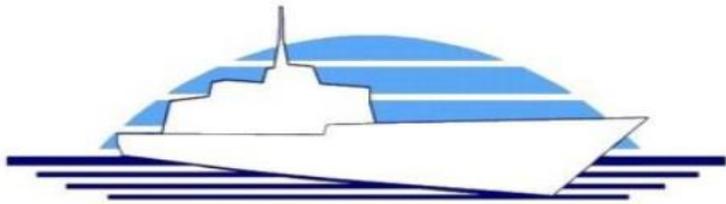# Supportability Analysis

2024 Italian Opus Suite Conference

Orizzonte Sistemi Navali S.p.A.

A Fincantieri and Leonardo Company
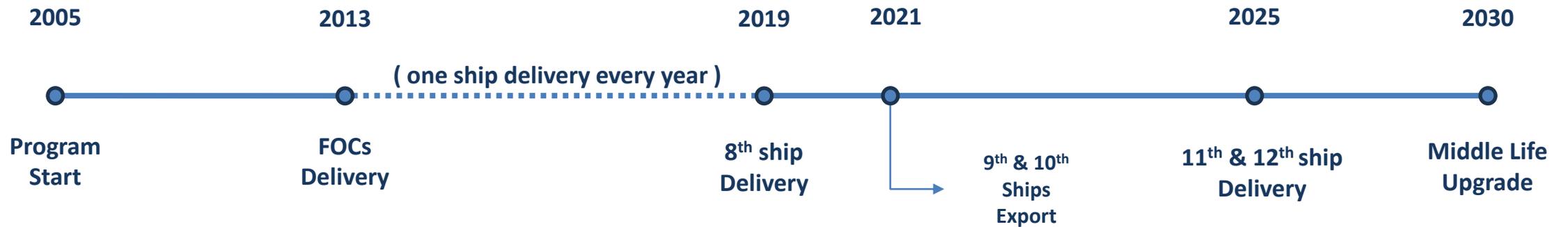
Agenda

1. FREMM Programs overview

2. Opus Suite in OSN

3. Supportability and Opus Suite

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FREMM Program Overview

FREMM Program consists in Development, Production and Support of 12+ Frigates for Italian Navy and Export

	2005	2013	2019	2021	2025	2030

(one ship delivery every year)

Program Start — **FOCs Delivery** — **8th ship Delivery** — **9th & 10th Ships Export** — **11th & 12th ship Delivery** — **Middle Life Upgrade**

DESIGN						
PRODUCTION						
ISS						

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Opus Suite & OSN

OPUS 10

OPUS 10 is being used since 2011 for Initial Stock & Replenishment sizing

Now the need is decreased because Italian Navy is requiring spare parts on effective consumption (failures) and obsolescence issues during ISS phase

SIMLOX

SIMLOX has been used in 2014/2015* to validate, by simulation and LSDB data, Operational Availability performed during design phase with OSN specific tools.

On occasion SIMLOX is used to validate or estimate Ao for some equipment.

CATLOC

CATLOC has been used since 2016 for the Lifecyle Cost Estimation of FREMM Fleet.

OCCAR/Italian Navy require an annual update to estimate the budget to allocate during ISS phases

	2005	2013	(one ship delivery every year)	2019	2021		2025	2030
	Program Start	FOCs Delivery		8th ship Delivery		9th & 10th Ships Export	11th & 12th ship Delivery	Middle Life Upgrade
OPUS 10								
SIMLOX								
CATLOC								

* The adoption of SIMLOX for warship applications required an upgrade based on OSN specific requirements

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New ITN programs (OPV, FREMM EVO, DDX) – design, production and support - will require an extensive use of OPUS, SIMLOX and CATLOC

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The Supportability Problem

The obsolescence issue and material shortage stiffen as near the middle of live cycle of the ships.

