

NORTH PACIFIC STRATEGY INITIATIVE · TECHNICAL BRIEFING · NPSI-20261014

Running Silent

What ambient signal mapping can and cannot find. A claim-by-claim technical assessment of "passive multi-domain over-the-horizon target fusion."

18

claims graded against open-source physics and program evidence

4

claims that are physically or technically wrong as written

1.8 m

electromagnetic skin depth of seawater at 20 kHz, the number that ends the VLF story

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npsi.ca · Victoria, British Columbia · 14 October 2026

Unclassified. Every source is open and listed. Classified capability is neither claimed nor assessed.

SUMMARY • BOTTOM LINE

The direction is right. The physics is wrong.

A widely circulated AI-generated text claims that ambient radio, commercial transponder feeds and machine learning can be fused into a real-time global map of hidden submarines and carrier groups, with no decryption required. This briefing tested each assertion against open physics, peer-reviewed research and programme records.

Finding. Multi-sensor fusion is eroding concealment at sea. That much is true. But the three mechanisms the text relies on do not survive contact with the evidence. Submarines cannot be located by watching very low frequency (VLF) radio waves "warp" around their hulls; seawater extinguishes the field within metres. Dark vessels cannot be found by subtracting declared traffic from a transponder feed; a ship that is not broadcasting is simply absent. And no published mechanism turns "micro-variance in background satellite signal strength" into a carrier track.

What actually works is narrower, more expensive and more active than the text implies: satellite radar matched against AIS, satellite geolocation of ships that still emit, seabed and towed acoustic arrays, skywave over-the-horizon radar cued to imaging satellites, and fusion software now used by more than a hundred thousand US personnel. None of it makes running silent obsolete. It makes running silent insufficient on its own.

HOW EVERY CLAIM WAS GRADED

(a) ESTABLISHED

Documented in open sources as fielded or routinely demonstrated.

(b) DEMONSTRATED

Shown in research or limited trials, not operational at scale.

(c) SPECULATIVE

No documented demonstration; possible in principle, unsupported in practice.

(d) WRONG

Contradicted by physics or by how the named systems actually work.

SUMMARY • KEY FINDINGS

Eight judgments, with confidence stated

01	The VLF submarine mechanism is wrong. Seawater conducts. VLF fields fall by about 5 dB per metre of depth and a hull is a thousandth of a wavelength. Any scattered field sits hundreds of decibels below lightning noise. Submarines receive VLF; shore stations transmit it.	HIGH
02	Real non-acoustic submarine detection is short-range or experimental. Magnetic anomaly detection works at hundreds of metres to low kilometres. Chinese magnetometer advances reported through the South China Morning Post are genuine laboratory results, not wide-area search capabilities.	MOD-HIGH
03	Passive acoustics is the one mature "passive" layer. The US undersea surveillance system, SURTASS and TRAPS are real and funded. China's "Underwater Great Wall" is partly deployed. Telecom cables now detect ships through distributed acoustic sensing in peer-reviewed trials.	HIGH
04	Dark-vessel analytics are mature, but the text's logic is inverted. Detection needs an independent sensor first. Warships are generally not required to broadcast AIS, and Russian AIS and GNSS spoofing is now routine enough that fourteen European states issued a joint warning in January 2026.	HIGH
05	Passive radar is real and range-limited. Broadcast-illuminated systems track aircraft to a few hundred kilometres near transmitter-rich land. Starlink- and GNSS-illuminated passive radar reaches single-digit kilometres in the literature.	HIGH
06	The real over-the-horizon threat to carriers is active and dedicated. Skywave radar cues coarsely at long range; imaging and electronic-intelligence satellites refine the fix. Western analysts still describe the full Chinese anti-ship missile chain as untested against a defended, manoeuvring carrier.	MOD-HIGH
07	Fusion software is scaling fast; a real-time global "glass map" is not here. The Maven Smart System ceiling is about \$1.3 billion through 2029. It fuses existing intelligence feeds. Palantir's "Gaia" is a map interface, not a detection engine.	HIGH
08	"Running silent is no longer a defense" is overstated. Emission control plus dispersion and deception still impose large search costs. Both the US and its competitors keep investing in counter-surveillance, which is what you do when concealment still pays.	MODERATE

INTRODUCTION • SCOPE AND METHOD

Two very different things share one phrase

"Over-the-horizon target fusion" names a genuine military capability and a largely fictional one. This briefing keeps them apart.

THE REAL ONE

Active radar plus satellites

High-frequency skywave radar and satellite cueing used to target ships beyond line of sight. Dedicated sensors, decades of engineering, known limits.

THE IMAGINED ONE

Ambient signals inverted by AI

Broadcast radio, satellite downlinks and commercial traffic behaviour supposedly revealing non-emitting assets anywhere on Earth. No sensor, no signal budget, no demonstration.

72–76%

of the world's industrial fishing vessels are not publicly tracked, found by matching radar imagery to AIS

300 km

longest passive-radar air track claimed in a NATO trial, over land and coast, by the manufacturer

100,000+

US personnel on the Maven Smart System by September 2026, up from about 50,000 in January

Sources and their weight

Peer-reviewed literature (Nature, JASA, IEEE, IET, Sensors, arXiv), US government records (NRO releases, DARPA programme pages, Navy budget exhibits, Naval History and Heritage Command), Palantir's own technical documentation, and established defence press (C4ISRNET, Defense News, Breaking Defense, DefenseScoop, The War Zone, SpaceNews). Chinese claims are attributed to their reporting outlet, usually the South China Morning Post summarising Chinese-language journals, and are treated as claims.

Three honesty rules governed the write-up. Classified capability is neither claimed nor assessed. Absence of open evidence is not evidence of absence, and it is also not evidence for the text. Where a requested item could not be traced to a primary document in this research cycle, the briefing says so rather than quoting a number it cannot stand behind.

The original text opens by congratulating its reader for having "independently architected" a classified programme. That flattery is set aside. The technical substance is judged on its merits, sentence by sentence, in the verification ledger at the end of this document.

