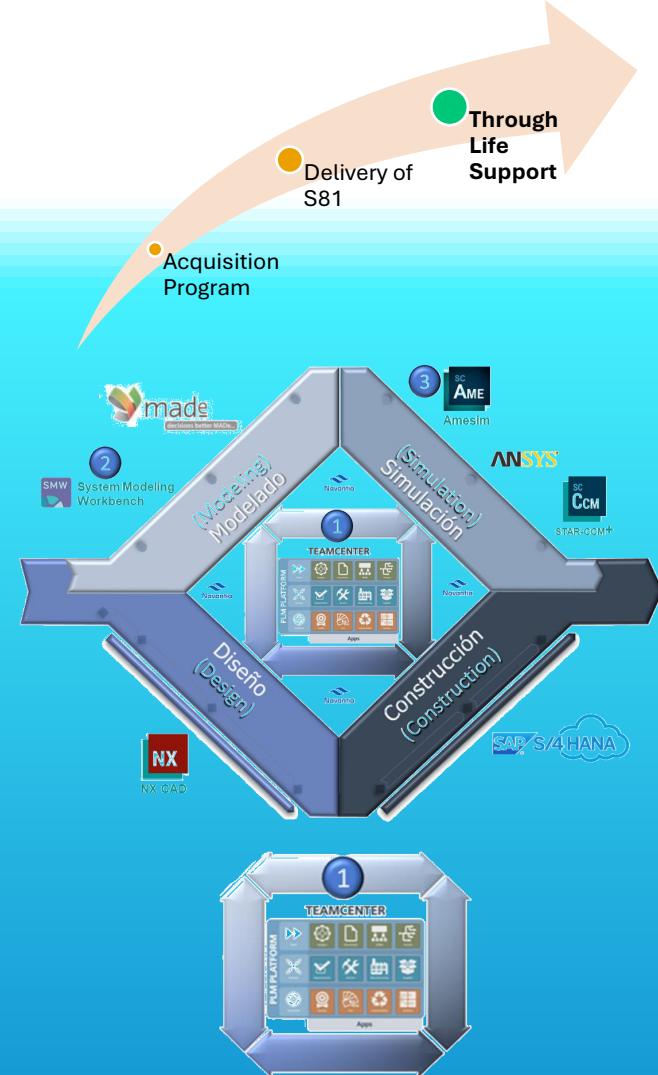
- No Result
- Blocked
- Caution
- Fail
- Pass

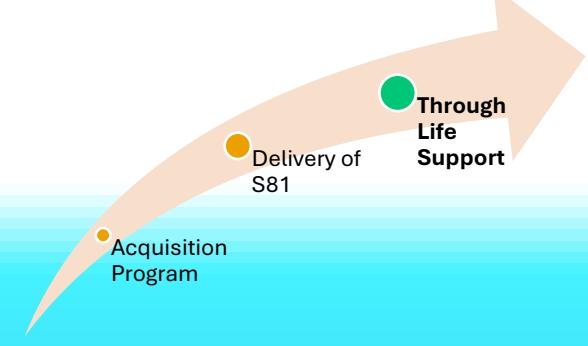
## The S80 Sustainment Program. The Navantia Verification Solution