An proactive management of obsolescence, to guarantee the system supportability and mitigate costs, is more and more important

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Supportability – Customer Requests

- During the FREMM life cycle, Obsolescence is starting to be an important limiting factor of supportability and Italian Navy focused on Obsolescence Treatments, including Last Buy Order, focused redesign or limited upgrades for some equipment

- So it is necessary to be able to answer to following requests

We have the possibility to do a Last Buy Order for an obsolete item. *How many spare parts should we buy to support the system until the Middle Life Update?"*
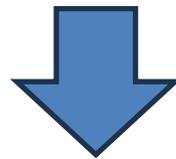
These items are no longer available on the market. How long can we support the system with available Navy stock? What is the achieved availability at Middle Life Update date?

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"We have the possibility to do a Last Buy Order for an obsolete item. How many spare parts should we buy to support the system until the Middle Life Update date?"

Method: Poisson model with no Replenishment.

$$P_n(T) = e^{-\lambda_{eq}T} * \sum_{j=0}^{k} \frac{(\lambda_{eq}T)^j}{j!}$$
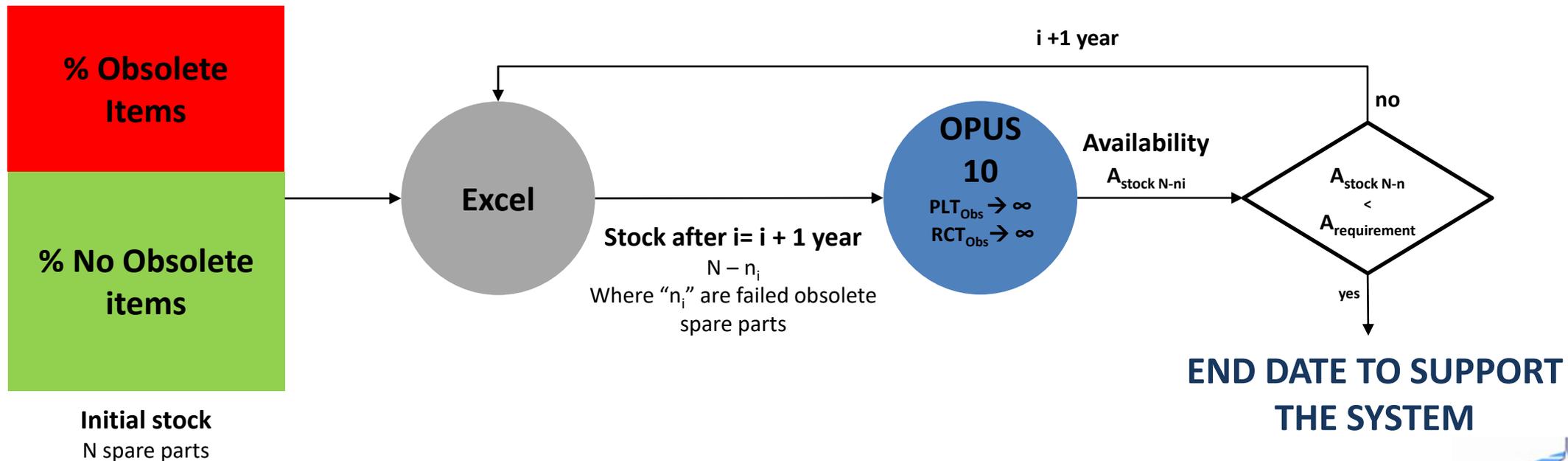
SPARE PARTS NUMBER TO BUY

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Supportability – Stock

These items are no longer available on the market. How long can we support the system with Navy stock? What is the achieved availability at Middle Life Update date?

