PART I-AI USE CASE STRATEGIC ALIGNMENT

The United States Department of Transportation (Department or DOT) stands at a pivotal moment, tasked with advancing safety, rebuilding national infrastructure, and ushering in a new era of American transportation leadership. The scale, complexity, and dynamism of the modern transportation ecosystem demand a technological and strategic evolution beyond incremental improvements. This report establishes that Artificial Intelligence (AI) is a critical enabling capability for DOT. AI offers the potential to fundamentally transform of the Department's operations, moving it from a reactive to a proactive and predictive posture across its core mission areas. This is a living document and will be updated as DOT continues to evolve through the 1DOT technology modernization initiative.

This framework outlines how a portfolio of AI capabilities can be leveraged to meet the Department's four draft strategic goals: Safety, Infrastructure, Innovation, and Efficiency[1]. For Safety, AI can enable tools to anticipate and prevent incidents before they occur by analyzing vast datasets to identify latent risks. For Infrastructure, AI can enable the optimization of the entire asset lifecycle, from intelligent design and predictive maintenance to enhanced operational reliability. In Innovation, AI serves a dual role, acting as a transformative technology for direct investment while also accelerating the development, validation, and regulatory process for of other new technologies. Finally, for Efficiency, AI-driven automation can streamline internal bureaucracy, accelerate project delivery, and modernize the Department's own operations, ensuring taxpayer dollars are used with maximum effect.

[1] Draft, subject to change pending publication of the DOT Strategic Plan for Fiscal Years 2026-2030

INTRODUCTION

The Department pursues goals across a vast and intricate network of aviation, highway, rail, transit, maritime, and pipeline systems that form the circulatory system of the American economy and way of life. However, the sheer volume of data, the speed of operations, and the interconnectedness of this national system have reached a scale that challenges the limits of traditional management, oversight, and planning methods.

To meet the demands of the 21st century and achieve its strategic goals, the Department must embrace a foundational technological shift. Artificial Intelligence represents this shift. It is not merely a collection of discrete software tools but a new paradigm for decision-making and operations, akin to the transformative impact of the internet or the Global Positioning System (GPS). The core power of AI lies in its ability to process immense and diverse datasets, recognize complex patterns invisible to human analysts, and generate predictive judgments with accuracy at a scale and speed that is otherwise unattainable. All this while maintaining strong safeguards for civil rights, civil liberties, and privacy.

This AI Use Case Alignment provides a strategic framework for aligning AI capabilities with the Department's mission. It is organized around the four draft strategic goals DOT anticipated to be included in the Department's Strategic Plan for FY2026-2030: Safety, Infrastructure, Innovation, and Efficiency. For each goal, the AI strategy articulates a clear vision for how a portfolio of AI capabilities, abstracted from detailed, mode-specific use cases, can directly support the achievement of the goal and its underlying strategic objectives and demonstrate how a cohesive, department-wide AI strategy is the essential ingredient for ensuring the United States has the safest, most modern, and most efficient transportation system in the world.

CONTENTS

SAFETY

Reaffirming the Commitment to Safety Through Proactive, Data-Driven Insights

Safety continues to be the Department's highest priority. AI capabilities, such as predictive analytics, computer vision, and Natural Language Processing (NLP), will empower the Department to identify latent risks buried within operational data, maintenance logs, and millions of words of narrative safety reports long before they escalate into catastrophic failures. This technology will create a holistic, system-of-systems view of risk by fusing data from across aviation, surface, and maritime transportation, breaking down the organizational silos that currently obscure correlated threats and prevent a comprehensive understanding of safety challenges. By leveraging AI to monitor the health of physical infrastructure, study the onset of fatigue in critical personnel, detect emerging cyber and physical threats in real-time, and automate hazardous inspection and maintenance tasks, the Department can build multiple, overlapping layers of defense and should also ensure safeguards for civil rights, civil liberties and privacy.