## The S80 Sustainment Program. The Navantia Verification Solution

Name	Result	Type
CONTROLAR FBW COTA Y TRIMADO	Pass	Capability Revision



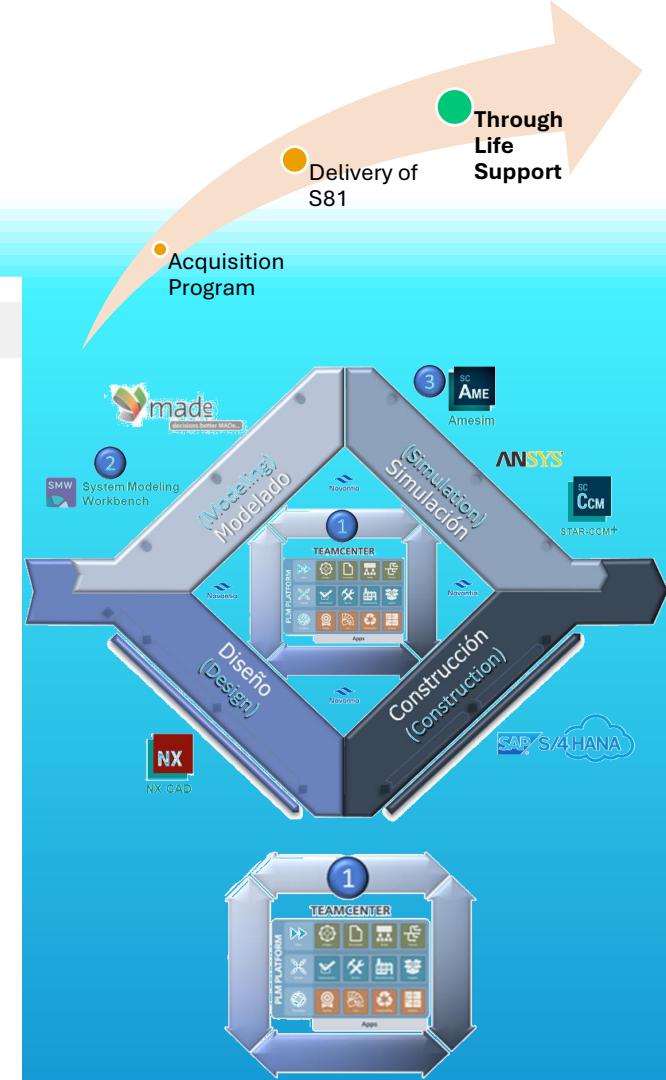


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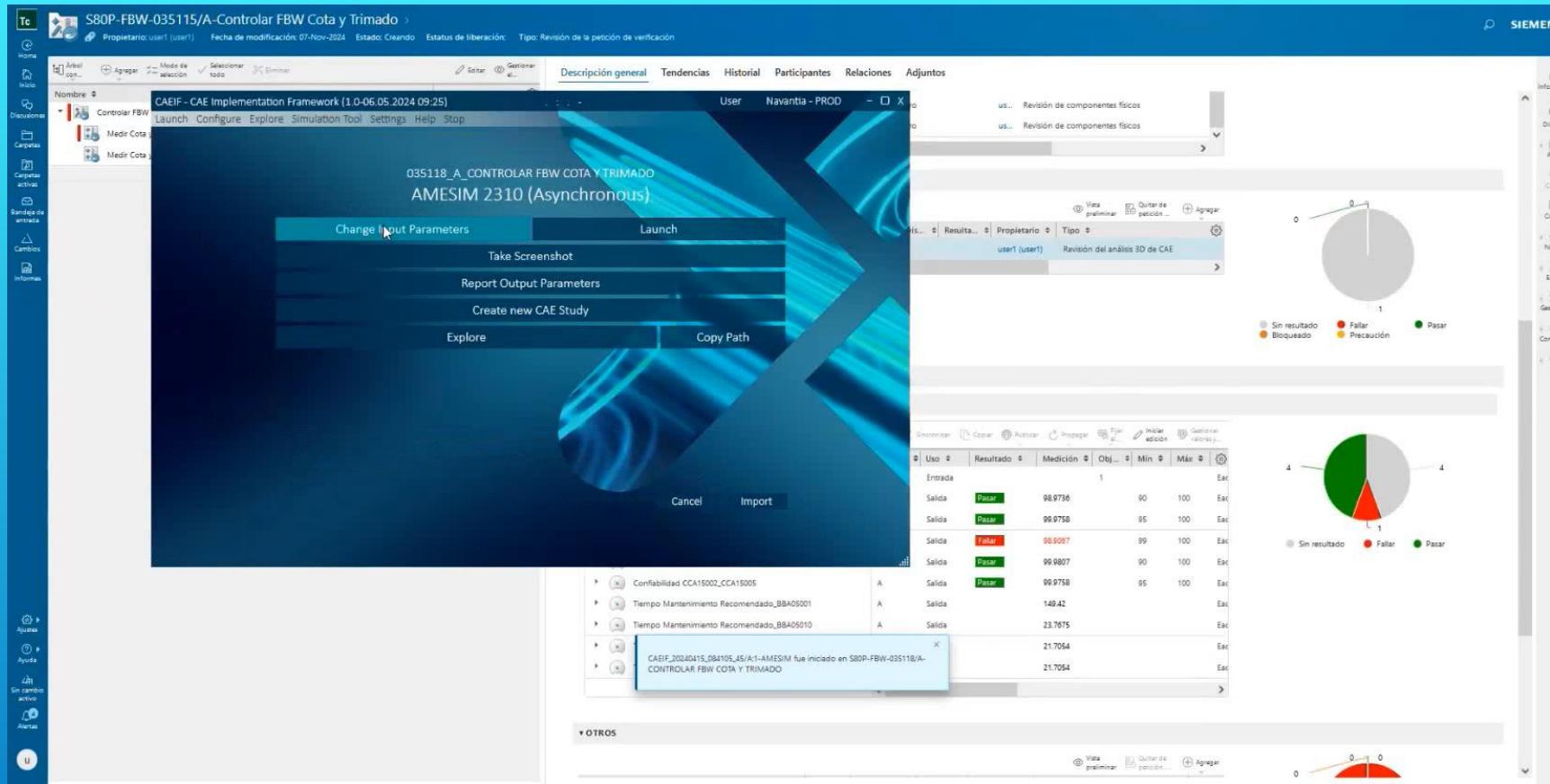
Delivery of S81

