From Situational Awareness to Operational Advantage: The Evolving Role of Live Video in Critical Infrastructure Protection

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Introduction: Live Video in a Resilience-Focused Intelligence Environment

Critical infrastructure protection, once defined solely by physical security measures, now requires infrastructure owners and public authorities to operate in an environment characterised by asymmetric risk and the potential for a major failure cascade, all the while operating under heightened public scrutiny. Climate-related disruption, supply chain fragility, and hybrid security threats have increased the pressure on operators to detect, assess, and respond to incidents with greater speed and confidence.

Situational awareness in this context is increasingly intelligence-led, often on a multi-agency level, and built through a fusion of sensor data, supervisory control systems, geospatial data, and human reporting. Live video has emerged as a critical enabler within this ecosystem, providing real-time visual confirmation that supports and contextualises other sources of information, enabling

Emergency Response helicopter treating a forest fire – airborne video can support operations in dangerous environments by providing commanders with a visual overview of major incidents.

faster decision-making.

Rather than functioning as a standalone surveillance capability, live video strengthens resilience by improving understanding during periods of uncertainty of emergency response. It allows decision-makers to visualise evolving conditions, validate intelligence, and agree on operational actions as needs evolve.

A Shift from Retrospective Evidence to Real-Time Risk Assessment

For many years, video in critical infrastructure environments has been used in retrospective analysis. Live video has been hard to implement, hampered by connectivity, technology, or security issues.

However, advances in transmission resilience and network integration have now repositioned live video as a vital operational risk-management tool. In an emergency, visual information enables operators or AI-enabled decision support systems to rapidly assess scale, severity, and potential escalation pathways. This reduces reliance on fragmented reports and supports earlier, more proportionate intervention, while also reducing risk to personnel who might need to make live assessments.

For critical infrastructure operators, live video reduces ambiguity, providing clarity where needed, enabling faster intelligence sharing and decision-making to protect assets, maintain service continuity, and safeguard public safety. The previous burden of requiring live human observation is increasingly being relieved by AI, which enables deeper real-time analysis across datasets, making it even more critical.

This shift is further reinforced by improvements in video quality and resolution. The increasing availability of higher-resolution formats, including 4K, provides a richer visual dataset than legacy surveillance systems were ever able to deliver. For both human operators and agentic AI systems, clearer imagery enables more accurate detection, classification and assessment of activity, conditions and anomalies. In a critical infrastructure context, this additional visual fidelity supports more reliable interpretation of events, reduces false positives, and allows automated systems to extract greater operational insight from live video feeds.

Live Video Perspectives Across Distributed Infrastructure

By their nature, critical infrastructure systems are widely distributed - even across international borders - and often in remote locations. The effectiveness of live video is heightened by the ability to draw insight from different vantage points and asset types.

Elevated and Aerial Perspectives:

Elevated viewpoints from manned aircraft or unmanned systems provide wide-area visibility across critical infrastructure such as pipelines, rail networks, coastlines, and flood defences. These perspectives are particularly valuable during natural disasters or environmental incidents, where ground access may be restricted, and conditions can change rapidly. At these times, aerial video supports impact assessment, prioritisation of response activities, and coordination between infrastructure operators and civil authorities.

Mobile and Deployable Video Assets:

Mobile video deployed via

inspection teams or emergency crews provides close-range situational awareness during incidents that evolve dynamically. These feeds support tactical decision-making while enabling commanders to maintain strategic oversight from control rooms or emergency coordination centres.