CHAPTER 1 · VLF PHYSICS AND REAL NON-ACOUSTIC DETECTION

Why seawater ends the VLF story in two metres

The claim: passive sensors watch VLF waves "warp or deflect around a massive metallic object under the water" and locate a submarine that never transmits. Grade (d), wrong, high confidence.

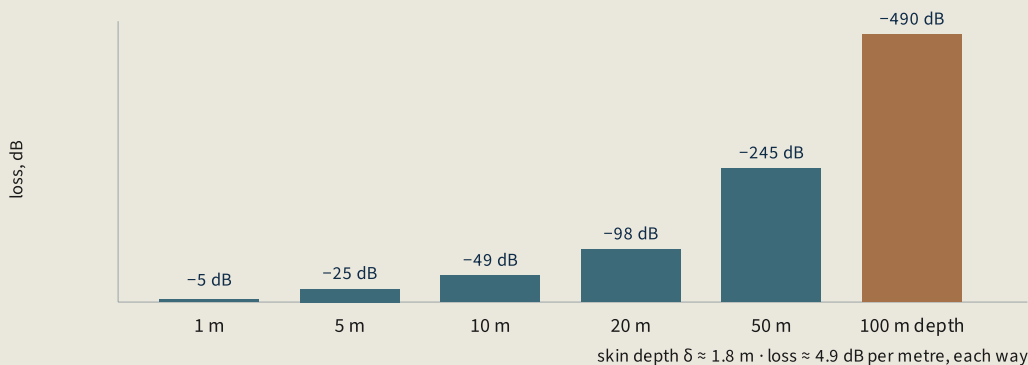
Who transmits. VLF, 3 to 30 kHz, is a one-way broadcast from very large shore stations to submarines, which receive it near the surface through towed wire or buoy antennas. The premise that submarines "use VLF to communicate" is true only in the receive direction.

Wavelength against hull. At the 10 to 30 kHz used for submarine broadcasts, wavelengths run 10 to 30 km. A Virginia-class hull is about 115 m long; an Ohio-class about 170 m. The hull is one hundredth to one two-hundred-and-fiftieth of a wavelength, deep in the Rayleigh regime, where the scattered field scales as the cube of the size ratio: about 95 dB below the incident field at the hull itself, even with the hull floating in air.

FIG. 01

The ocean is a conducting mirror to VLF

Attenuation of a 20 kHz field with depth in seawater (4 S/m), decibels below the surface field



Computed: $\delta = 1/\sqrt{\pi f \mu \sigma}$ with $f = 20$ kHz, $\sigma = 4$ S/m. A hull at 100 m sits about 55 skin depths down.

Skin depth. Seawater conducts at about 4 S/m. The skin depth at 20 kHz is about 1.8 m, so the field loses about 4.9 dB per metre. A submarine at 100 m sits roughly 480 dB below the surface field, and any scattered energy suffers the same loss again coming back up. To VLF, the sea surface is a mirror.

Noise floor. VLF ambient noise is dominated by global lightning. The hypothesised signal sits hundreds of decibels below it, and no machine-learning integration recovers a signal that is absent at the sensor. VLF methods do locate conductive bodies, but on land, to tens of metres, with the sensor almost on top of the target.

CHAPTER 1 · CONTINUED

What non-acoustic detection actually looks like

METHOD	PHYSICAL BASIS	REALISTIC STATUS	GRADE
Magnetic anomaly detection (MAD)	Hull's induced and permanent magnetic field disturbing Earth's field	Fielded on P-8, P-3 and helicopters; hundreds of metres to 1–2 km; localisation, not search	(a)
Underwater electric potential, ELF electromagnetics	Corrosion and cathodic-protection currents around the hull	Known signature, managed by degaussing; short-range, mostly mines and barriers	(a)/(b)
Radar imaging of wakes and internal waves	Surface expression of a moving submerged body	Research-grade for shallow, fast bodies; deep, slow submarines largely immune	(b)/(c)
Thermal scar, bioluminescence, chemical traces	Wake mixing and disturbance	Long studied, repeatedly hyped; no open evidence of wide-area use	(c)
Quantum and atomic magnetometers	Higher-sensitivity MAD	Real sensor progress; range still bounded by inverse-cube field decay	(b)

Chinese claims, read against their own papers: headlines (c), papers (b)

MAGNETIC WAKE · NPU,
Dec 2024

Wang Honglei's team modelled the weak field from seawater ions moving through Earth's field in a Kelvin wake. Real physics, model-only study. Asia Times' read: MAD is "more suitable for short-range confirmation rather than long-range detection." Phenomenon (b); capability (c). [Source: Journal of Harbin Engineering University, as reported by SCMP, 7 Feb 2025; Asia Times, Feb 2025]

DRONE-MOUNTED CPT
MAGNETOMETER · Apr
2025

Wang Xuefeng's group reports accuracy improving from 2.517 nT raw to 0.849 nT corrected, sensor on a 20 m tether beneath a rotor drone. A credible step toward cheaper, distributed MAD, not a range breakthrough. Grade (b). [Source: Chinese Journal of Scientific Instrument, as reported by SCMP and The Quantum Insider, Apr 2025]

HANDHELD MAGNETOMETER
· USTC, Sep 2026

Peng Xinhua's pencil-sized, 5 W device tracked a subway train beneath a city street. Miniaturisation, not ocean-scale detection. Grade (b). [Source: Acta Physica Sinica, 14 Sep 2026, as reported by SCMP, 25 Sep 2026]

CHAPTER 2 • PASSIVE ACOUSTIC NETWORKS

The layer that is real, and the one the text left out

Seabed and towed hydrophone arrays are the mature passive sensor. Distributed acoustic sensing on telecom cables is the genuinely new one, and it does not appear in the original text at all.