## The S80 Sustainment Program. The Navantia Verification Solution

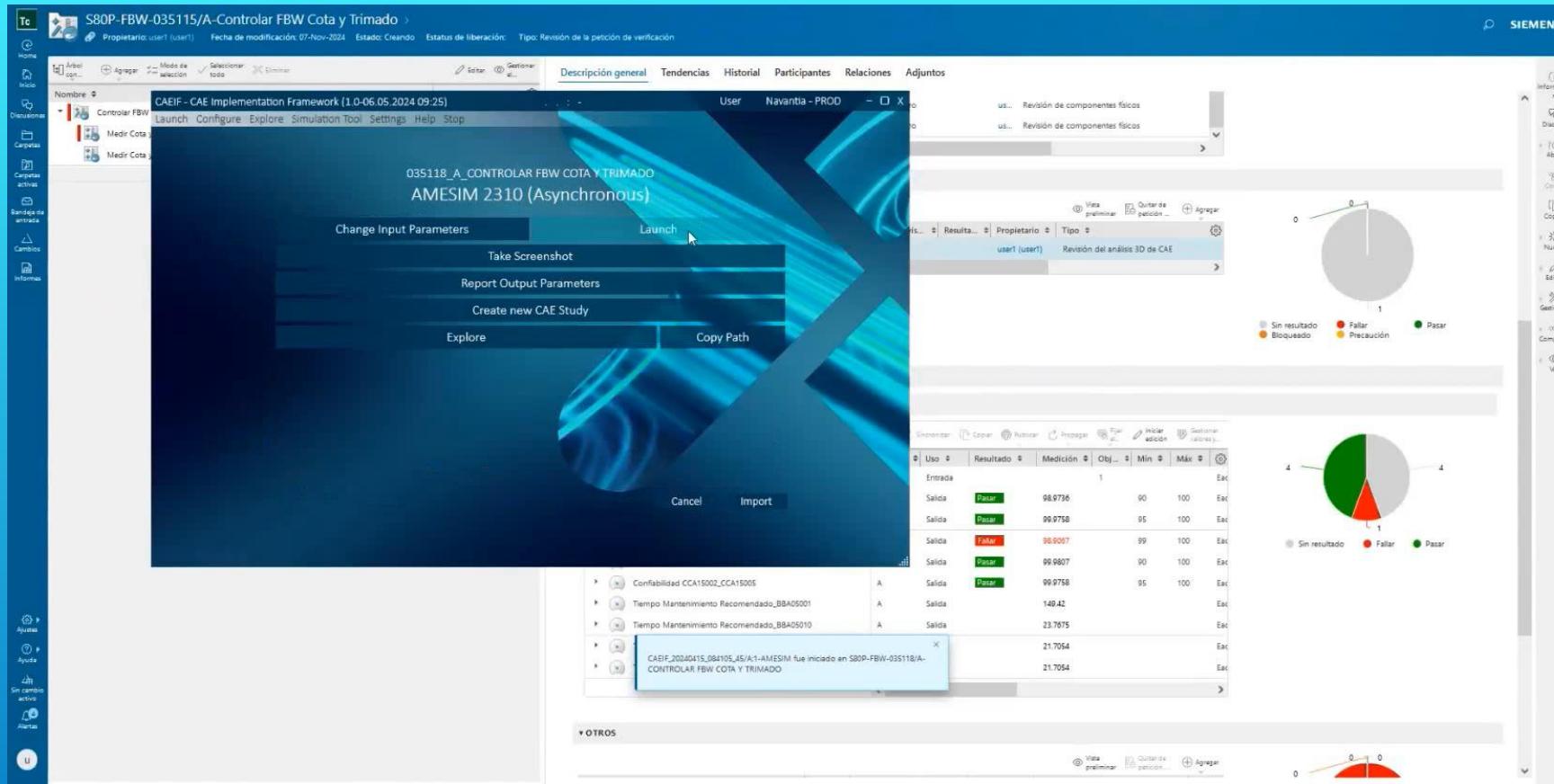
PARAMETERS							
		Result	Measure...	Goal	Min	Max	Usage
	Confiabilidad	Pass	98.9067	95	100	Output	%
	Confiabilidad BBA05001	Pass	99.9807	90	100	Output	%
	Confiabilidad BBA05010	Pass	99.9736	90	100	Output	%
	Confiabilidad Captadores Asiento_CCA15004_CCA15005	Pass	99.9758	95	100	Output	%
	Confiabilidad Captadores Cota_CCA15001_CCA15002	Pass	99.9758	95	100	Output	%
	Tiempo de Mantenimiento Recomendado BBA05001		149.42			Output	h
	Tiempo de Mantenimiento Recomendado BBA05010		207.0			Output	h
	Tiempo de Mantenimiento Recomendado Captadores Asiento_CCA15004_CCA15005		21.7054			Output	h
	Tiempo de Mantenimiento Recomendado Captadores Cota_CCA15001_CCA15002		21.7054			Output	%
	Tiempo de Operacion			1		Input	h
OTHERS							
	CONTROLAR FBW COTA Y TRIMADO	Pass	Capability Revision				