Proactive Risk Identification

Historically, safety improvements have often been driven by forensic analysis of incidents. AI enables a transition to a predictive approach by identifying leading indicators of risk. Machine learning and NLP algorithms can be deployed to analyze millions of unstructured and semi-structured documents, such as voluntary safety reports, confidential close-call narratives, and maintenance logs. These systems can detect subtle patterns, recurring themes, and correlations that are impossible for human analysts to find at scale, flagging latent risks. This capability provides a constant stream of data-driven intelligence that directly enhances the Safety Risk Management (SRM) and Safety Assurance (SA) pillars of a modern Safety Management System (SMS), supporting the objective to develop improved SMS across all modes. By identifying emerging threats from global research and technical forums, the Department can also proactively develop policy and guidance for new technologies like advanced air mobility, ensuring safety is built-in from the start.

Predictive Maintenance and Anomaly Detection

Mechanical failure remains a significant causal factor in transportation incidents. AI-powered predictive maintenance systems for aircraft, commercial vehicles, rail rolling stock, and transit buses can analyze flight data, sensor readings, and maintenance histories to forecast component failures before they happen. This allows for

maintenance to be scheduled proactively, preventing in-flight emergencies or on-road breakdowns that can lead to incidents and system disruptions. This innovation directly supports the objectives to improve aviation and surface transportation safety.

Simultaneously, AI-powered monitoring systems enhance operational safety in real-time. Computer vision can analyze airport surveillance data to predict and prevent runway incursions, a critical aviation risk. On the surface, similar systems can detect wrong-way drivers on highways, monitor for unsafe vehicle speeds in airport environments, and identify trespassing on high-risk rail corridors. For infrastructure, automated systems using drones, robotics, and sensors can continuously inspect runways, bridges, and tracks for subtle signs of degradation or foreign object debris, providing alerts that enable preemptive repairs. This constant, data-rich vigilance provides a layer of safety that is more comprehensive and consistent than periodic manual inspections alone.

Human Factors and Workforce Safety

Human error is a contributing factor in a large percentage of transportation incidents. The AI strategy directly addresses this through several avenues. AI systems can analyze scheduling data, workload metrics, and even communication patterns to predict periods of high fatigue risk for air traffic controllers, pilots, and commercial drivers, allowing for proactive adjustments to staffing and rest periods to prevent fatigue-induced errors. To enhance competency, AI-driven adaptive training platforms can create personalized learning programs for pilots, mechanics, and other safety-critical personnel. These platforms identify and address individual knowledge gaps in real-time, ensuring a higher and more consistent level of proficiency across the workforce.

To directly protect workers, AI offers transformative solutions. Robotics and drones powered by AI can be deployed to conduct inspections in hazardous environments—such as at height on bridges or in confined tunnels—removing humans from harm's way. In dynamic work zones, computer vision and connected vehicle technology can create a digital safety net, providing real-time alerts to workers and vehicle operators when a collision is imminent. This directly supports the strategic objective to improve transportation worker safety by addressing key risks like work zone intrusions and exposure to hazardous tasks.

SAFETY
ILLUSTRATIVE USE CASES

Cooperative Perception for Highway Traffic System Operations

Highways present persistent safety risks where curves, congestion, and large vehicles obscure hazards and reduce reaction time. This Cooperative Perception for Highway Traffic System Operations project applied AI-powered cooperative perception, integrating roadside and vehicle-based sensors with machine learning, computer vision, and predictive modeling, to create a shared, real-time object map of the freeway environment. The results were: improved situational awareness, faster operator and vehicle response to hidden hazards, and safer, more efficient highway operations that lay the groundwork for connected and automated driving. More details can be found here: https://rosap.ntl.bts.gov/view/dot/72302

Aviation Safety Information Analysis and Sharing (ASIAS)

To assist the work done by FAA, the Aviation Safety Information Analysis and Sharing (ASIAS) program aggregates and analyzes large volumes of operational, maintenance, and environmental data spanning the entire aviation life cycle to identify emerging safety risks. By applying AI-driven predictive analytics, ASIAS can detect latent hazards and emerging risk patterns within its datasets before they lead to safety events. This capability enables earlier identification of systemic safety issues, allowing for targeted mitigations, reducing the likelihood of accidents, and strengthening the FAA's ability to uphold the highest levels of aviation safety.

