Kongsberg Naval and Joint Strike Missiles Update

KONGSBERG 200

Precision Strike Annual Review (PSAR-14)

Content



- System Overview
- Integration
- Performance & Capabilities

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System Overview

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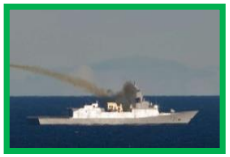
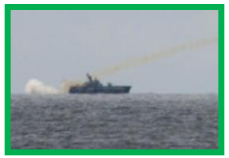
Kongsberg Family of Missiles

Weapon Platforms

Polish Coastal Defense



RNoN NANSEN FFG



RNoN Skjold Corvette

LCS - pending

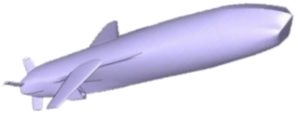
F-16 Blk 60 - pending

MH60 - pending

2012 2017 2021 2026

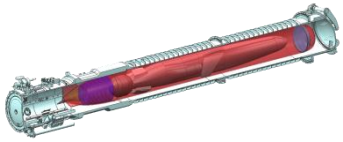
Capability

IOC NSM



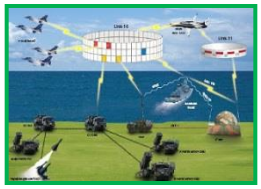
IOC JSM

NSM
Mid-Life-Update



IOC NSM-SL

Note: green framed pictures are capabilities that are funded or a validated requirement for spiral upgrade roadmap



Network Enabling

Land Attack ATR

Naval Strike Missile (NSM)

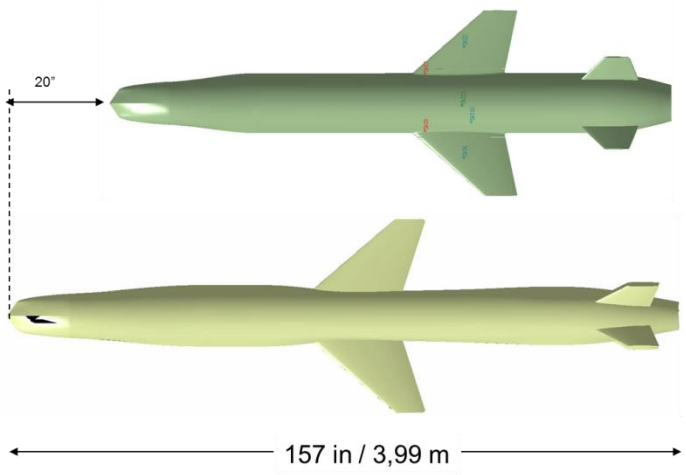
Coastal Defence

“NANSEN” Class Frigates

“SKJOLD” Class Littoral Corvette

Key NSM / JSM

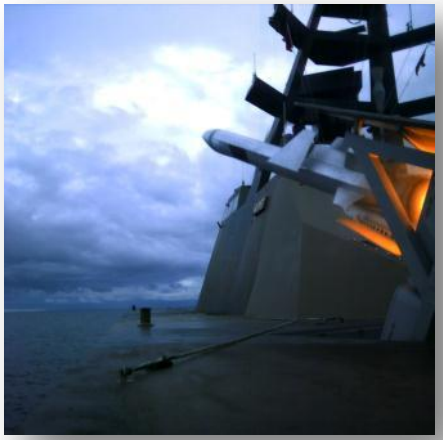
- **Naval Strike Missile (NSM)**
  - Ship-based cruise missile developed to meet Royal Norwegian Navy requirements for NANSEN FFGs and SKJOLD Corvette
  - Land-based variant developed for Polish Defense Force (coastal defense)
- **Joint Strike Missile (JSM)**
  - Air launched variant being designed for the F-35 (internal and external carriage) to meet Royal Norwegian Air Force requirements
- **Similarities**
  - Seeker, software, mission planning, warhead, engine
- **Differences**
  - JSM will introduce Link-16 and overland capability
    - Capability to be retrofitted in NSM
  - JSM outer mold line changes to fit F-35A/C internal weapons bay



JSOW size and weight

Naval Strike Missile (NSM) Tests

HNoMS GLIMT firing NSM October, 10 2012



HNoMS ROALD AMUNDSEN firing NSM October, 15 2012

- Multiple firings at Pt. Mugu Missile Test Range, CA (2006-2011)
  - Key tests accomplished - capability against sea, littoral and overland targets
- 6 firings at Andoya Missile Test Range, Norway (2012-2013)
  - Key test accomplished - Autonomous Target Recognition (ATR), live warhead, “no attack” zone compliance, platform integration
- Planned RIMPAC 14 live warhead shot from a NANSEN FFG

NSM Demonstrated Lethality

- Lethality a combination of:
  - Energetics / fill
  - Fuzing
  - Accuracy
  - Size
- NSM has demonstrated
  - High accuracy
  - Reliable blast / frag warhead
  - Advanced fuzing