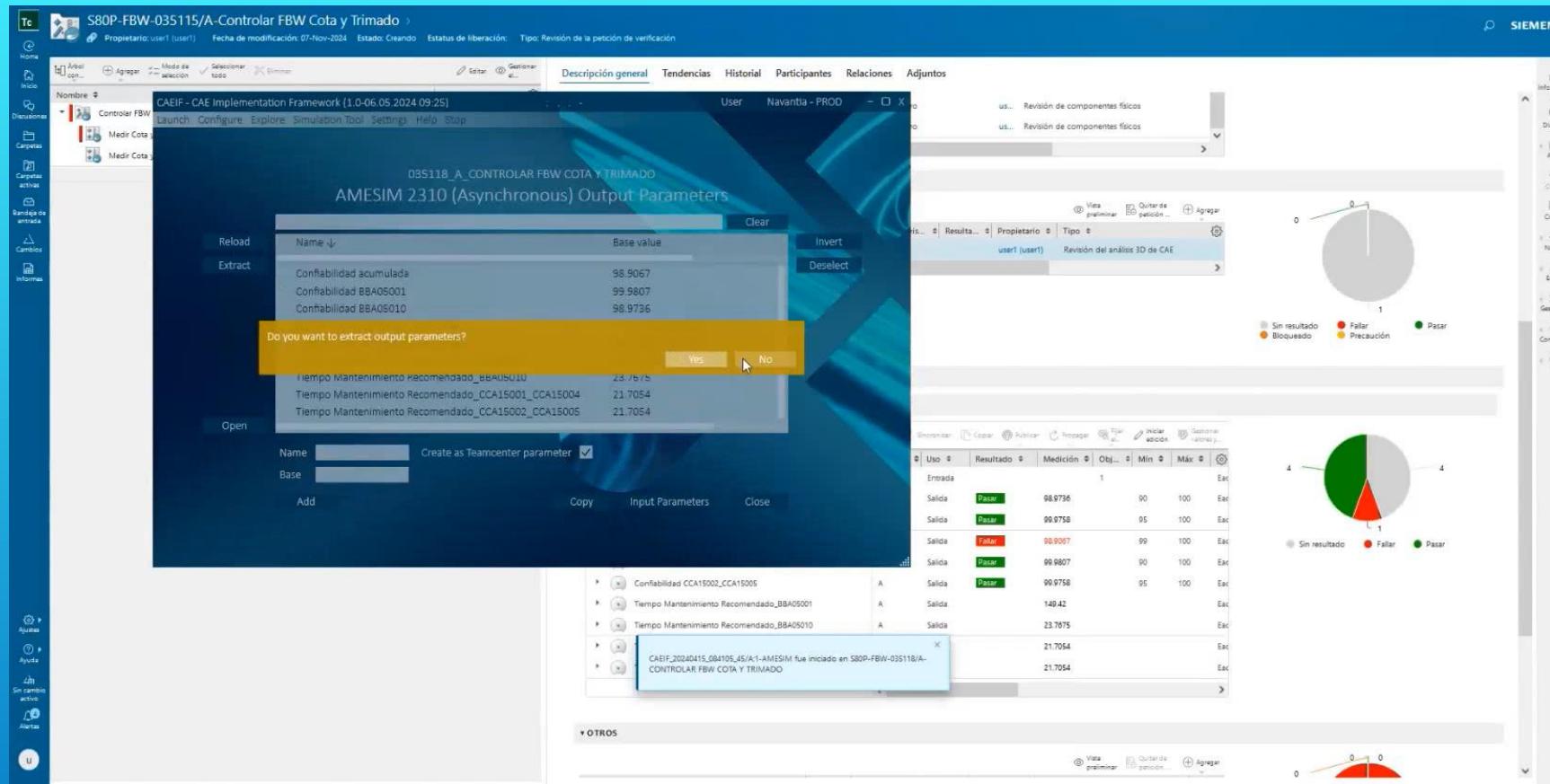
# The S80 Sustainment Program. The Navantia Verification Solution



