The Federal Aviation Administration’s (FAA’s) Next Generation Air Transportation System (NextGen) program is transitioning the National Airspace System (NAS) to Trajectory Based Operations (TBO) to make flight operations more efficient and predictable, while maintaining operational flexibility. TBO is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the operation by using time-based management, information exchange between air and ground systems, and the aircraft’s ability to fly precise paths in time and space.

TBO leverages significant NextGen investments already made in Performance-Based Navigation (PBN), surveillance, communications, and automation systems for decision support, flight data management, and information sharing. The vision for TBO in 2025 will be accomplished through improved air traffic management strategic planning initiatives along with the predominant use of time-based management using precise and repeatable paths defined by PBN procedures and routings.

Together, time-based management and PBN comprise a four-dimensional (4D) trajectory (latitude, longitude, altitude, and time) that airspace users negotiate with the Air Navigation Service Providers to identify a solution that best accommodates both their needs. The trajectory includes a path between origin and destination with predicted crossing time estimates at key points along the path which are much more accurate than the estimates used today for strategic planning. The time parameter provides a common planning reference across all phases of flight, including pre-departure. The trajectory facilitates integration across Air Traffic Control (ATC) domains, enables the FAA to plan accounting for user objectives, and allows for more collaborative and flight-specific solutions in response to NAS constraints. This represents a great improvement over today’s strategic planning initiatives and tactical flow management techniques and addresses many of today’s operational shortfalls.

TBO in 2025 depends upon use of improved data sets and greater collaboration between the FAA and its customers to enable better traffic planning and scheduling decisions. Improved data sets reflect access to new data elements, more accurate and timely data, and data integrated into automation tools where appropriate. User provided inputs are considered in the generation of the ATC schedule given availability of NAS resources and constraints. TBO in 2025 also depends on providing controllers, traffic managers, and airspace users with the necessary decision support tools to provide efficient flows that meet that schedule and the ability to adapt to changing operational conditions. It also requires that aircraft be appropriately equipped with navigation and communication capabilities needed to achieve the full benefits of TBO. Altogether, this will maximize use of available system capacity, reduce fuel burn, and result in more reliable travel times.

Because levels of demand and traffic complexity vary across the NAS, the application of TBO will be scaled appropriately to satisfy operational conditions. In other words, TBO will be available NAS-wide and higher TBO performance levels, which can include higher level of PBN precision and greater use of time-based management decision support tools, will be applied where it is needed. The determination for how it is applied will be driven by the operational needs and goals targeted.

Operational transition to the 2025 TBO vision will be evolutionary, building upon PBN infrastructure and time-based management enabling technologies. The magnitude of benefits will gradually increase over time with
experience and with national implementation. Successful implementation requires more than just sound
technology and procedures. It will only be achieved through shared FAA and operator collaboration, actions,
and investments. While many investments and changes have already been accomplished, many are still
forthcoming. Achieving the TBO vision requires a clear understanding and commitment by all stakeholders
(from executives in the FAA and industry, to controllers, pilots, traffic managers, and flight operation centers),
and a system-of-systems approach to change management to include the technology, people and culture,
procedures, policies, and operator and workforce training. Executing on the TBO vision will deliver the benefits
evenomed by NextGen and improve the flying experience for millions.