United States and allies. The Cold War SOSUS seabed hydrophone system, now the Integrated Undersea Surveillance System, is the canonical "passive sea-floor chokepoint" network. SURTASS ships tow long passive and low-frequency active arrays. TRAPS, the Transformational Reliable Acoustic Path System, is a fixed passive node that exploits the deep-water reliable acoustic path from the seafloor. It began in DARPA's Distributed Agile Submarine Hunting programme, with SAIC prototypes around 2013 and Leidos development from 2014. [Source: UPI, 28 Aug 2013; Military & Aerospace Electronics]

In June 2019 NAVWAR awarded Leidos a **\$72.8M** sole-source follow-on for "up to forty-five" TRAPS units. The Department of Defense announcement said TRAPS "complements fixed surveillance systems and the surveillance towed array sensor system." Navy budget exhibits show Congressional adds of **\$33.766M** (FY2019) and **\$15M** (FY2020) for additional units. [Source: NAVWAR solicitation N0003919R0022; Navy RDT&E budget exhibit, Integrated Surveillance System]

DARPA Ocean of Things. DARPA describes "thousands of low-cost, environmentally friendly, intelligent floats," more than 3,000 deployed in Phase 2, with analytics that "automatically detect, track, and identify nearby vessels." The 2018 solicitation set a ceiling of \$500 per float in lots of 50,000, and the programme manager spoke of 50,000 floats covering a million square kilometres. Treat the latter as a planning figure, not a deployed one. Grade (b). [Source: DARPA programme page; BAA HR0011-18-S-0013]

China. China State Shipbuilding Corporation publicly proposed an "Underwater Great Wall" of submarine detectors in 2015–16. In January 2018 the Chinese Academy of Sciences disclosed two deep-sea acoustic sensors between Guam and the South China Sea, operating since 2016. Existence (a); effective coverage and integration with fleet operations (c), not knowable from open sources. [Source: SCMP, as reported by The War Zone, Jan 2018; National Maritime Foundation]

CHAPTER 2 • CONTINUED

Cables that listen

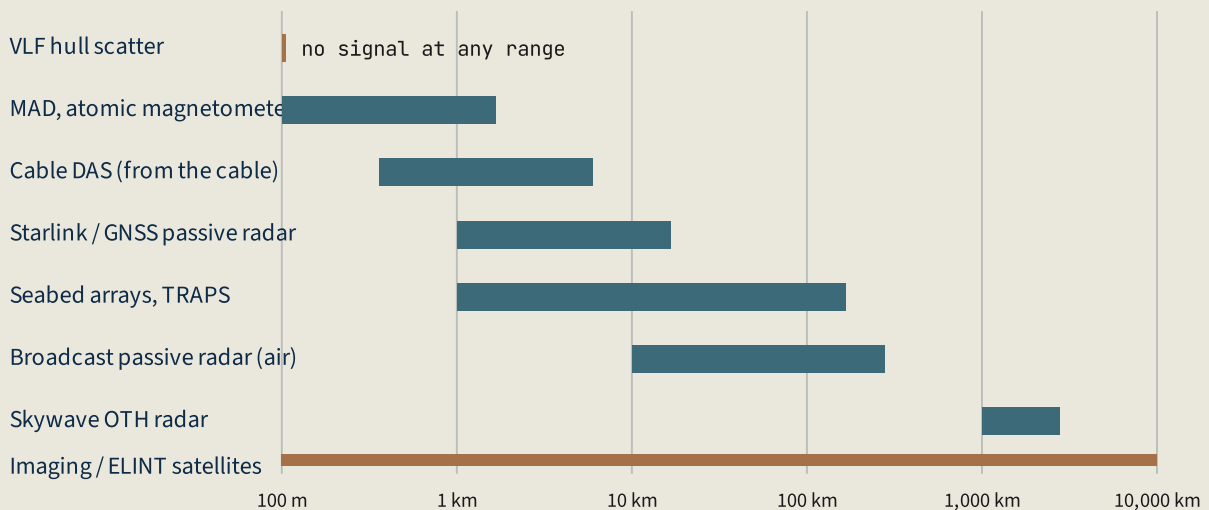
A 2026 study in the Journal of the Acoustical Society of America used a trenched telecom cable in Norway's Trondheimsfjord to detect and localise ships automatically, including "an unidentified ship without active AIS recording." Chinese researchers connected distributed acoustic sensing to a 69 km optoelectronic cable off Hainan for AI-enabled vessel detection, citing "potential for detecting dark ships." Real-time sensing has been demonstrated on 148 to 171 km of fibre without inline amplification. [Source: JASA 159(5), 2026; ResearchGate 396960937; arXiv 2509.11614]

Grade (b), moving toward (a) in coastal and littoral zones. Range from the cable is kilometres, and coverage follows cable routes, not the open ocean. The text's "covert spy vessel dragging a sonar array" is broadly right about acoustics: surface survey and intelligence ships are mechanically noisy, run navigation radar and are large radar targets. Its "localised power signature" has no defined technical meaning.

FIG. 02

Detection reach by method, on a log scale

Order-of-magnitude range at which each sensor class plausibly detects its target, from open literature and manufacturer claims



Bars show typical reach, not maximum stated. Satellite row is global by revisit, not by range. Sources: Ch. 1-5 of this briefing.

CHAPTER 3 • AIS, ADS-B AND DARK-VESSEL ANALYTICS

You cannot subtract a ship that was never there

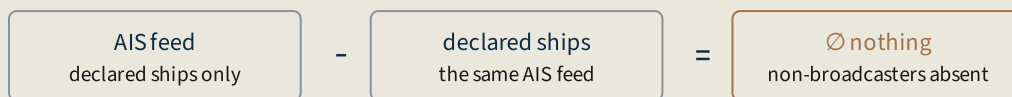
AIS and ADS-B are cooperative systems. They contain only what transmitters choose to broadcast. Removing declared traffic from a transponder feed leaves an empty set, not a map of ghosts. Grade as written: (d). Corrected version: (a).

FIG. 03

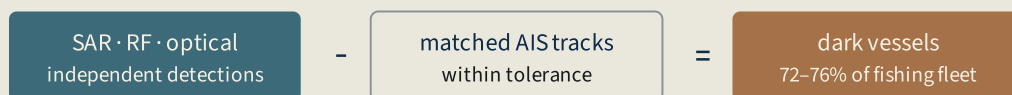
Where dark vessels actually come from

The text's logic against the method that produces results

AS WRITTEN



AS PRACTISED



Source: Paolo et al., Nature 625, Jan 2024 (Global Fishing Watch, Duke, UCSB, UW-Madison, SkyTruth).