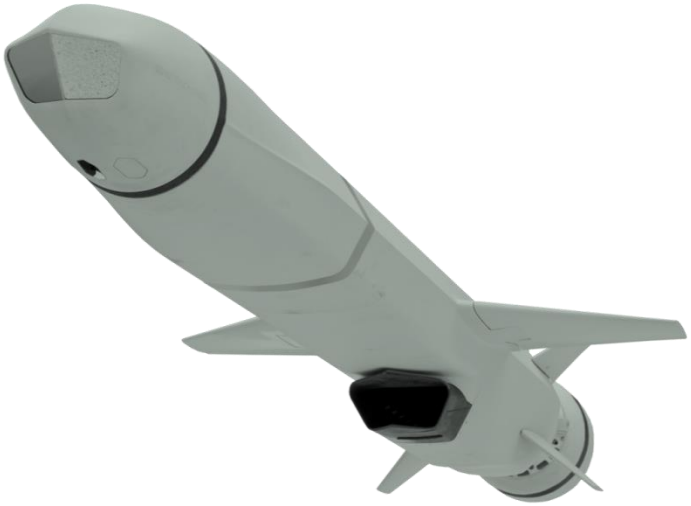
June 2013 Inert Warhead Test

June 2013 Live Warhead Shot vs. Oslo FFG CIC aimpoint

Post Mission Damage

Key NSM Missile Attributes

- Solid propellant booster motor
- Turbojet sustainer engine (JP-10)
- Low missile weight
- High, adjustable subsonic speed
- ***Range: > 100+ nm*** (profile dependent)



- Overall length: 156 in
- Wingspan: Folded 27.5 in
  Deployed 53.5 in
- Launch weight: ***880 lbs***

- ***GPS assisted INS*** guidance, TERCOM
- Intelligent Imaging IR (I^3R) seeker
- Automatic target recognition (***ATR***)
- ***Seeker generated aim point***

- Titanium alloy warhead casing
- ***500 lbs class warhead*** (264 lbs)
- Programmable, multipurpose fuze
- Selectable payload configuration

- Highly maneuverable
- Wave-adaptable super sea skim
- ***Low Observable RCS and IR*** signature design
- Highly resistant to countermeasures
- Precise TOT

Key JSM Missile Attributes

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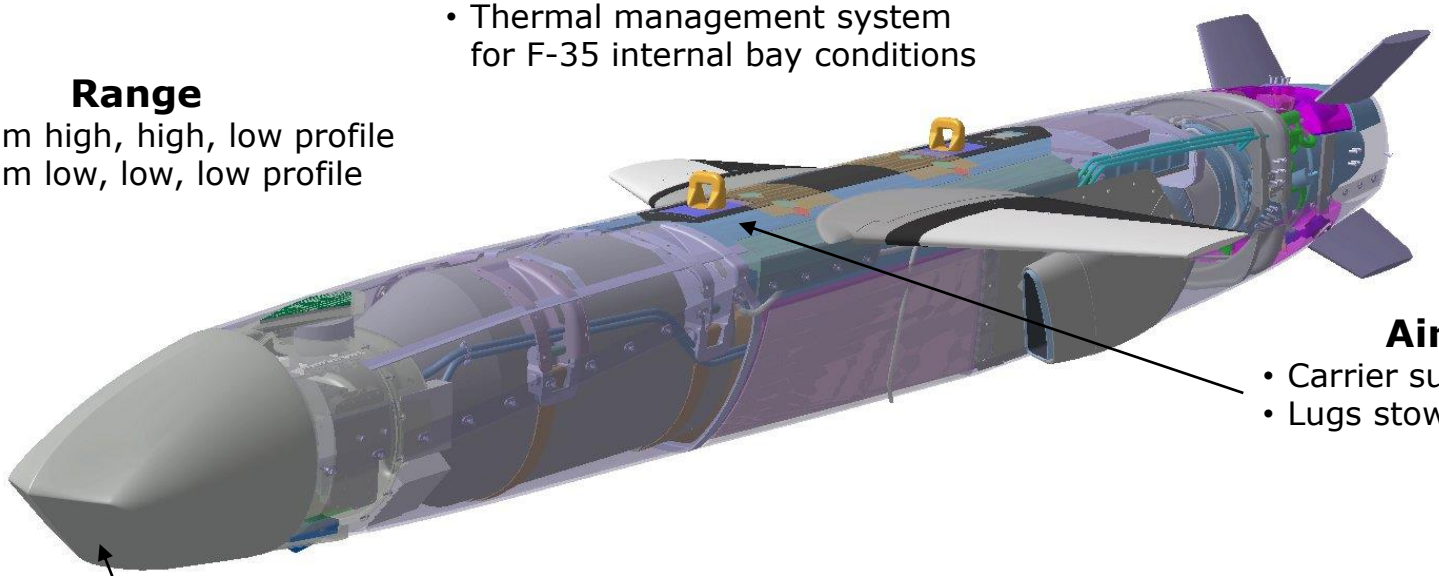
Propulsion
- Throttle modulates to achieve desired TOT
- > 1:1 thrust to wt in end-game