Fixed Infrastructure Monitoring:

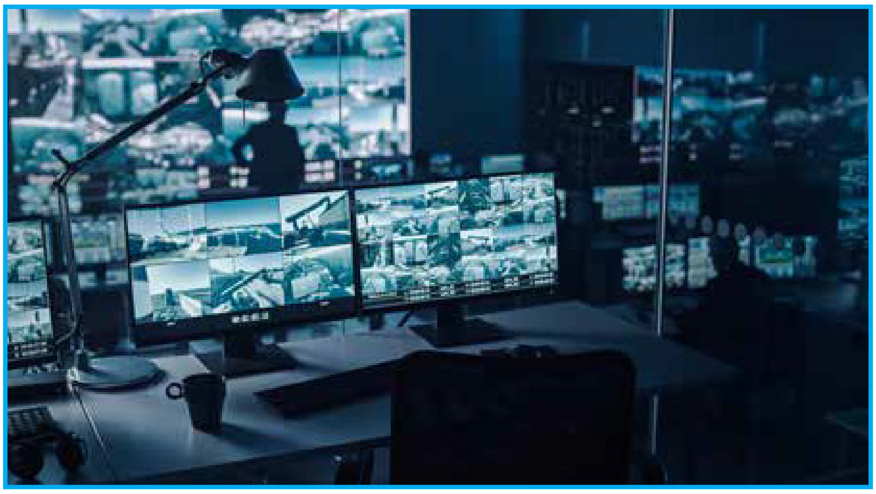
Fixed cameras at substations, transport hubs, ports, and other critical nodes provide continuity and baseline awareness. When integrated into live operational workflows, these feeds enable operators to detect deviations from normal conditions and track incident progression in real time.

Supporting Decision-Making and Continuity of Operations

A central objective of critical infrastructure protection is maintaining continuity of essential services when under actual or suspected threat. Live video contributes directly to this objective by supporting fast, informed decision-making at both operational and strategic levels.

Visual confirmation enables infrastructure operators and authorities to assess whether incidents are real, contained, or at risk of escalation, informing decisions on secondary operations such as controlled shutdown and public communications. In critical infrastructure environments, these decisions can also be pivotal in preventing localized incidents from cascading into wider system failures across interconnected assets.

From a tactical perspective, visual



Control Room Image: High quality 4K video can be streamed in realtime to the operations control room of any CNI location, enabling rapid environmental analysis and to inform future decision making

information reduces cognitive load during high-pressure situations. By presenting clear evidence of conditions and agentic situational assessment, as they are, it reduces the need for interpretation or clarification, supporting clearer judgment and reducing the likelihood of delayed or overly conservative responses that can exacerbate disruption.

Integration with Command, Control, and Information Systems

Modern CIP operations rely on integrated command, control, and coordination environments. Live video increasingly functions as a data layer within these systems, supplementing and engaging with existing information sources.

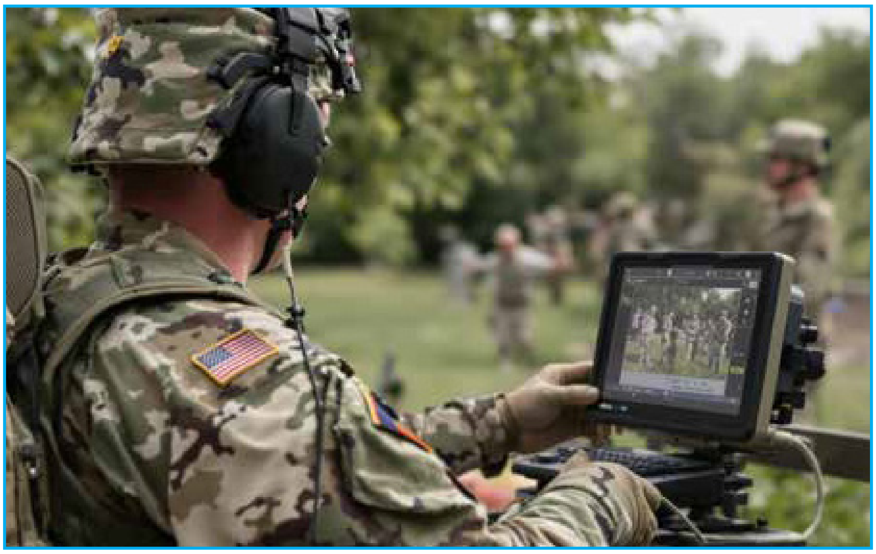
When aligned with geospatial platforms, asset management systems, and incident logs, video provides context to the common operating picture. This integration supports cross-organisational coordination, particularly where infrastructure incidents require emergency response involving multiple operators, public safety services, and regulatory bodies.