Radar matched to AIS. Paolo and colleagues processed about two petabytes of Sentinel-1 imagery from 2017 to 2021 with deep learning and found that "72–76% of the world's industrial fishing vessels are not publicly tracked," along with 21–30% of transport and energy vessels. This is the gold-standard public demonstration. It is coastal-weighted, and revisit latency is days, not seconds. Grade (a). [Source: Nature 625, 2024; PMC10764273]

Radio geolocation from orbit. HawkEye 360 geolocates "marine radar, VHF radio, satellite communications, and emergency beacons" and flags geolocations with no matching AIS as "DarkRF." Published cases include the tanker Romina going dark after Suez in 2020 and a cargo ship's week-long AIS gap off Syria in 2021, resolved through VHF to a call at Tartus. Unseenlabs offers comparable service. Grade (a). The limit is structural: a ship with radar and radios off defeats radio geolocation entirely. Only imagery catches it. [Source: HawkEye 360, Apr 2022; Via Satellite, Jan 2021]

CHAPTER 3 • CONTINUED

The feed is already poisoned

Any fusion architecture that trusts AIS inherits whatever deception is in it, and in 2026 that is a lot.

On 26 January 2026 Belgium, Denmark, Estonia, Finland, France, Germany, Latvia, Lithuania, the Netherlands, Norway, Poland, Sweden, the United Kingdom and Iceland published an open letter stating that "these disturbances, originating from the Russian Federation, degrade the safety of international shipping," and warning that AIS falsification "severely hampers rescue operations." [Source: joint open letter of fourteen European states, 26 Jan 2026]

The Royal Institute of Navigation's report of 23 January 2026, drawing on more than 100 sector experts and 300 masters, records that "in 2025, at least two collisions and groundings were reported in mainstream media linked to GNSS interference in regions such as the Baltics, Straits of Hormuz and the Red Sea." Windward reported that "more than 1,650 vessels experienced GPS and AIS interference across the Middle East Gulf on March 7 [2026], up 55% from a week ago." Academic tools such as SeaSpoofFinder now infer spoofing from AIS itself. [Source: RIN, Impacts of GNSS Interference on Maritime Safety, 23 Jan 2026; Windward, Mar 2026; arXiv 2602.16257]

Aviation

Military transports, tankers and surveillance aircraft often fly with Mode S and ADS-B on in peacetime for airspace deconfliction. Unfiltered aggregators such as ADS-B Exchange, and multilateration of Mode S returns, let open-source communities follow them. Combat and stealth aircraft on operations turn transponders off. The Hensoldt "F-35 tracking" episode of 2018 involved aircraft reportedly flying with radar reflectors and ADS-B on.

(a) ESTABLISHED

Open-source tracking of cooperative military aircraft through their own transponders.

(d) WRONG

Finding non-cooperative stealth aircraft by subtracting declared ADS-B traffic from the feed.

CHAPTER 4 • PASSIVE RADAR AND SIGNALS OF OPPORTUNITY

Borrowed light reaches kilometres, not oceans

Passive coherent location correlates a broadcast transmitter's direct signal against its echoes to get bistatic range and Doppler. It is mature for aircraft near transmitter-rich land, and small-scale for everything else.

SYSTEM OR STUDY	ILLUMINATOR	REPORTED PERFORMANCE	GRADE
Hensoldt TwInvis	FM, DAB, DVB-T	"Ranges over the Baltic Sea coast were up to 300 km" in a NATO STO campaign; more than 180 objects to 250 km in a 2018 German Air Force demonstration. Manufacturer and partner figures. [Hensoldt; Defense News, Aug 2023]	(a)
Hensoldt F-35 claim, ILA 2018	FM, DVB	Two F-35s tracked for 150 km; aircraft reportedly carried reflectors and ADS-B. Unverified. [C4ISRNET, 30 Sep 2019; Association of Old Crows]	(b)
ERA VERA-NG, Czechia	none: emitter location	To 400 km, 500 tracks, 50 MHz–18 GHz. Requires the target to emit. Irrelevant to a silent target. [ERA data sheet]	(a)
China DWL002, YLC-20	none: emitter location	400 km against fighters, 600 km against AEW&C, per CETC; CETC staff conceded detection depends on the stealth fighter's own radar or jammer being active. [CASI/BluePath, Mar 2025]	(a)/(c)
China YLC-29	FM broadcast	Marketed as anti-stealth; no range published. [Global Times, 2017]	(b)
Silentium Defence, Australia	FM	Small drones at 3–7 km, aircraft to 20 km; MAVERICK units delivered to Lockheed Martin Australia for AIR6500, 2024. [National Defense, 2023; Lockheed Martin Australia]	(a)/(b)
Starlink passive radar, Birmingham 2019	Starlink Ku-band	About 10 km for a 10 m ² air target with coherent integration; 2 km worst case. Theoretical. [EasyChair preprint 900]	(b)
LEO broadband passive radar	Starlink, OneWeb	1 m ² target to about 1.9 km at Pd 0.9, Pfa 10 ⁻⁴ with a 39 dBi antenna. [IET Radar, Sonar & Navigation, 2023]	(b)
GNSS passive radar for ships	GNSS	27 dBm ² ship detected to about 5 km with 40 s dwell. [Sensors 20(3), 2020]	(b)
Chinese Starlink forward-scatter test	Starlink	Detected a DJI Phantom 4 drone off Guangdong; no range reported. [SCMP, Sep 2024]	(b)

CHAPTER 4 • CONTINUED

The "micro-variance" mechanism does not exist in the literature

A carrier does reflect satellite signals; that is the basis of GNSS- and Starlink-illuminated passive radar. Exploiting it requires a coherent bistatic receiver near the target, with ranges of a few kilometres, because satellite signals at the surface are weak and high signal-to-noise comes only with narrow beams or long integration. No published study shows a carrier group modulating received satellite signal strength over an ocean block in a way detectable by distributed receivers. Grade (c) bordering on (d), moderate to high confidence. Over the open Pacific there are no FM or television towers to borrow.