Avionics
- 2-way datalink
- Thermal management system for F-35 internal bay conditions

Range
- >300 nm high, high, low profile
- >100 nm low, low, low profile

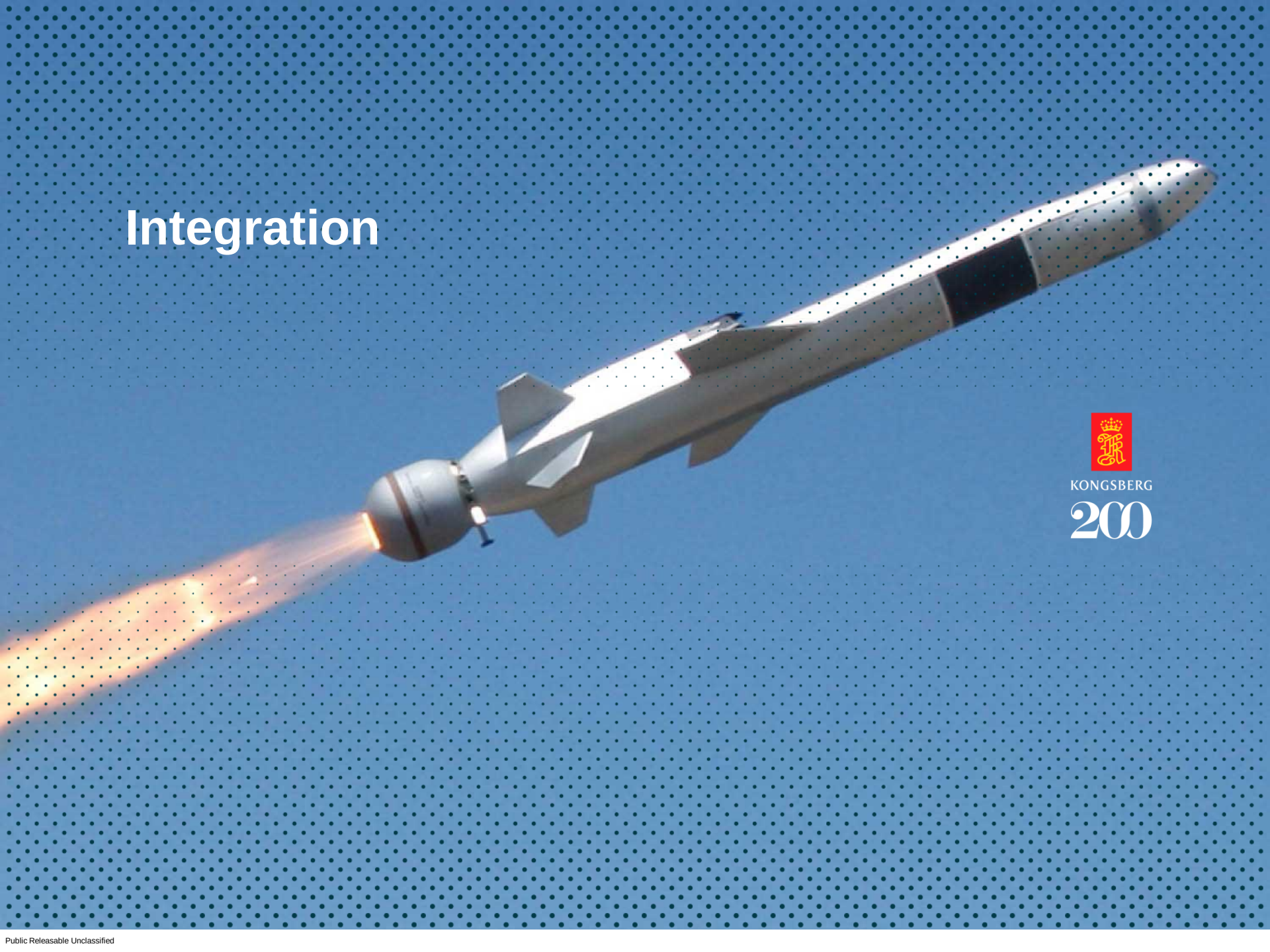


Airframe
- Carrier suitable reqmt
- Lugs stow after launch

Dimensions
- Length – 157 in
- Weight – 887 lbs
- Fits inside F-35A/C weapons bay
- CVN recoverable load