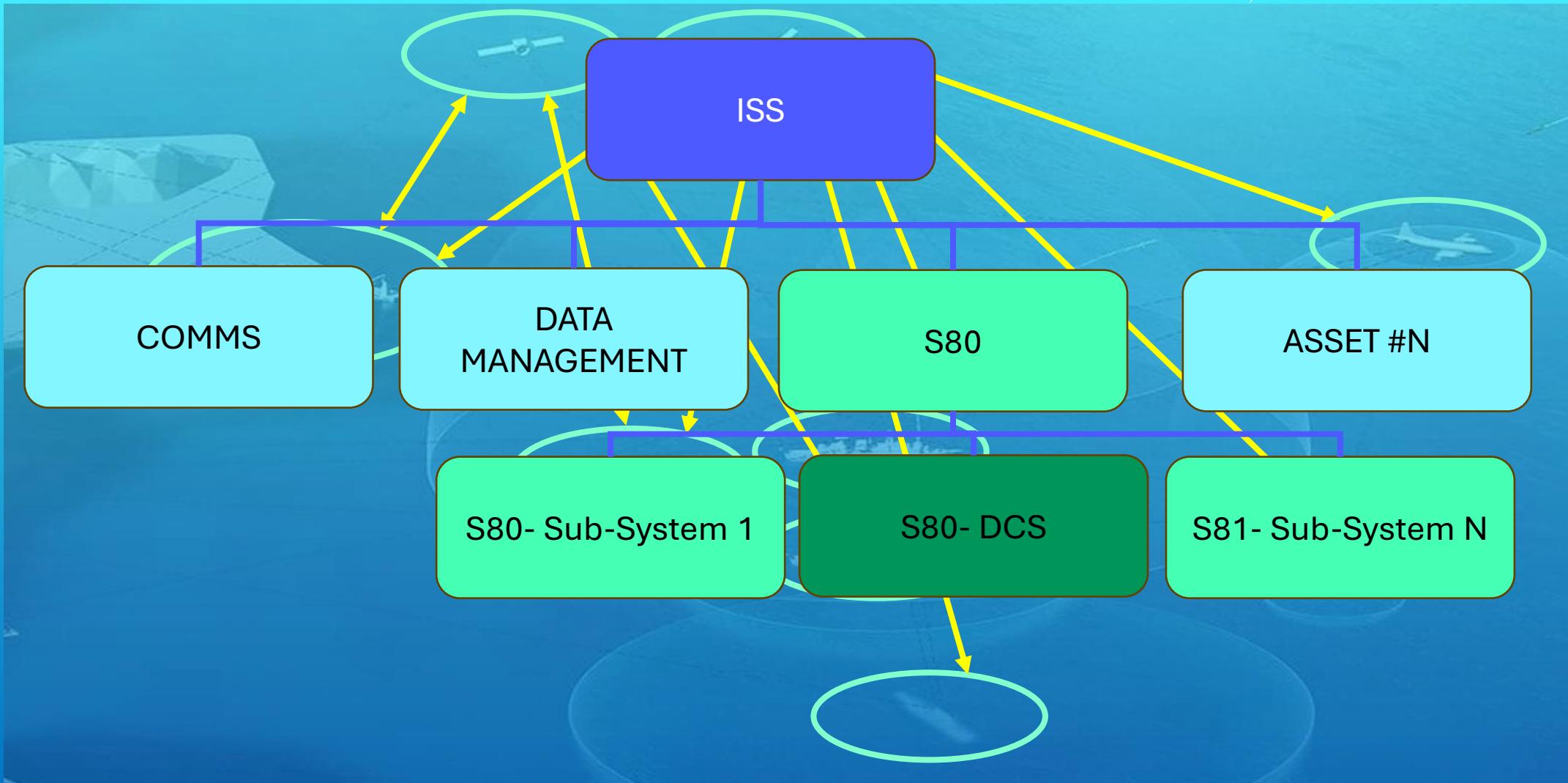
# The S80 Sustainment Program. The Navantia Verification Solution