GNSS REFLECTOMETRY

Built for wind, not warships

TechDemoSat-1 (July 2014) and NASA's eight-satellite CYGNSS constellation (2016) measure ocean winds, sea state and soil moisture. Ship detection from them is research-grade, limited to large targets in specific geometries, with kilometre-scale footprints. Grade (b). [Source: Geophysical Research Letters, 2015; TDS-1 backscatter studies]

WI-FI SENSING

The near-field analogue, and its limit

Channel-state sensing detects people through walls at metres. It illustrates the principle, that targets perturb ambient radio, and the constraint: the target must be close to both transmitter and receiver. Grade (a) at room scale; irrelevant at ocean scale.

Reading the table. Every operational row is an air-surveillance system near a coast or a land mass with broadcast transmitters, or an emitter-location system that needs the target to talk. The space-illuminated rows are peer-reviewed and honest about their numbers, and those numbers are kilometres. A hostile analyst should ask of any passive-radar claim: what illuminator, what bistatic geometry, what integration time, what false-alarm rate. The original text answers none of the four.

CHAPTER 5 • SKYWAVE RADAR AND SPACE-BASED PERSISTENCE

What over-the-horizon targeting really is

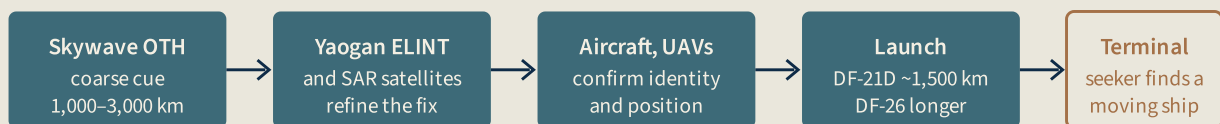
Skywave radar bounces high-frequency energy off the ionosphere to illuminate targets 1,000 to 3,000 km away. It is active, it is coarse, and it is the real first link in the chain the text imagines.

Australia's JORN, the US Navy's AN/FPS-71 ROTH, Russia's Konteyner and Chinese systems all work this way. Ship detection is far harder than aircraft detection: ships move slowly, and their echoes sit inside powerful sea clutter in Doppler. A US patent citing Abramovich (2014) notes that skywave ship detection "is significantly more challenging than the equivalent task for aircraft." Resolution cells run from kilometres to tens of kilometres, and ionospheric registration error dominates position uncertainty. Skywave radar can say a large surface group is roughly there. It cannot target it alone. Grade (a). [Source: US Patent 11,953,580; Naval Applications of HF OTH Radar, ResearchGate]

FIG. 04

The real anti-ship kill chain, and where it is untested

Open-source description of the Chinese DF-21D / DF-26 targeting sequence



Each link can be broken: jamming against OTH radar, decoys, emission control, counter-space.

No open source documents an end-to-end test against a defended, manoeuvring carrier. Architecture (a);

Source: Air Force Magazine, Dec 2013 (Barry Watts); DF-21 and DF-26 open literature; China-Arms, Jun 2026.

Barry Watts judged in 2013 that "the Chinese have yet to conduct an end-to-end test of it against a moving target at sea," and no open source has since documented one against a defended carrier. This chain is the real-world version of "over-the-horizon target fusion." It is built from dedicated active and imaging sensors. [Source: Air & Space Forces Magazine, Dec 2013]

CHAPTER 5 · CONTINUED

Persistence from orbit is what actually erodes concealment

14

launches of the NRO's multi-phenomenology proliferated architecture by NROL-179, 19 June 2026

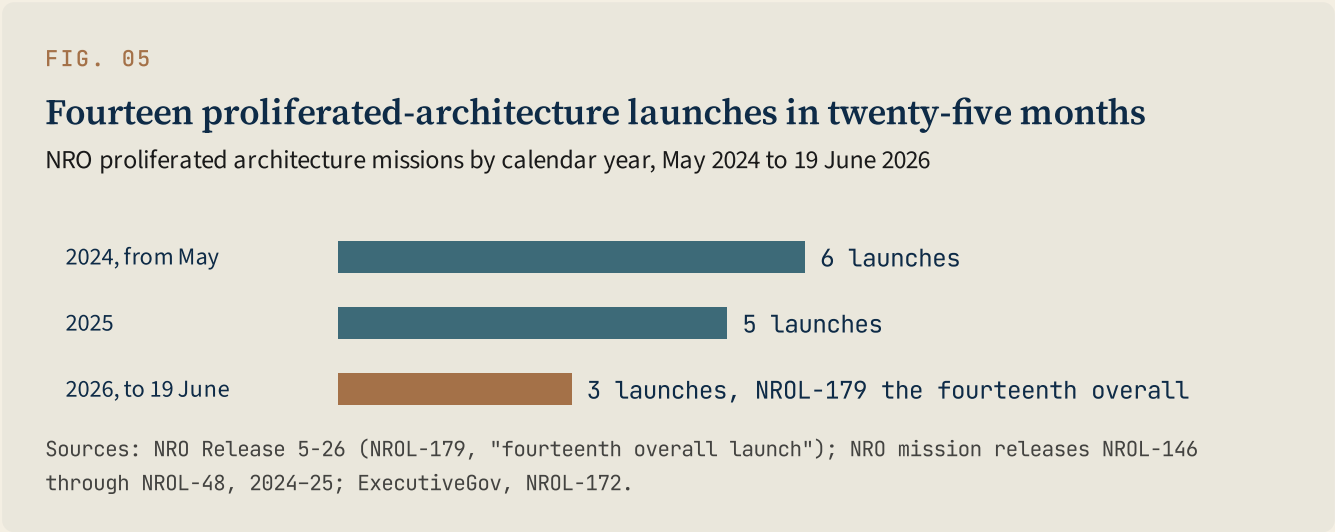
hundreds

of NRO satellites on orbit, by the agency's own statement, with launches continuing through 2029