NAS Safety Anomaly Metric with Safety Trend Analytics Dashboard integration

The Spatio-Temporal Anomaly Detection and Situational Awareness Module (STAD SAM) is an unsupervised anomaly detection capability with continuous learning, designed to forecast both anomalous and non-anomalous conditions in the National Airspace System (NAS) at the District and facility levels. By generating forward-looking forecasts, STAD SAM equips headquarters leadership and field decision-makers with enhanced situational awareness of conditions for the day ahead. Leveraging contributing factors behind the forecast, leaders can propagate awareness across the system and proactively take action on potential drivers of safety risk, ultimately strengthening operational safety and resilience in the NAS.

Automatic Speech Recognition (Voice Transcription) – VTACT

Voice communication remains the primary method of exchanging information between pilots and air traffic controllers, yet it creates challenges for analysis and data-driven insights. The Voice Transcription for Air Traffic Communications (VTACT) initiative addresses this gap by transcribing audio recordings of radio transmissions into text across the entire national airspace. By converting these communications into an accessible, analyzable textual dataset, VTACT will provide a rich new source of information. This capability is expected to enhance aviation safety significantly by enabling deeper analysis, trend detection, and insight generation that were previously difficult to achieve with voice-only records.

INFRASTRUCTURE

Investing in World-Class Infrastructure with Intelligent Systems

Investing in high-quality transportation infrastructure is central to the vision of unlocking American prosperity and achieving economic dominance. Artificial Intelligence provides the means to transform infrastructure from a collection of static, physical assets into a dynamic, intelligent, and responsive system. The application of AI shifts from a simple build more mentality to a more sophisticated approach of building smarter, maintaining predictively, and operating at maximum efficiency. AI-powered demand forecasting and generative design algorithms can ensure that new capacity is constructed in the most economically significant locations and with optimal, resilient designs. Crucially, enterprise-wide predictive maintenance platforms, fed by a constant stream of data from automated inspections, will allow the Department and its partners to move from a costly reactive repair cycle to a proactive state of good repair, enhancing reliability and extending the lifecycle of critical assets. This approach directly addresses freight and passenger bottlenecks by maximizing the performance of the existing network while strategically planning for its expansion. By enabling the creation of digital twins, dynamic virtual models of the Nation's transportation system, AI will provide a transformative tool for lifecycle management, allowing planners to simulate, analyze, and optimize the country's most vital assets to ensure their long-term condition and reliability.

Intelligent Asset Management

AI can help to change fundamentally how infrastructure is maintained.. AI-powered predictive maintenance platforms can be deployed at an enterprise scale to ingest and analyze a wide array of data, including real-time sensor readings, historical inspection reports, traffic loads, and environmental conditions. By identifying subtle patterns that precede failure, these systems can forecast when a specific asset, a bridge girder, a segment of pavement, a rail switch, or a lock gate, for example, is at high risk of deterioration. This allows maintenance resources to be deployed proactively and precisely where they are needed most, preventing unplanned outages, reducing long-term lifecycle costs, and keeping the system in a state of good repair.

This predictive capability is fueled by advances in automated inspection. The use of drones, robotics, and vehicles equipped with computer vision, lidar, and other advanced sensors enables more frequent, consistent, and data-rich assessments of infrastructure condition than are possible with manual methods. These automated systems can

detect hairline cracks in bridges, subsurface defects in pavement, and alignment issues in rail lines with a high degree of accuracy, providing the steady stream of high-quality data that predictive models require to be effective.

Strategic Capacity Expansion

AI offers tools to ensure that investments are both strategic and efficient. AI-powered demand forecasting models can analyze complex economic, demographic, and logistics data to produce granular forecasts of future travel and freight patterns. This innovation allows planners to identify emerging bottlenecks and prioritize investments in the highway corridors, rail lines, ports, and airports where new capacity will deliver the greatest economic benefit and best serve growing communities.

Once a project is identified, generative AI can accelerate the design phase. Engineers can input project constraints, material properties, and performance goals, and the AI system can generate hundreds of validated design options for assets like bridges or highway interchanges. This process not only reduces engineering costs and timelines but also allows planners to explore more innovative, resilient, and aesthetically pleasing designs. This moves transportation planning from simply optimizing a human-generated design to having AI co-create the design itself.