Seeker
- Seeker stablized on horizon

Integration



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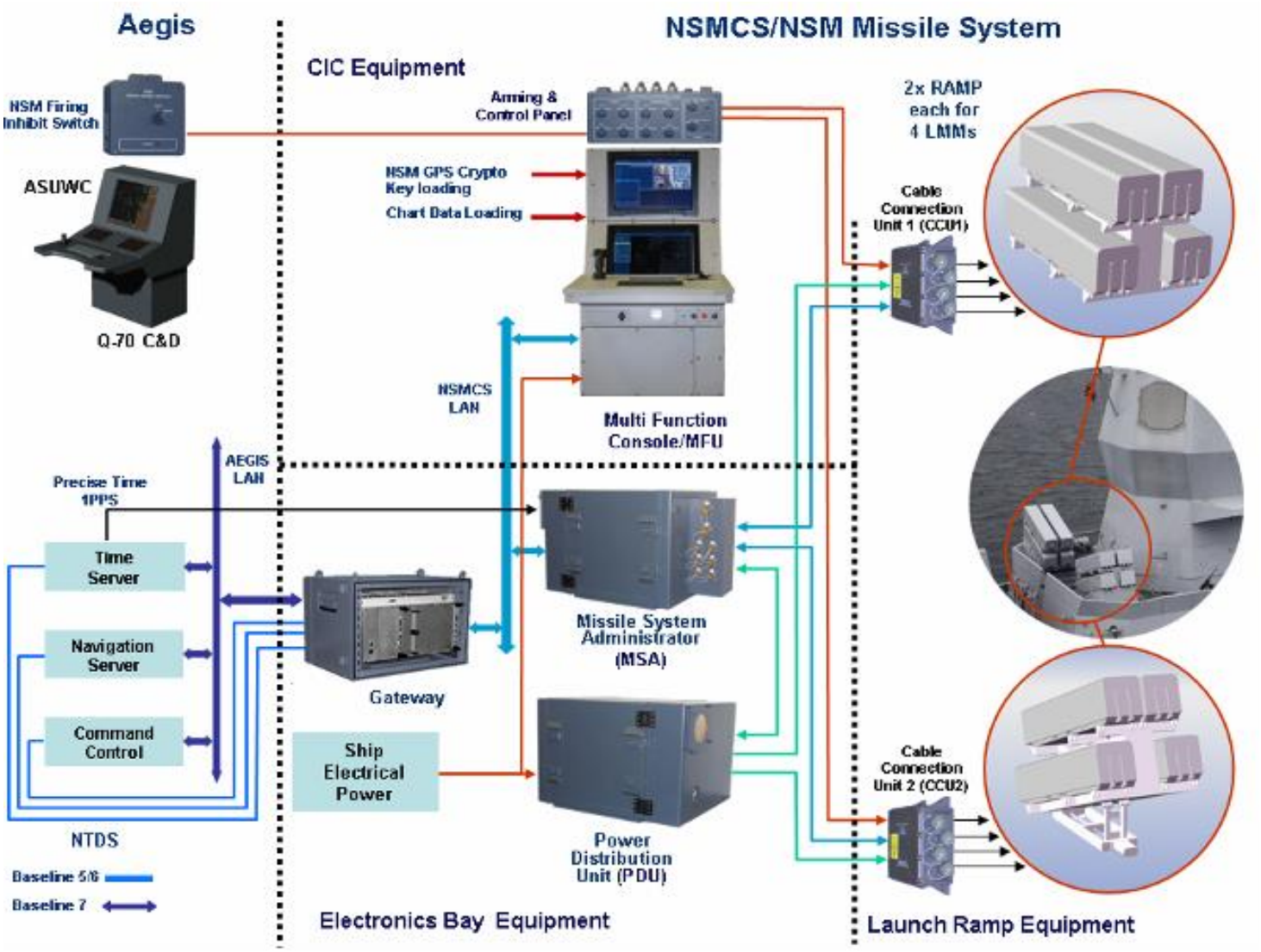
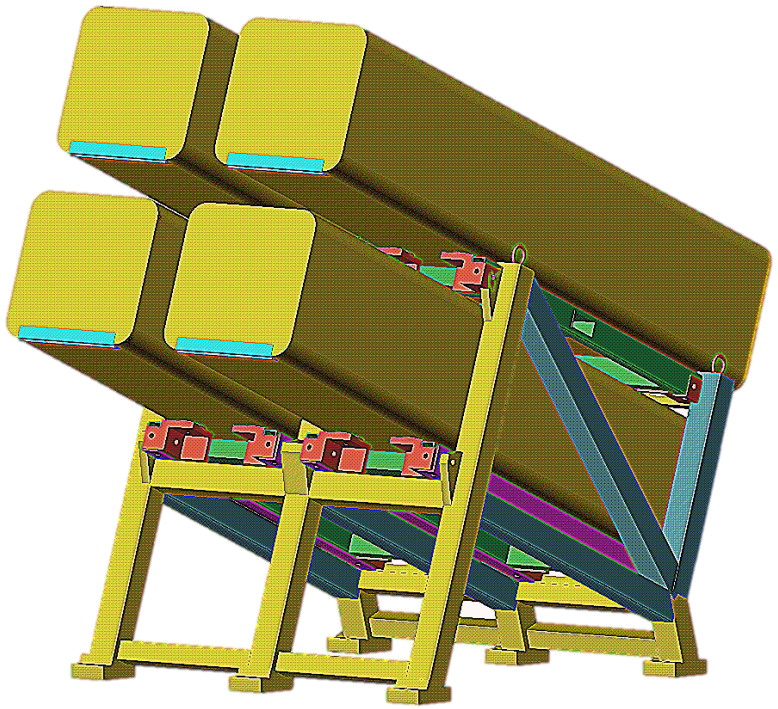
NSMC / NSM Missile System