OPUS 10 and Excel to estimate End Date to support the system

% Obsolete Items

% No Obsolete items

Initial stock
N spare parts

i +1 year

Excel

Stock after i= i + 1 year
$N - n_i$
Where "n_i" are failed obsolete spare parts

OPUS 10
$PLT_{Obs} \rightarrow \infty$
$RCT_{Obs} \rightarrow \infty$

Availability
$A_{stock\ N-ni}$

no

$A_{stock\ N-n}$
$<$
$A_{requirement}$

yes

END DATE TO SUPPORT THE SYSTEM

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Supportability – Ao

These items are no longer available on the market. How long can we support the system with Navy stock? What is the achieved availability at Middle Life Update date?
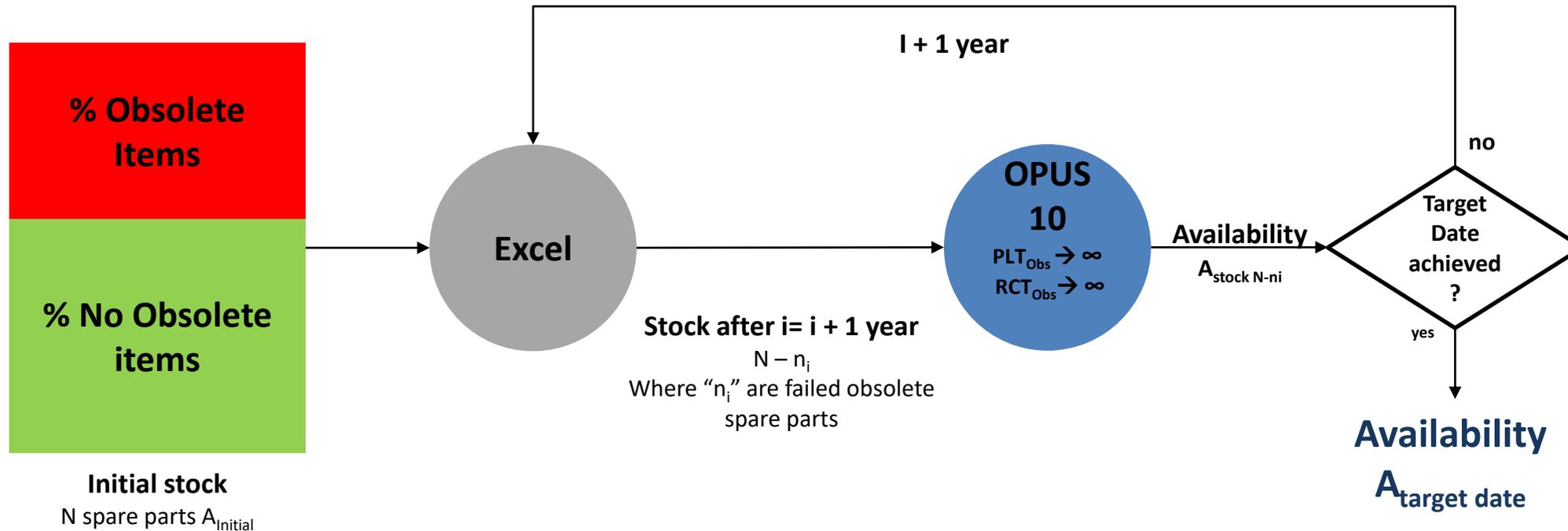
OPUS 10 and Excel to calculate the "System Availability"* at Middle Life Update

% Obsolete Items

% No Obsolete items

Initial stock
N spare parts $A_{Initial}$

I + 1 year

Excel

Stock after i= i + 1 year
$N - n_i$
Where "n_i" are failed obsolete spare parts

OPUS 10
$PLT_{Obs} \rightarrow \infty$
$RCT_{Obs} \rightarrow \infty$

Availability
$A_{stock\ N-ni}$

Target Date achieved ?

no

yes

Availability
$A_{target\ date}$

* A more effective evaluation of availability would require SIMLOX instead of OPUS steady state evaluation

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Supportability – Conclusions