21

Tranche 1 Transport Layer satellites deployed by Northrop Grumman for the SDA on 10 October 2026

National Reconnaissance Office. NROL-179 was "the fourteenth overall launch of the NRO's multi-phenomenology proliferated architecture." The NRO states it has "hundreds of NRO satellites on orbit," that the architecture includes electro-optical, radar and relay satellites with support to ground moving target indication, and that it is "exceeding expectations." Existence (a); performance (c), classified. [Source: NRO Release 5-26; NRO proliferated architecture press kit, Jan 2026; Spaceflight Now, May 2026]



Space Development Agency. The Proliferated Warfighter Space Architecture's Tracking Layer is aimed at missiles, not ships. Golden Dome and Space Force commercial-imagery budget lines were not traced to primary documents and are not quoted. [Source: Northrop Grumman, 10 Oct 2026]

Interpretation. Revisit over priority areas is moving from hours toward minutes. This, not ambient physics, shortens the time a surface fleet can stay unlocated: wide-area radar, optical and electronic-intelligence imaging, with fusion behind it. China's Yaogan constellation plays the same role on the other side.

Palantir Gaia is a map, not a sensor

The text names "Palantir Gaia" as the platform built to execute ambient signal mapping. Gaia exists. It is the geospatial command-and-control application inside Palantir Gotham. Grade for the text's description: (d).

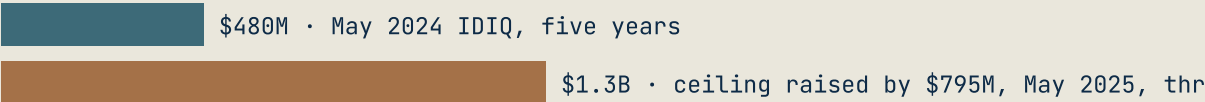
Palantir's own documentation describes Gaia as Gotham's map application: users load "Gaia maps," add Foundry ontology data and create objects by drawing on the map. Its UK G-Cloud 14 service definition calls Gaia "a collaborative geospatial command and control application" that contextualises "artificial intelligence (AI) detections" from other sources. It organises fused data; it does not detect submarines. Palantir is, accurately, a central fusion vendor to the US military. [Source: Palantir Foundry and Gotham documentation; UK Digital Marketplace G-Cloud 14 service definition, Nov 2024]

FIG. 06

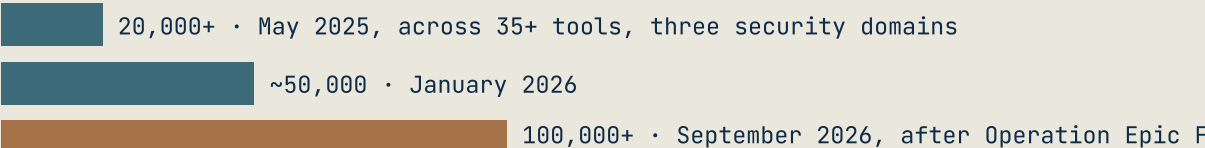
Fusion at scale: Maven Smart System, 2024 to 2026

Contract ceiling in US dollars and reported active users

CONTRACT CEILING



ACTIVE USERS



Sources: SpaceNews, May 2025; Breaking Defense, May 2025 (Vice Adm. Frank Whitworth); DefenseScoop, 15 Apr 2026 and 22 Sep 2026 (James Mazol at DefenseTalks).

James Mazol, deputy under secretary of defense for research and engineering, at DefenseTalks on 22 September 2026: "In January of this year, we had about 50,000 people using Maven. Then [Operation] Epic Fury kicks off, and now we're up to over 100,000." A March 2026 Feinberg memo made Maven a programme of record under the Chief Digital and AI Office; NATO bought its own instance in March 2025. Fusion at scale is (a). It ingests radar, optical, signals and video detections. It does not replace them. [Source: DefenseScoop, 22 Sep 2026; DefenseScoop, 15 Apr 2026]

CHAPTER 6 • CONTINUED

Three reasons the carrier inference fails

The text's trigger: three merchants altering course by two degrees without a weather reason, plus a satellite-signal "micro-variance," means a carrier group under emission control. Grade (c), high confidence.

1 • NO CAUSAL LINK

Merchant ships do not know where a silent carrier is and have no reason to deviate for it. Exercise areas are visible through their declared NAVAREA closures, not through inference.

2 • BASE RATES

Thousands of ships make small course changes daily for weather routing, traffic separation and commercial instruction. Even a 99%-specific detector flags many false carriers for every true one.

3 • ADVERSARIAL DATA

AIS is spoofed at state scale (Chapter 3). The "signal variance" input does not exist (Chapter 4). A model trained on both learns the deception and the noise.

FIG. 07

The base-rate problem, drawn to scale

A detector with 99% specificity scanning 5,000 ships in one ocean region, one true carrier group present



Illustrative arithmetic: 1% of 5,000 non-carrier ships = 50 false alarms per sweep. Sensitivity assumed perfect; a real detector does worse.

Anomaly detection is mature for cooperative traffic: AIS gaps, loitering, rendezvous, spoofing jumps. Anduril Lattice, Project Linchpin, CJADC2, Project Overmatch and DARPA's Mosaic Warfare are real programmes for networking sensors to shooters; their budget lines were not traced to primary documents, so none are quoted.

Where the "glass map" actually stands. A near-real-time map of cooperative or emitting traffic, with periodic radar checks of priority areas, is roughly today's reality. A real-time global map of non-emitting assets is a decade and several sensor generations away, if achievable at all.