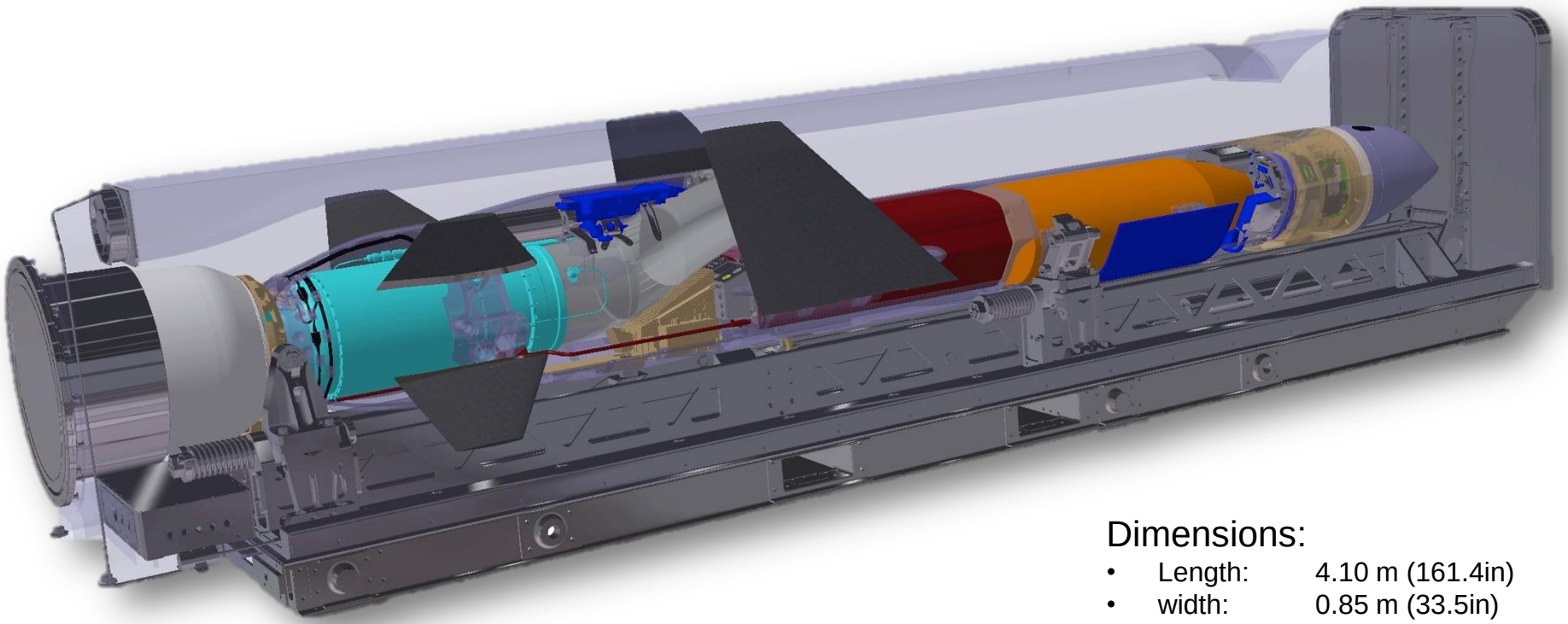


NSM Deck Mounting 4-Pack (20^0)

- LMMs mounted in clusters to fit the available ship deck space
  - Single, 2-pack, 3-pack, 4-pack, 6-pack
  - Mounting can be tailored existing deck interfaces
- Installation weight (total, includes electronics and cabling)
  - 4 LMM installation ≈ 8,600 lbs
  - 8 LMM installation ≈ 17,000 lbs
  - 12 LMM installation ≈ 26,000 lbs
- Elevation angle
  - 10° to 60 °



NSM Launch Missile Module (LMM)



Dimensions:

- Length: 4.10 m (161.4in)
- width: 0.85 m (33.5in)
- Height: 0.90 m (35.4in)

Total weight of LMM: 885 kg (1951 lb.)