System Availability
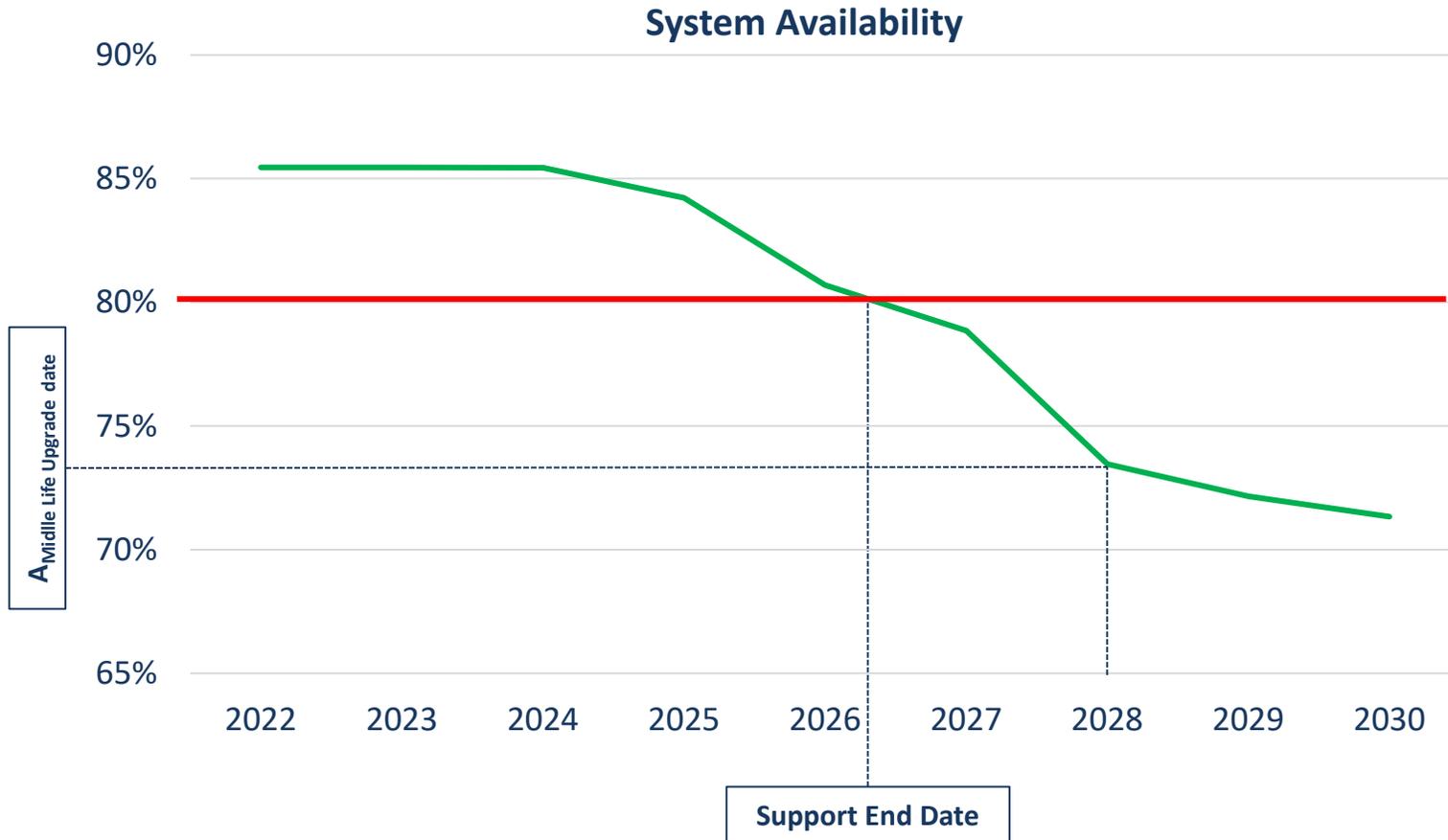
a) **System Availability trend with Obsolete Items** (green)

b) **System Availability Requirement** (red)

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- Today the problem cannot be managed with OPUS in one shot

- We do recursive computations to perform required analyses

- May be future evolutions will let this type of analysis