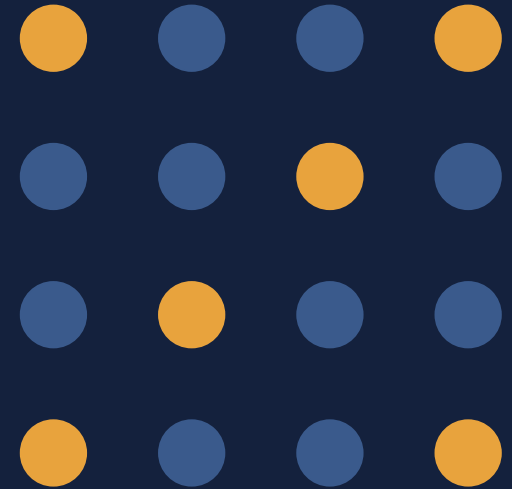


Evaluating Quantum Technologies for Mission Use



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What mistakes do we want to prevent?

1

Buying too early

A device that works in the lab but not in the field.

Cost: money, credibility, a soured customer.

2

Buying the wrong thing

Technology that addresses a different problem.

Cost: solves nothing, consumes budget.

3

Missing the window

Deployable technology that didn't make it into the program.

Cost: capability gap that takes years to close.

Five axes to evaluate technology/vendors on

1

Classical baseline delta

How does this compare against the best classical alternative at comparable SWaP and cost?

2

Lab vs. field performance

Ask for field or environmental test data, parameter drift, duty cycle, etc.

3

Integration and logistics burden

Cryogenics, laser alignment, calibration, facility needs.

4

Deployment readiness

L1 lab demo → L2 prototype → L3 ruggedized → L4 field trial → L5 sustained operational use.

5

Vendor and supply-chain viability

Runway, revenue mix, single-source components, foreign ownership.

Quantum sensing

Factors to consider:

Bias stability and drift over mission duration

Recalibration isn't always possible during the mission.

Environmental hardening

Device sensitivity to platform effects: vibration, magnetic fields, thermal gradients.

Data products vs. just sensors

Data processing algorithms are often the key step in getting useful information.

Selected vendors

Vector Atomic

Infleqtion

Q-CTRL

AOSense · Exail

SandboxAQ

DEPLOYMENT READINESS

L1 Lab demo

L2 Prototype

L3 Ruggedized

L4 Field trial

L5 Operational

Quantum networking

 PQC migration	Standards published and mandated	Real work
 QKD	Not endorsed for national security systems	Requires extraordinary justification
 Entanglement distribution, repeaters, memories, transduction	Research	Monitor; selective testbed engagement

Physical constraints:

- Fiber loss caps repeaterless links to roughly 100–200 km.
- Without working repeaters and memories, a "quantum network" requires trusted nodes, which are inherently less secure.
- Quantum channels generally cannot traverse amplified and switched telecom fiber; dark fiber is required.

DEPLOYMENT READINESS

L1 Lab demo

L2 Prototype

L3 Ruggedized

L4 Field trial

L5 Operational

Quantum computing hardware

**Access,
don't acquire**

Metrics hygiene

- Two-qubit gate fidelity, with the benchmarking methodology stated
- Logical qubit count vs. roadmap
- Error-correction trajectory: distance to threshold, demonstrated below-threshold scaling
- Benchmarks against the best classical (HPC) method

Hardware-related costs

Dilution refrigeration · helium supply chain · power, vibration, EMI, floor loading · specialist operators · calibration cadence.

What to spend money on instead

Workforce development · algorithm and use-case readiness · benchmarking discipline · cryptographic inventory.

DEPLOYMENT READINESS

L1 Lab demo

L2 Prototype

L3 Ruggedized

L4 Field trial

L5 Operational

Final recommendation result

Acquire

Pilot

Access

Monitor

Pass

“Pass on QKD for this enclave. Revisit if federal guidance changes, or if a repeater-based architecture removes the trusted-node assumption.”

Additional questions before recommendation is actionable:

- Acquisition path
- Accreditation
- Facility and SCIF constraints
- Maintenance
- Supply chain
- Budget cycles
- Workforce