Kongsberg LCS Proposed Concept

JSM F-35 Integration Activities

Performance & Capability

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NSM Mission Planning

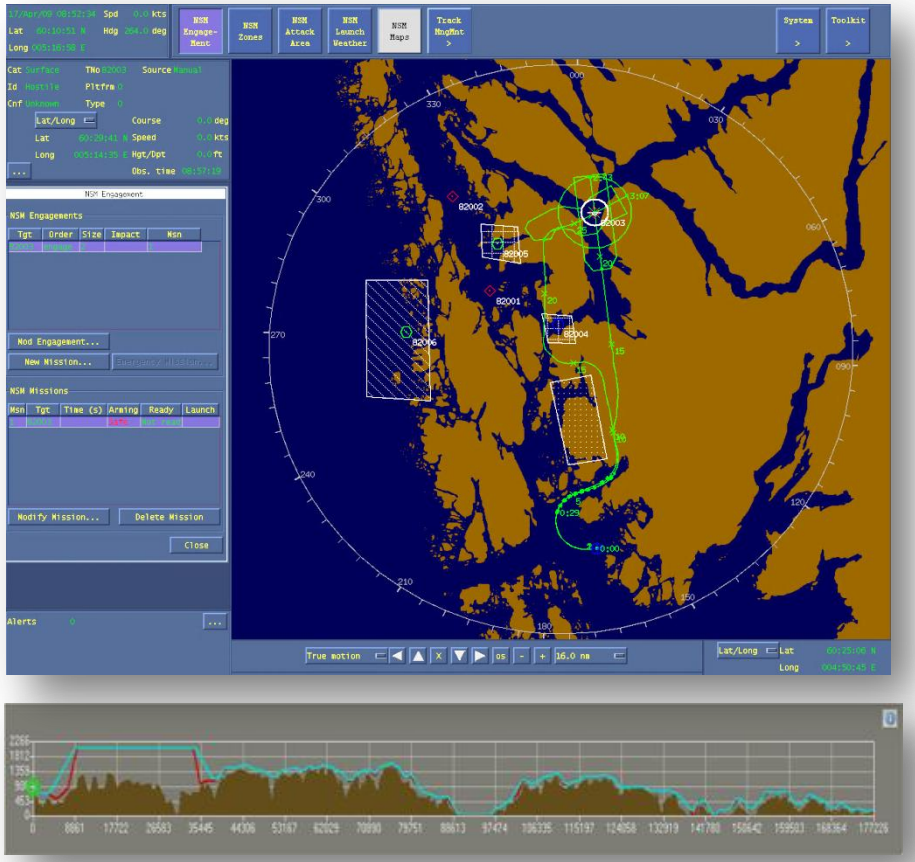
- Automatic mission
  - NSM generates the engagement based on:
    - Tactical situation / scene data
    - Strategy criteria decided by the operator
  - Engagement generated within less than 5 s

- Manual mission
  - Horizontal trajectory sketch defined by operator; vertical generated automatically
  - Operator modified “automatic mission”
  - Horizontal waypoints: up to 200

- Emergency / Secondary launch
  - Straight flight path at given bearing (no target data)
  - Sub-set of Manual Mission functionality

NSM Mission Planning

- NSM generates the mission based on:
  - Tactical situation / scene data
    - “Attack” / “No-Attack” Zones
    - “No-Flight” Zones
    - Altitude restrictions
  - Mission criteria decided by the operator
    - Minimum time of flight
    - Minimum detection by target
    - Maximum search area
    - Target approach heading



NSM Persistence / Alert Capability

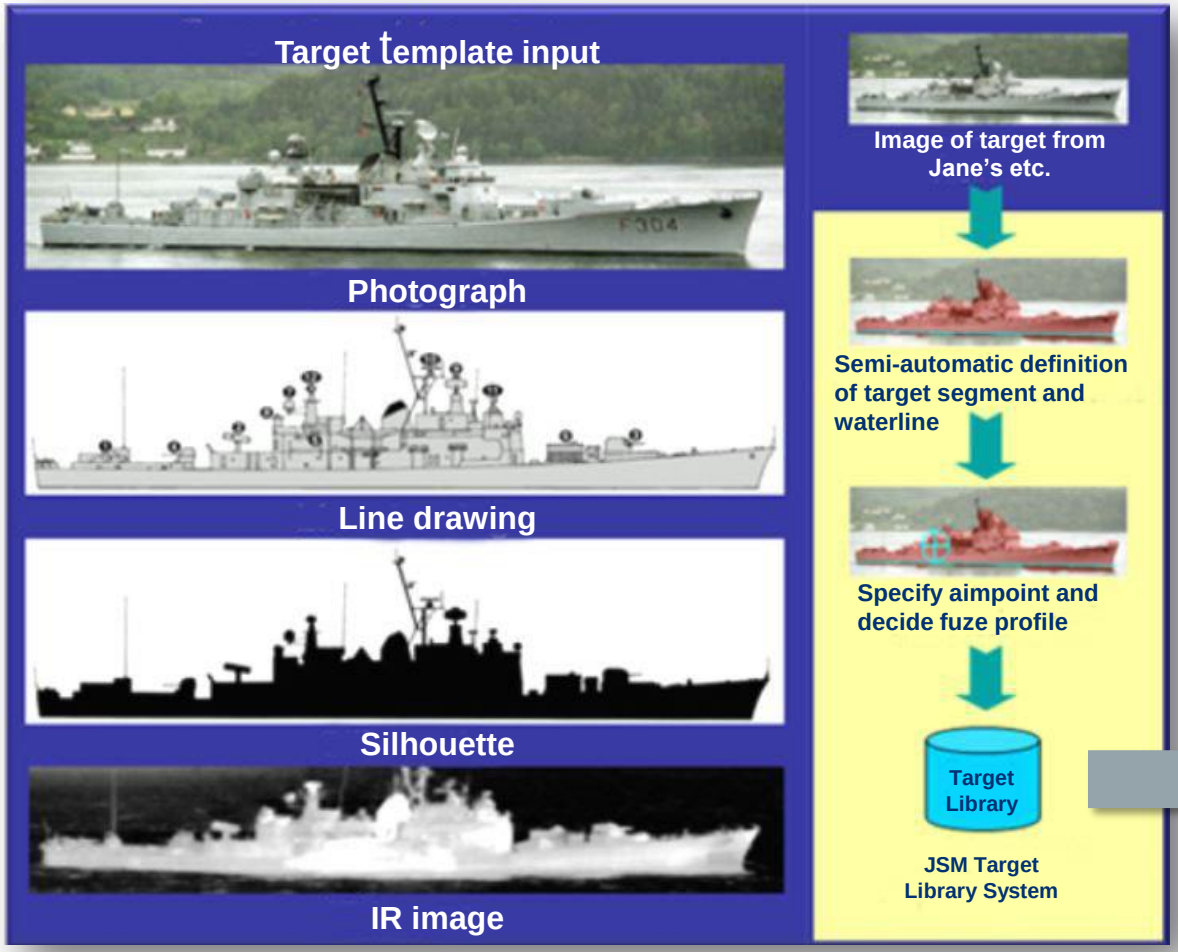
- NSM Power On timeline:
  - MSA Power ON: < 30 s
  - LMM Power ON: < 45 s (limited performance)
    < 4 min (full performance)
  - Missile Launch: < 2.5 s