## The S80 Sustainment Program. The Navantia Verification Solution

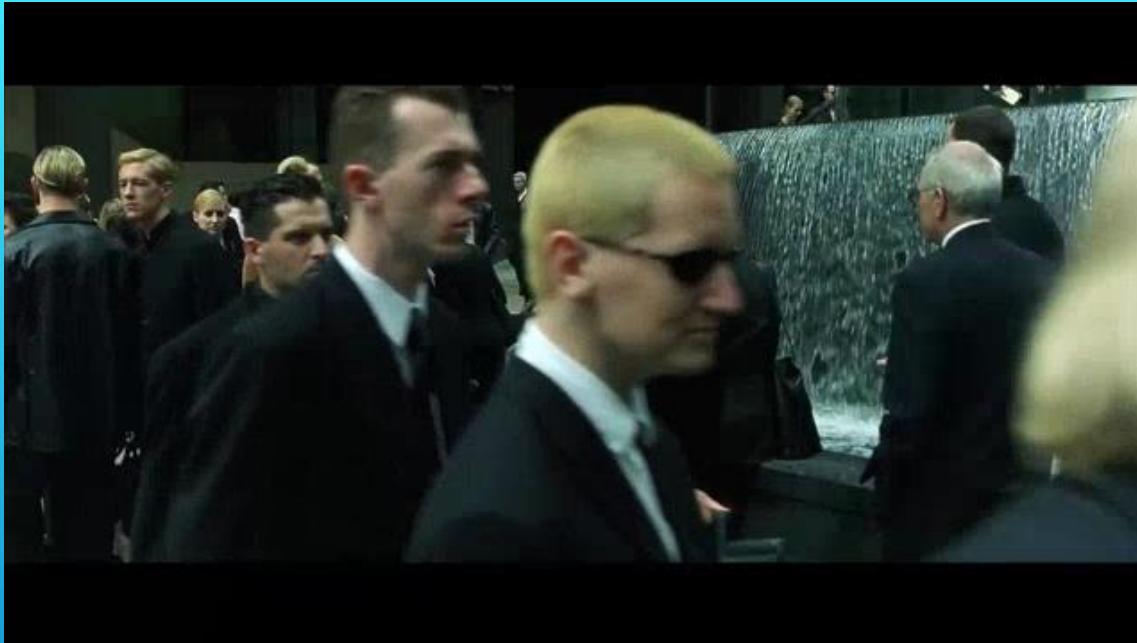


## Current S80 Progress



## The S80 Sustainment Program. The foundation of the digital twin, the structure

Front-End



PLM, virtual mock-up  
Performance metrics  
Cost metrics  
Reliability metrics

Back-End



Systems Engineering  
Configuration Management  
Simulation  
Data management

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Acquisition Program

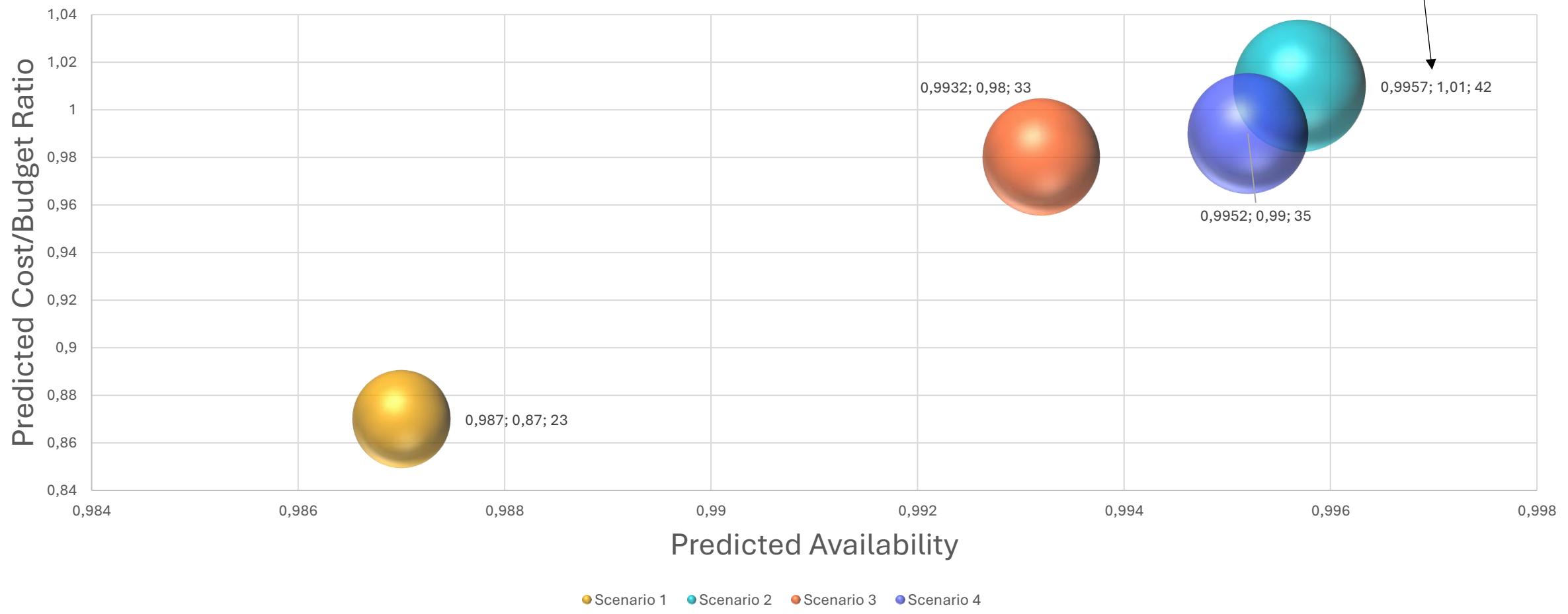
Through Life Support

## The S80 Sustainment Program. The foundation of the digital twin, the promise

Front-End (specimen)

Availability; Cost/Budget ratio; Shutdown days

Maintenance Scenarios



# Key Takeaways

- Sustainment of Naval Vessels has evolved from preventive to availability-driven
- S80 must evolve from document based to model based Systems Engineering
- MBSE provides new high added value capabilities to Navantia Services portfolio



**Navantia**  
Innovation where it matters

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# Questions?