Digital Twins as a Core Unifying Capability

The concept of the digital twin emerges as a central, unifying technology for modern infrastructure management. A digital twin is a dynamic, virtual model of a physical asset or an entire network, continuously updated with real-time data. At an enterprise level, a national digital twin of the transportation system would provide a transformative capability. Planners could use it to simulate the system-wide impacts of a proposed capacity expansion project, such as a new high-speed rail line or port terminal, before committing billions of dollars to construction, leading to better investment decisions. For operations, the digital twin can be used to monitor the health of critical infrastructure in real-time, optimize maintenance schedules across an entire network, and model the system's resilience to disruptions like extreme weather events or security threats. This ability to test virtually before implementing physically is a powerful strategy for de-risking massive capital investments and major operational changes, ultimately saving taxpayer dollars and improving outcomes.

Transformative Research for Future Infrastructure

Beyond optimizing the infrastructure of today, the Department’s AI strategy includes investing in research that could revolutionize the infrastructure of tomorrow. This change includes funding high-risk, high-reward initiatives to develop novel materials. Using AI for materials science discovery, researchers can simulate and invent new forms of concrete or asphalt that can autonomously repair their own cracks, for example, dramatically reducing long-term maintenance needs. Another transformative research area is the development of fully autonomous robotic systems for infrastructure construction. These systems could operate 24/7 with minimal human oversight, dramatically accelerating the construction of new capacity while removing human workers from hazardous environments. These forward-looking investments show a long-term vision that moves beyond mere optimization to the fundamental reinvention of how infrastructure is designed, built, and maintained.

INFRASTRUCTURE
ILLUSTRATIVE USE CASES

Advancing Data Access for Multimodal Transportation Infrastructure

Safe and accessible transportation infrastructure is critical for multimodal mobility, yet data on many features are often poorly mapped, inconsistently documented, or missing from digital networks, leaving agencies, industry and the traveling public without reliable information. The University of Washington's Transportation Data Exchange Initiative (TDEI), funded under DOT's ITS4US program, transforms how we map and share critical transportation infrastructure by using AI and high-resolution imagery to generate comprehensive, standardized maps of multimodal networks and accessibility features. By pairing these data products with open standards, this project offers a repeatable framework for transportation agencies nationwide.

AI-Enabled Winter Road Maintenance Decision-Making

Winter weather causes roadway crashes in the U.S. with agency costs in snow and ice control. The AI-Enabled Winter Road Maintenance project applies AI to fuse roadway sensor, vehicle, and weather data with predictive modeling to forecast conditions and recommend optimized plowing, treatment, and routing strategies. The result will be safer winter travel, more efficient and cost-effective maintenance operations.

AI to Enhance Non-Destructive Evaluation (NDE) Techniques

Maintaining the Nation's aging bridges and tunnels requires faster and more reliable ways to detect hidden defects such as delamination and corrosion. This AI to Enhance NDE Techniques project will apply AI, including computer vision, signal processing, and multi-sensor data fusion, to interpret complex (NDE) methods and data with greater accuracy and consistency. By automating analysis and delivering unified condition maps, the NDE AI project will enable earlier detection of structural issues, reduce inspection time and costs, and improve asset management and safety planning.

INNOVATION

Leading Global Transportation Innovation by Accelerating the Technology Lifecycle

DOT has a significant role to play in positioning the United States to lead the world in transportation technology and innovation. Artificial Intelligence plays a unique and powerful dual role in achieving this goal: it is both a transformative technology that warrants direct investment and the primary accelerator for the development and adoption of other critical technologies, such as automated vehicles, Unmanned Aircraft Systems (UAS), and advanced air mobility. AI will create a more efficient, predictable, and agile innovation ecosystem. AI-assisted rulemaking, self-certification and certification processes will help reduce regulatory burden and uncertainty by analyzing complex technical data and public feedback, providing innovators with a faster and clearer path to market. Enterprise-scale digital twin environments will serve as virtual sandboxes, allowing for the safe, rapid, and low-cost testing and validation of new technologies before real-world deployment. Furthermore, by establishing national open data platforms and investing in foundational AI research, from quantum sensing to AI-driven scientific discovery, the Department will provide the essential fuel and foundational breakthroughs needed to power the next generation of transportation solutions. This comprehensive strategy ensures that the Department not only keeps pace with innovation but actively shapes its direction, securing America's position as the undisputed global leader in advanced transportation technology.