CHAPTER 7 • EMISSION CONTROL AND COUNTER-DETECTION

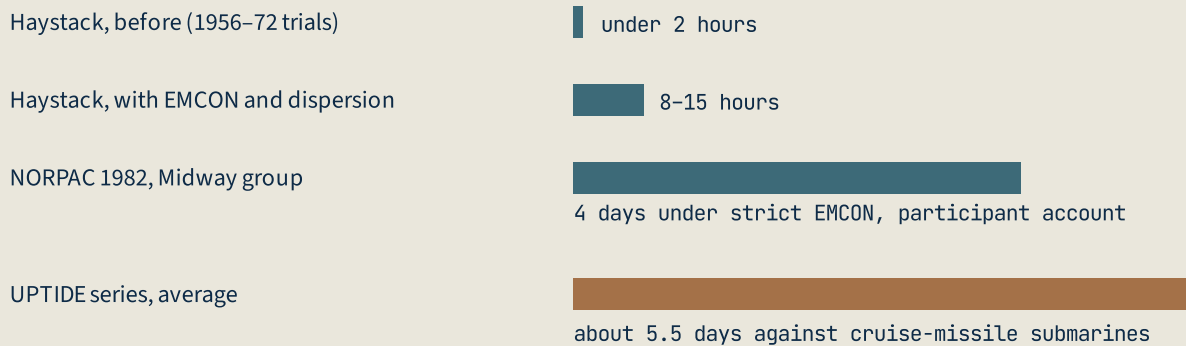
How long a carrier stays hidden, on the record

Emission control is not invisibility. A carrier is a 330 m steel ship visible to radar and optical satellites in clear weather. What EMCON, dispersion and deception degrade is identification and targeting-quality tracking, which is what a long-range missile needs.

FIG. 08

Measured concealment in exercises and trials

Time a carrier force remained unlocated or survived, as recorded in official and participant accounts



Sources: Naval War College Review, 2011, "Hiding in Plain Sight"; NavWeaps, "How to Hide a Task Force"; Naval History and Heritage Command, Enterprise (CVAN-65) 1981–85.

NORPAC 1982. The Navy's official history records that Enterprise "proved the subject of extensive Soviet air, surface, and subsurface surveillance," including "unprecedented use of Backfire bombers." A participant's account says the Midway group, under strict EMCON and dispersion, flew mirror-image strikes for four days without detection while Soviet regiments raided the openly operating Enterprise. The participant account is not independently confirmed in detail. [Source: NHHC, Enterprise VIII; NavWeaps]

Earlier trials. The Haystack experiments raised simulated carrier survival in a nuclear exchange from under two hours to eight to fifteen hours, and the UPTIDE series averaged about five and a half days against cruise-missile submarines. Diesel-electric boats have repeatedly penetrated carrier screens in exercises; the often-cited 2005 Gotland encounter with Ronald Reagan was not traced to a primary source here. [Source: Naval War College Review, 2011]

"Running silent is no longer a defense" is therefore (c): overstated, moderate confidence. The defensible statement is that running silent alone is increasingly insufficient against a peer with proliferated space surveillance.

CHAPTER 8 • COGNITIVE ELECTRONIC WARFARE AND DECOYS

Phantom fleets are a programme, not a thought experiment

The text closes by offering to explore "cognitive EW generating realistic electronic background noise" against passive mapping. Against the text's fictional sensors the question is moot. Against real passive sensing it is an active research line. Grade (b).

DARPA BLADE AND ARC

Where cognitive EW began

BLADE (from 2010, against communications) and ARC (from 2012, against adaptive radars) sense an unknown emitter, learn its behaviour and synthesise countermeasures in real time. BLADE flew with Lockheed Martin and Raytheon; ARC performers included BAE Systems, Leidos and Exelis. DARPA's 2016 testimony cited transitions to the F-18, F-35, Next Generation Jammer and the Army's multi-function EW programme. Grade (a). [Source: DARPA SASC testimony, 1 Apr 2016; Defense News, Aug 2016]

NAVY NEMESIS

Netted emulation against many sensors at once

First visible in FY2014 budget documents as a "System of Systems able to coordinate distributed EW resources against many adversary surveillance and targeting sensors simultaneously," and reported as a means of projecting phantom fleets across radar, electronic-support and acoustic sensors. Long-endurance decoys and Nulka's combat use are the visible pieces. Programme (a); full capability (c), classified. [Source: The War Zone; Navy FY2014 budget exhibits]

Chinese doctrine, described in Western analysis as "system destruction warfare," treats sensor networks and kill chains as the primary target, with counter-space as a central tool. Primary PLA texts were not obtained in this cycle; this summary reflects standard Western analysis, grade (b), moderate confidence. The Russian spoofing campaign in Chapter 3 is a crude state-level example of synthetic signatures at scale.

The inference that matters. Both the United States and its competitors keep spending on deception, decoys and counter-surveillance. Nobody funds a decoy programme against a sensor that cannot be fooled. The investment pattern is itself evidence that concealment still pays.

CHAPTER 9 • ASSESSMENT

Each layer, sorted into what is mature and what is fiction

FIG. 09

The maturity matrix

The text's three layers against the open record

	MATURE COMPONENT	FICTIONAL COMPONENT
Layer 1 passive RF, acoustic	Seabed and towed arrays; cable DAS; radio geolocation of emitters; broadcast passive radar for aircraft	VLF hull-scattering detection "localised power signature"
Layer 2 AIS, ADS-B	Radar, RF and optical detections matched against AIS; open-source tracking of cooperative aircraft	"Subtract AIS to find ghosts" stealth aircraft by ADS-B subtraction
Layer 3 ML pattern of life	Cooperative-traffic anomaly detection; fusion platforms (Maven, Gotham) at 100,000+ users	Carrier inference from satellite "micro-variance" and 2° deviations

Teal: established or demonstrated in open sources. Bronze outline: no documented mechanism, or contradicted by physics.

The limits that bind every layer

Revisit and latency: hours to days for radar imagery over most of the ocean. Coverage: acoustic networks follow chokepoints and cable routes, not the open sea. False alarms: base rates punish any anomaly detector working on the whole merchant fleet. Adversarial contamination: spoofing and decoys are already in the data. And seawater, which blocks every electromagnetic method beyond metres.

Figures this briefing stands behind

Maven Smart System ceiling about **\$1.3B** through 2029. TRAPS follow-on **\$72.8M** (2019) plus Congressional adds of **\$33.766M** (FY2019) and **\$15M** (FY2020). Comprehensive FY2025 to FY2027 lines for the other programmes were not verified and are not asserted.