- NSM System (power on / ready) state
  - All missiles: > 30 days
  - 3 out of 8 missiles: > 7 months

Target Selectivity – Autonomous Target Recognition

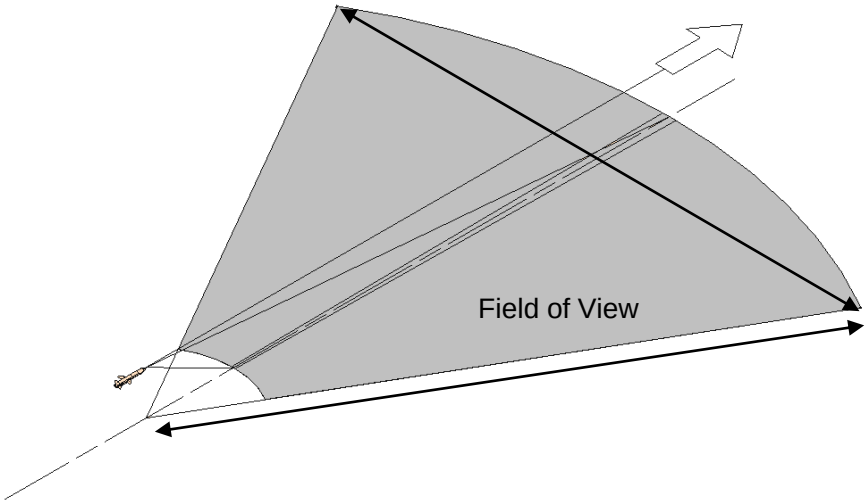
- Addressing Kill Chain challenges
  - Autonomous Target ID
    - Close to zero probability for inadvertently attacking a civilian ship
  - Autonomous target selection in dense ship traffic
  - Target detection and discrimination in cluttered environment
- Compatible with different Rules of Engagements (ROE)
  - Programmable capability to meet range of restrictions and conditions
- Mission Planning
  - Rapid mission planning with flexible template inputs from Data Base
  - On-board templates for rapid target changes

ATR Template Generation

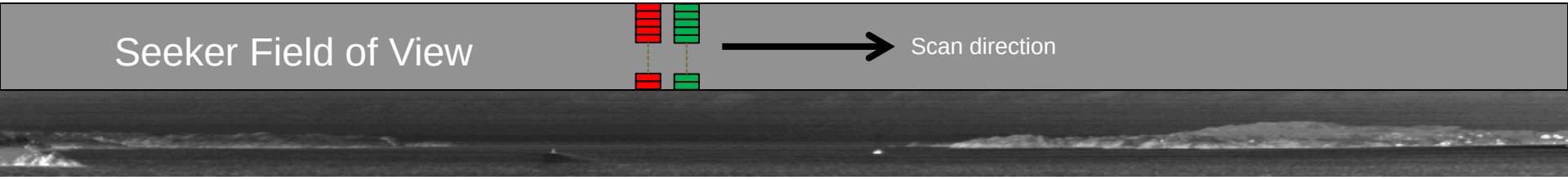


ATR Template Generation

Probability of Detection – Scanning Cooled Imaging Infrared Seeker

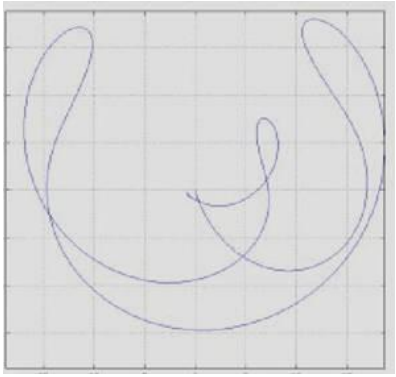


- Scanning sensor similar to naval IRST sensors
  - Wide Field Of View (FOV) combined with high resolution
  - High performance dual band imaging
  - Robust against laser threats
- Dual band imaging IR sensor – mid and long wave