The Department's innovation strategy, powered by AI, is designed to foster a dynamic environment where new technologies can be developed, tested, and deployed safely and efficiently while ensuring safeguards for civil rights, civil liberties and privacy. This strategy involves both direct investment in transformative technologies and the creation of systems that accelerate the entire innovation lifecycle for the private sector.

De-Risking Innovation through Virtualization

The creation of a multi-modal digital twin of the national transportation system can serve as a virtual sandbox. In this hyper-realistic simulated environment, technology developers can new technologies under a wide range of conditions. This use of virtualization allows both innovators and regulators to gather extensive safety and performance data at low cost and with low public risk, dramatically accelerating the validation process and building confidence in new technologies before they are deployed on public roads or in the national airspace.

Fueling Innovation with Data

Data is the essential raw material for modern innovation, particularly for the development of AI and machine learning applications. Data collection and use must ensure appropriate safeguards are in place to protect privacy, civil rights, and civil liberties, and to mitigate any unlawful discrimination. The AI strategy recognizes the value of data by prioritizing initiatives that make high-quality transportation data more accessible. The establishment of a National Transportation Open Data Platform will provide a centralized, secure, and user-friendly portal for researchers, startups, and the public to access non-sensitive government data via standardized Application Programming Interfaces (APIs). In addition, the creation of curated, analysis-ready data sandboxes will provide the high-quality, labeled datasets that innovators need to train and test new AI models. By providing this foundational resource, the Department acts as a catalyst, unleashing American innovation from the private sector to solve pressing transportation challenges.

Strategic Investment in Moonshot Technologies

In addition to enabling private sector innovation, the Department will make direct, strategic investments in transformative technologies that have the potential for massive long-term impact. This is the core mission of Department entities like the Advanced Research Projects Agency - Infrastructure (ARPA-I), which is designed to fund high-risk, high-reward research into game-changing ideas that are unlikely to be funded by the private sector alone.

Beyond this entity, the AI strategy calls for forward-looking investments at the frontiers of science and technology. This prioritization includes initiatives to use AI to accelerate fundamental scientific discovery that can underpin transportation innovation, such as designing novel materials. It also includes exploratory investments in nascent fields like quantum computing and quantum sensing, which could one day solve currently intractable problems in logistics optimization or hazard detection. These moonshot investments will ensure that the U.S. remains the global leader in the foundational breakthroughs that will enable the next generation of transportation systems.

INNOVATION
ILLUSTRATIVE USE CASES

AI for Transportation Planning and Design (AI TPD)

State and local transportation agencies often lack the comprehensive data needed to plan, design and implement multimodal projects that serve all users safely and efficiently. AI TPD, funded in phases under DOT's Small Business Innovation Research (SBIR) program applies AI and advanced analytics to generate and integrate infrastructure, traveler behavior, and contextual data into practical decision-support tools. By enabling agencies to identify network gaps and system needs, to test design solutions, and to measure impacts on mobility, safety, and system performance this initiative will deliver scalable, AI-enabled resources that transportation agencies can use nationwide.

Incorporating AI in National Intelligent Transportation System (ITS) Deployments

ITS is the integrated application of electronics, communications, data, and all advanced information technologies in communication, control, and information processing to the entire transportation network. This includes all modes of transportation and users. This project will advance AI-enabled ITS through deployments of high priority use cases defined within the service packages of the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT), the national ITS reference architecture.

Enterprise AI Public Comment Processing Analyzer

AI can accelerate the processing and evaluation of public comments for regulatory and agency actions by quickly categorizing and synthesizing large volumes of feedback for agency review. This use of AI enables faster, more comprehensive assimilation of every stakeholder's input, reduces delays in regulatory decision-making.