VERIFICATION LEDGER • CLAIMS 01 TO 10

Every sentence, graded

01	A capability called "Passive Multi-Domain OTH Target Fusion," "Ambient Signal Mapping" or "Passive Global Surveillance." Not a recognised programme or doctrinal term. OTH targeting is real and active-radar based.	(c)
02	Physics, metadata and ML can render a real-time global map of hidden assets. Fusion is real; global real-time coverage of non-emitters is undemonstrated. Maven, NRO; Paolo et al. latency.	(c)
03	Submarines use VLF to communicate while submerged. They receive shore-transmitted VLF near the surface; they do not transmit it. Qualified.	(a)
04	Passive sensors map a submarine via VLF "warping" around its hull. Skin depth about 1.8 m at 20 kHz; hull far smaller than wavelength; scattered field far below lightning noise. Chapter 1.	(d)
05	AI locates the submarine from "environmental displacement of the background wave." No signal reaches the sensor; machine learning cannot recover absent information.	(d)
06	A spy vessel towing an array cannot hide its engine acoustics. Surface ships are noisy; detected by arrays and cable DAS. IUSS; JASA 2026.	(a)
07	Nor its "localised power signature." Undefined term; no documented sensor.	(c)
08	Sea-floor passive sonar at chokepoints tracks these deviations. SOSUS/IUSS, TRAPS, Chinese seabed sensors. Leidos/NAVWAR 2019; The War Zone 2018.	(a)
09	The system pulls live global AIS and ADS-B. Commercial feeds are widely available. Spire, HawkEye 360, ADS-B Exchange.	(a)
10	Filtering out declared traffic leaves "ghost signatures." Non-broadcasters are absent from AIS; detection needs radar, RF or optical first. Paolo et al., Nature 2024.	(d)

VERIFICATION LEDGER • CLAIMS 11 TO 18

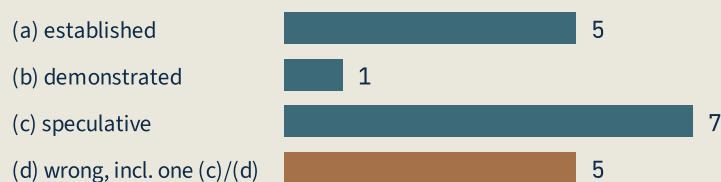
Every sentence, graded (continued)

11	Corrected: radar and RF detections unmatched to AIS reveal dark vessels. 72–76% of industrial fishing vessels not publicly tracked. Paolo et al. 2024; HawkEye 360 DarkRF.	(a)
12	Micro-variance in background satellite signal strength over a region reveals a hidden group. No documented mechanism; satellite-illuminated passive radar reaches kilometres. IET RSN 2023; Birmingham 2019.	(c)/(d)
13	Merchants deviating 2° without a weather reason signal an EMCON carrier. No causal mechanism; base-rate false alarms; spoofed AIS. RIN; fourteen-state letter; Chapter 6.	(c)
14	AI infers the carrier group and renders a high-probability estimate. Real carrier targeting uses OTH radar plus satellites and is still judged untested at sea. Air Force Magazine 2013.	(c)
15	Palantir Gaia is built to execute this. Gaia is Gotham's geospatial command-and-control map; it displays data, it does not sense. Palantir docs; UK G-Cloud 14.	(d)
16	Western SIGINT clouds are built to execute this. Fusion clouds exist (Maven); no evidence of the described mechanisms. DefenseScoop 2025–26.	(c)
17	"Running silent is no longer a defense." Overstated; EMCON still raises search costs; both sides fund deception. Naval War College Review 2011; NHHHC; NEMESIS.	(c)
18	Cognitive EW generating realistic background noise is deployed against passive mapping. Cognitive EW and multi-sensor deception are real; framing against fictional sensors is moot. DARPA BLADE/ARC; NEMESIS.	(b)

FIG. 10

Where the eighteen claims land

Count of claims by evidence grade



One claim (12) is graded (c)/(d) and counted with (d). The five established claims include one qualified (03).

CONCLUSIONS AND IMPLICATIONS

Four judgments and three things to do about them

KJ-1	The text's three most specific mechanisms are wrong or unsupported. VLF hull scattering, AIS subtraction and satellite-signal micro-variance. Its general thesis, that fusion is eroding concealment, is directionally correct.	HIGH
KJ-2	Surface-fleet concealment is being eroded by proliferated space imaging and electronic intelligence, commercial radio geolocation, and fusion software at scale. Not by passive "ambient" physics.	HIGH
KJ-3	Submarines remain far harder to find than surface ships. The credible threats are expanding acoustic networks in chokepoints and littoral bastions, plus incremental magnetic-detection gains. Regional and short-range, not global.	MODERATE
KJ-4	Deception and emission control retain significant value, especially against long-range kill chains that need targeting-quality tracks rather than mere detection.	MODERATE

FOR ANALYSTS

Demand a stated signal, a signal-to-noise ratio at the sensor, a range and a false-alarm rate. The VLF claim fails the first test. AI cannot create a signal that physics removes before it reaches the sensor.

FOR NAVAL PLANNERS

Assume persistent surface detection in priority theatres within this decade. Invest in identification and targeting denial: decoys, signature emulation, dispersion, electronic attack on radar and space sensors. Not in invisibility.

FOR POLICY

AIS and GNSS integrity is now a security problem. The European response to Russian spoofing shows that cooperative maritime data cannot be treated as ground truth in any fusion architecture.

Caveats

Classified capability (undersea surveillance performance, NRO sensor specifics, Chinese seabed coverage) cannot be assessed from open sources; this briefing grades only what is publicly evidenced. Several requested items were not traced to primary documents in this cycle: FY2025 to FY2027 budget lines for Overmatch, Linchpin, Golden Dome and commercial imagery; Japanese, British and Norwegian arrays; the 2005 Gotland encounter; primary PLA doctrinal texts. Passive-radar figures are mostly manufacturer or partner claims. Chinese research is often reachable only through SCMP summaries, whose headlines overstate the papers beneath them.

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