Survivability Against Close In Weapons Systems

- **Late Detection**
  - Optimized flight profile and terrain following through advanced mission planning
  - Low flight altitude – below radar horizon
  - Passive seeker – no RF emissions
  - Low RCS and IR signature
- **Highly effective against countermeasures**
- **Highly Agile**
  - High-G evasive maneuvers to counter CIWS and other short range defense systems
- **Variable Flight Altitude**
  - Sea Skim / Super Sea Skim
- **Speed**
  - High subsonic end-game speed with > 1:1 thrust-to-weight
- **Saturation**
  - Precise Time-On-Target (TOT)
  - Specified attack directions / sectors



2-D plot of "target eye view" of the missile end-game weaving maneuver

Lethality

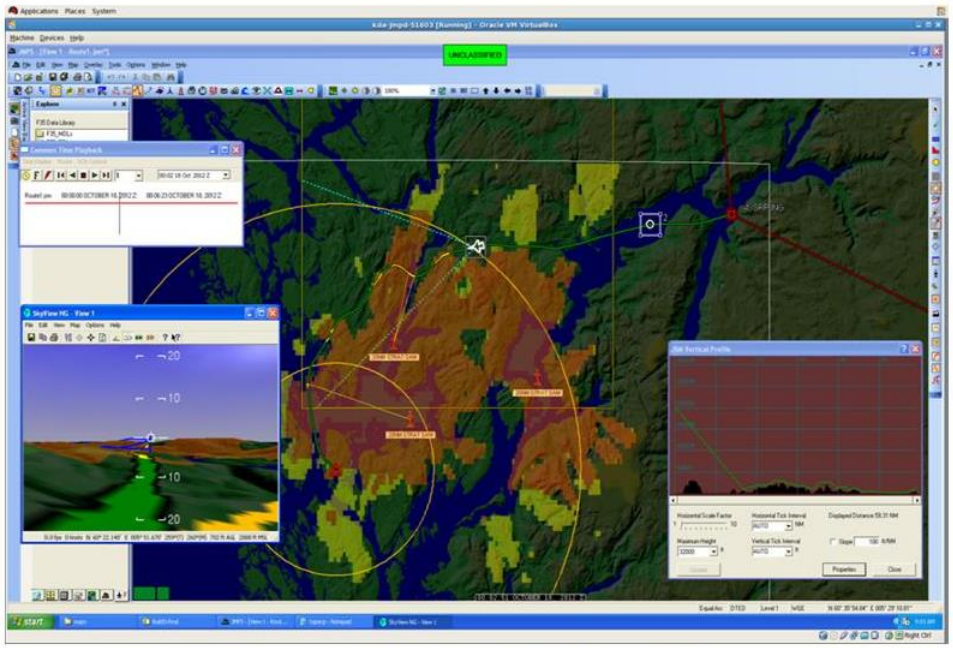
- Warhead
  - 500 lbs class warhead (265 lbs HE)
  - Blast and controlled fragmentation
  - Warhead is a strap-in design
- Fuze
  - Programmable Intelligent Multi-Purpose Fuze
- Programmable Desired Point of Impact
  - Default setting from vulnerability assessment (part of target library)
  - Operator selectable
  - Seeker detects and tracks desired aimpoint
- Insensitive Munitions (IM) qualified

Titanium Casing

Controlled Fragmentation

Common Support Interfaces

- Off-Board Mission Planning environment
  - JSM Mission Planning implemented as a Component in the Joint Mission Planning System (JMPS)
- Common Infrastructure
  - GPS and Weapon Data Link (WDL) Keys
  - Digital elevation data (maps)
  - Standard Mission Planning interfaces ; ACO, ATO, EOB, etc (common with aircraft)
- Common Munition Bit/Reprogramming Equipment (CMBRE) used for
  - BIT testing
  - Map loading
  - Reprogramming
- No peculiar equipment required for transportation and handling



Joint Mission Planning System (JMPS) environment

Standard US Test Equipment Made by ATK/USA

Common Munition Bit/Reprogramming Equipment (CMBRE)

Summary

- Program
  - NSM operational in ship-based canister launcher and land-based versions
  - JSM F-35A integration - fully funded development program for Block 4

- Suitability
  - NSM Aegis compatable
  - F-35A internal & external
  - GPS, Datalink
  - Maintenance concept – O to D, All Up Round (AUR)
  - MILSTAN

- Capability
  - Robust flexibility in mission planning and execution
  - Launch platform survivability
  - Weapon survivability and lethality based on a multiple attribute approach
  - Target selectivity – ATR allows you to kill the right target

- Mission Flexibility – ASuW, DEAD & TST in an A2/AD environment


Questions
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