EFFICIENCY

Enhancing System and Departmental Efficiency Through Intelligent Automation

The Department's focus on efficiency includes efforts to improve both the performance of the national transportation system and the internal accountability of the Department. Artificial Intelligence and intelligent automation are the keys to modernizing the Department's 20th-century processes to meet 21st-century challenges. This goal will be achieved through a comprehensive, three-pronged approach. First, AI will help to automate the analysis of regulatory code to assist with the identification and elimination of outdated rules, and streamline complex and time-consuming processes like environmental reviews and permitting. Second, AI will accelerate the delivery of critical infrastructure projects from conception to completion by enabling digital construction management, optimizing project schedules, and promoting the use of innovative, time-saving contracting methods. Third, AI will fundamentally modernize the Department's own internal operations by automating high-volume, repetitive administrative tasks in finance, human resources, and procurement; streamlining the entire grants management lifecycle; and providing leadership with real-time, data-driven performance dashboards. This comprehensive application of AI will create a more agile, data-driven, and efficient Department, freeing valuable human capital to focus on high-value, mission-critical work and ensuring that taxpayer dollars are used more effectively to deliver transportation services to the American people.

The pursuit of efficiency through AI is not about incremental cost-cutting but about a fundamental re-engineering of core government processes. The strategy addresses bottlenecks in regulatory processes, project delivery, and internal administration, all of which are interconnected while ensuring safeguards for civil rights, civil liberties and privacy

Accelerating Project Delivery

The time and cost overruns associated with major infrastructure projects are a persistent challenge. AI can help to accelerate project delivery through improvements at every phase of the project lifecycle. Beyond streamlining environmental reviews, AI tools can analyze project characteristics to recommend the most effective and time-saving contracting methods, such as Design-Build. During construction, "intelligent construction management" systems using computer vision and drones can automate the monitoring of project progress against digital plans,

track the quality of materials, and ensure site safety in real-time. This application allows project managers to identify and resolve potential delays or defects instantly, reducing the need for costly rework and preventing schedule slippages. This entire process, from planning to completion, can be managed on a unified "digital twin" platform, ensuring all stakeholders are working from the same data and improving overall coordination.

Modernizing Internal Operations

To be an effective and efficient organization, the Department must modernize its own internal business processes. The AI strategy calls for a comprehensive digital transformation of the Department's administrative functions. Robotic Process Automation (RPA) and machine learning can be deployed to automate high-volume, repetitive tasks in areas like finance, procurement, and human resources, freeing employees to focus on more complex, analytical work.

AI-powered strategic workforce planning can analyze HR data to forecast retirement waves and future skills gaps, allowing the Department to recruit and train the talent needed for emerging fields proactively like data science and cybersecurity, ensuring the agency has the human capital required to execute its 21st-century mission. The modernization of the Department's own IT infrastructure, assisted by AI tools that can analyze legacy code and predict system failures, provides the secure and reliable foundation upon which all these other efficiencies depend.

EFFICIENCY
ILLUSTRATIVE USE CASES

Model Minimum Uniform Crash Criteria (MMUCC)

Model Minimum Uniform Crash Criteria provides intelligent automation that involves mapping States' police crash report data elements and attributes to MMUCC guidelines, ensuring efficiency, consistency and accuracy. Current manual processes are labor intensive, time-consuming, and prone to error., AI-powered solution can automate MMUCC mapping, and reduce manual labor by approximately 95 percent and reducing error. This solution provides enhanced transparency, accuracy, future-proofing, and efficient information retrieval, resulting in improved compliance and decision-making. The improved uniformity of crash data uniformity and accuracy of crash data collection will ultimately lead to improved public safety outcomes central to the National Highway Traffic Safety Administration's mission.

AI for DOT Assistant for Policies and Procedures

The AI assistant helps agency personnel with effectively creating and updating documentation, processes, and generating workflows by utilizing templates with AI capabilities. The assistant tool helps create SOPs, processes, and diagrams more efficiently to assist with drafts, comments, and accelerating completion. The assistant tool will save DOT personnel time for agency personal to focus on more mission-critical work.

