6G SUMMIT 2026 • HELSINKI

6G NTN

Europe’s resilient and sovereign connectivity fabric

From space-based radio access to trusted services on Earth

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6G NTN moves space from backhaul to a native radio-access layer



Ubiquitous
Coverage across land, sea, air and remote regions

Intelligent
AI-native orchestration across networks and orbits

Resilient
Continuity when terrestrial infrastructure is disrupted

Sovereign
European control of critical technologies and operations

ONE SERVICE FABRIC
Multiple access technologies • multiple orbits

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6G NTN • CRITICAL BUILDING BLOCK

On-board gNodeB: moving radio intelligence into space



REGENERATIVE PAYLOAD

Processes the radio signal on board, reducing dependence on transparent bent-pipe architectures



LOWER LATENCY

Local scheduling and routing can shorten the end-to-end control loop



FLEXIBLE BEAMS

Software-defined radio resources can adapt to traffic, mobility and priority services



RESILIENT OPERATIONS

Distributed radio access reduces reliance on a single terrestrial gateway path

A sovereign European on-board gNodeB is a strategic capability for future 6G NTN.

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6G NTN • USER TERMINALS

A new generation of user terminals

Compact, intelligent and multi-band terminals enable seamless connectivity across terrestrial and non-terrestrial networks.

MINIATURISED
Smaller, lighter and lower power

MULTI-BAND
LEO, MEO, GEO and terrestrial

INTELLIGENT
AI-driven beam selection and seamless handover

MASS MARKET READY
Cost-effective and scalable

STANDARDISED
3GPP compliant and interoperable





RURAL CONNECTIVITY
Bridging the digital divide



AVIATION
Always connected in the air



MARITIME
Reliable and resilient global coverage



EMERGENCY SERVICES
Connectivity when it matters most



IoT & AGRICULTURE
Smart and sustainable ecosystems



CONNECTED MOBILITY
Continuous coverage on land, sea and air

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Two complementary 6G NTN service families

6G NB-IoT / massive IoT

Billions of devices, everywhere

- Low data rates
- Very low power consumption
- Large number of devices
- Long battery life
- Delay-tolerant
- Low-cost terminals



Environment monitoring · Agriculture · Asset tracking · Industrial sensors

6G Broadband / eMBB

High-performance connectivity

- High throughput
- Lower latency
- Mobility support
- Richer applications
- More capable terminals



Aviation · Maritime · Enterprises · Public safety

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6G NTN • ARCHITECTURE

One system across Earth and space

SERVICES & MISSIONS
Public safety • mobility • industry • climate • inclusion

AI ORCHESTRATION & ASSURANCE
Intent • prediction • optimisation • security

EDGE, CLOUD & DATA
Distributed compute • digital twins • service continuity

RADIO ACCESS
On-board gNodeB • terrestrial gNodeB • gateways

TERMINALS & DEVICES
D2D • NB-IoT • broadband • mobility platforms



Resilience and sovereignty must be designed through every layer.

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Resilience is engineered through diversity and autonomy

DIVERSE ACCESS
Terrestrial • LEO • MEO • GEO • HAPS

AUTONOMOUS REROUTING
Predict • prioritise • reconfigure • recover

ASSURED CONTROL
Identity • encryption • interference protection

OPERATIONAL VALIDATION
Cyber ranges • field trials • in-orbit testing

OBJECTIVE:
graceful degradation, protected priority services and rapid recovery.



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6G NTN • EUROPEAN SOVEREIGNTY

Sovereignty requires credible European options across the stack

PAYLOADS
On-board gNodeB and software-defined processing

TERMINALS
RF, antennas, chipsets and secure device platforms

STANDARDS
Influence over 3GPP and global interfaces

INFRASTRUCTURE
European testbeds, gateways and in-orbit assets

OPERATIONS
Trusted control, data governance and supply chains



Sovereignty is not isolation: it is the capacity to decide, operate and evolve while remaining globally interoperable.

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Different services, one resilient European connectivity fabric

NB-IoT
Millions of low-power sensors

BROADBAND
People and platforms everywhere

CRISIS
Priority communications under disruption

MOBILITY
Continuity across air, sea, rail and road



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6G NTN • FROM VISION TO EVIDENCE

Europe must validate the complete chain

1. **MODEL**
   Architecture, spectrum and threats
2. **INTEGRATE**
   Payloads, gNodeBs, terminals and cloud
3. **EXPERIMENT**
   NB-IoT and broadband services
4. **VALIDATE**
   Resilience, security and interoperability
5. **SCALE**
   Standards, procurement and products



GROUND HUBS
Multi-vendor integration, demonstrations

FIELD TRIALS
Mobility, interference and disruption

IN-ORBIT LAB
Payload, on-board gNodeB and end-to-end validation

ESA can convene the ecosystem and turn innovation into operational evidence.

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EUROPE'S 6G NTN PRIORITIES

From ambition to impact

1 Make NTN native
Integrate space in 6G architecture and standards

2 Master the on-board gNodeB
Develop European capability in regenerative payloads

3 Scale user terminals
Enable cost-effective, interoperable terminals

4 Deliver NB-IoT and broadband
Support massive IoT and high-capacity services

5 Design for resilience
Ensure continuity, security and rapid recovery

6 Build sovereign options
Strengthen European industry, infrastructure and operations

esa EUROPEAN SPACE AGENCY



The next connectivity fabric will be built across Earth and space. Europe must shape it

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Without NTN, 6G will not be global.

Without resilience, it will not be trusted.

Without sovereignty, Europe will not shape it.

Let us build the next connectivity fabric across Earth and space, together.



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