Underpinning this integration is the growing reliance on proven, mission-critical communications platforms, such as RF and operator-controlled cellular networks, which are increasingly being designed for assured performance and resilience in critical infrastructure environments.

Resilience, Communications Assurance, and Security Considerations

Incidents affecting critical infrastructure frequently occur under degraded communications conditions. Severe weather, network congestion, or physical damage can all disrupt connectivity at precisely the moment when situational awareness is most critical.

The ability to sustain live video under these conditions is a core element of both everyday operational robustness and disaster response. For infrastructure operators and public authorities, resilience depends not only on having access to live video



Military user in the field: Where necessary, live video streams can be securely streamed with partner agencies or law enforcement teams, to ensure that any dangerous situations are handled with the best intelligence to hand.

but also on the ability to sustain it reliably under adverse conditions.

That said, live video also represents sensitive operational information. Protecting its integrity is essential to maintaining trust between stakeholders.

To this end, advances in technology, including diversified connectivity paths, have helped to ensure that visual intelligence remains available during peak demand or partial outages. Software-defined network techniques help maintain that intelligence edge.

Modern systems also ensure high levels of encryption and robust access controls to ensure that live video is a key element in strengthening resilience and enabling response, rather than introducing new vulnerabilities.

Rather than relying on a single network or bearer, modern approaches increasingly combine proven mission-critical communications technologies to provide layered assurance against failure. Traditional RF-based links continue to play a vital role in critical infrastructure environments due to their predictability, controlled spectrum usage, and independence from public networks. These characteristics make RF particularly valuable during large-scale incidents where public infrastructure may be impaired or unavailable.

At the same time, the introduction of mission-critical capability private and public cellular technologies has introduced new options for resilient connectivity. Private and operator-controlled 5G deployments offer dedicated capacity, quality-of-service controls, and network isolation, enabling infrastructure operators and emergency authorities to maintain video connectivity even during periods of extreme demand.

When combined with other bearers, such as licensed RF or satellite backhaul, these platforms provide redundancy and continuity rather than single points of failure.

This multi-layered approach supports manageable degradation rather than abrupt loss of capability. If one connectivity path becomes constrained or unavailable, video services can be maintained through alternative routes, preserving situational awareness and operational continuity.

From a resilience planning perspective, this represents a significant shift away from brittle communications architectures toward adaptive, fault-tolerant systems designed to operate through disruption.

Security considerations remain central to this evolution. Live video used in critical infrastructure operations often contains sensitive information about asset vulnerabilities, response tactics, or public safety activities.

Taken together, these developments mean that live video is no longer constrained by the limitations that once restricted its use in mission-critical environments. By leveraging trusted platforms, agentic AI, diversified connectivity, and robust security practices, infrastructure operators can now treat visual intelligence as a resilient, dependable component of their communications assurance strategy.

Conclusion: Visual Intelligence as a Resilience Enabler

Live video has become a vital

capability within modern critical infrastructure protection. Providing real-time visual context enhances situational awareness, supports confident decision-making, and improves coordination in complex operational environments.

As infrastructure systems face increasing stress from environmental, technical, and security-related threats, resilience will depend on the ability to understand incidents as they unfold. Integrated, secure live video, used in conjunction with other intelligence and visualisation tools, plays a central role in enabling this understanding and supporting the continuity of essential services.

Carleton M. "Mickey" Miller was named CEO of Vislink Technologies in January 2020. He has over 25 years' experience creating and building growth businesses in the technology and communications industries. He has a proven track record in delivering results, from start-ups to Fortune 100 companies, in both growth and turnaround situations. Mickey brings the combination of strategic and organizational ability to lead billion-dollar organizations and the entrepreneurial drive and creativity for mid and small-cap companies.