Command Center Voice Data Analytics

Adoption of an AI-embedded audio processing pipeline with an intuitive web interface enables the Air Traffic Control System Command Center (ATCSCC) to search, retrieve, and analyze voice communication recordings efficiently. To the benefit of the FAA, this capability reduces the manual workload of locating and retrieving audio by up to 90 percent, saving personnel approximately a dozen hours each week. The efficiency gains free staff to focus on higher-priority tasks while minimizing errors and delays in responding to stakeholder inquiries. Beyond workload reduction, this capability unlocks new opportunities for advanced AI-driven analytics, allowing the FAA to extract patterns, trends, and actionable intelligence from voice communications that were previously inaccessible. These insights enhance decision-making, streamline coordination workflows, and support more optimized operational strategies across the National Airspace System.

CONCLUSION

The analysis presented in this section of the DOT AI Strategy for FY2026-2027 demonstrates that Artificial Intelligence is not a peripheral technology but a foundational, cross-cutting capability essential to achieving the U.S. Department of Transportation's core strategic goals. The diverse applications of AI, while tailored to specific objectives in Safety, Infrastructure, Innovation, and Efficiency, are all driven by a common strategic imperative: to transform the Department from a reactive to a proactive, predictive, and data-driven organization. The shift from investigating incidents to preventing them, from repairing failed infrastructure to predicting its needs, from cumbersome regulation to agile governance, and from manual processes to intelligent automation is the consistent thread that runs through the entire AI strategy. This represents a holistic vision for a more effective and modern Department. This document shows illustrative examples how AI supports the DOT mission, and a complete set of DOT public AI Use Cases can be found here: https://data.transportation.gov/Administrative/Department-of-Transportation-Inventory-of-Artifici/anj8-k6f5/.

Cross-Cutting Capabilities and Foundational Investments

The success of this vision hinges on recognizing that certain enterprise-level AI capabilities provide value across multiple strategic goals. These cross-cutting platforms are therefore the highest-priority investments, as they create a foundation upon which numerous modal-specific applications can be built. Key foundational capabilities include:

- Enterprise Digital Twin: A dynamic, virtual model of the national transportation system serves the Infrastructure goal by enabling advanced planning and lifecycle modeling. It serves the Innovation goal by providing a virtual sandbox for testing new technologies. It also serves the Safety goal by allowing for the simulation of complex incident scenarios and emergency response plans.
- Predictive Analytics Platforms: A common platform for predictive modeling serves the Safety goal by forecasting incident risk. It serves the Infrastructure goal by predicting asset failures and maintenance needs. It also serves the Efficiency goal by enabling strategic workforce and budget forecasting.
- Automated Data Ingestion & Natural Language Processing: An enterprise capability to ingest and analyze unstructured data serves the Safety goal by extracting insights from incident and safety culture reports. It serves the Efficiency goal by automating the analysis of regulations and environmental reviews. It also serves the Innovation goal by enabling technology scouting through the analysis of research and patent databases.

The synergistic nature of these foundational investments is best illustrated by mapping their contributions across the Department's strategic goals.

Core AI Capability	Safety	Infrastructure	Innovation	Efficiency
Predictive Analytics	Proactive incident & risk prediction	Predictive maintenance & failure forecasting	Modeling technology adoption & impact	Forecasting workforce & budget needs
Computer Vision	Automated hazard & compliance monitoring	Automated infrastructure & vehicle inspection	Validating autonomous system perception	Automating progress tracking on projects
Natural Language Processing (NLP)	Analyzing safety reports & culture surveys	Extracting data from maintenance logs	Accelerating regulatory & comment analysis	Streamlining environmental reviews
Simulation & Digital Twins	Testing safety scenarios & procedures	Modeling infrastructure lifecycle & capacity	Providing virtual sandboxes for new tech	Simulating project delivery timelines
Robotics & Process Automation	Automating hazardous tasks & inspections	Automating construction & maintenance	Automating research data collection and analysis	Automating administrative & grant processes

This mapping demonstrates that an investment in a core capability like a computer vision platform is not merely a "safety" expense but also a strategic investment in "infrastructure" and "efficiency," creating a more robust and compelling business case for these foundational technologies.