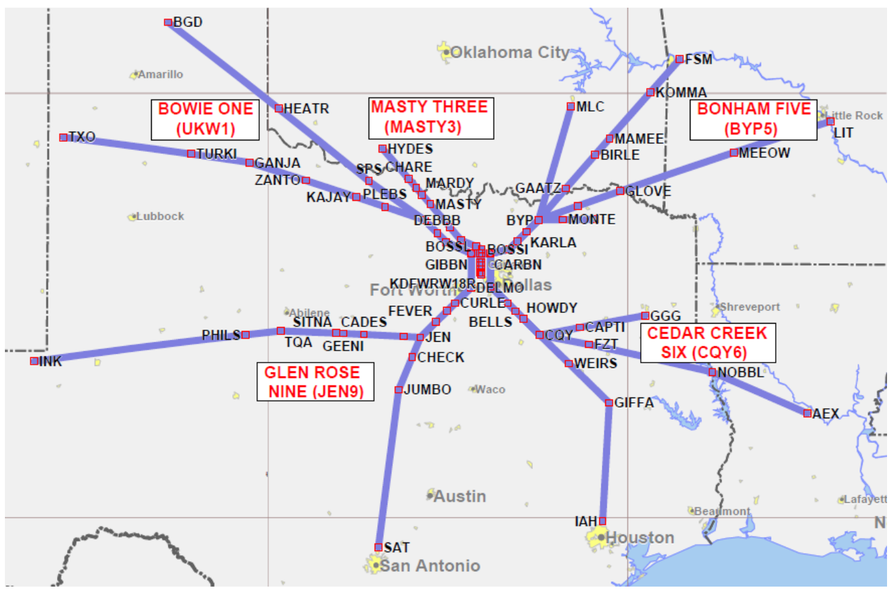
National Aeronautics and Space Administration

Interval Management Concept of Operations (IM)

Problem



Complex and Dense Terminal Area Operations

Challenging to maintain high airport throughput when using optimized descent profiles designed to minimize aircraft fuel consumption, engine emissions, and environmental noise.

Current Operational Arrival Procedures

A) Level-flight segments and vectoring provide spacing control.
B) Extra spacing buffer added to accommodate optimized descents.

Impact of Current Operational Arrival Procedures

A) Excessive fuel burn, higher emissions, increased noise levels.
B) Reduced runway throughput when using optimized descents.

IM Concept

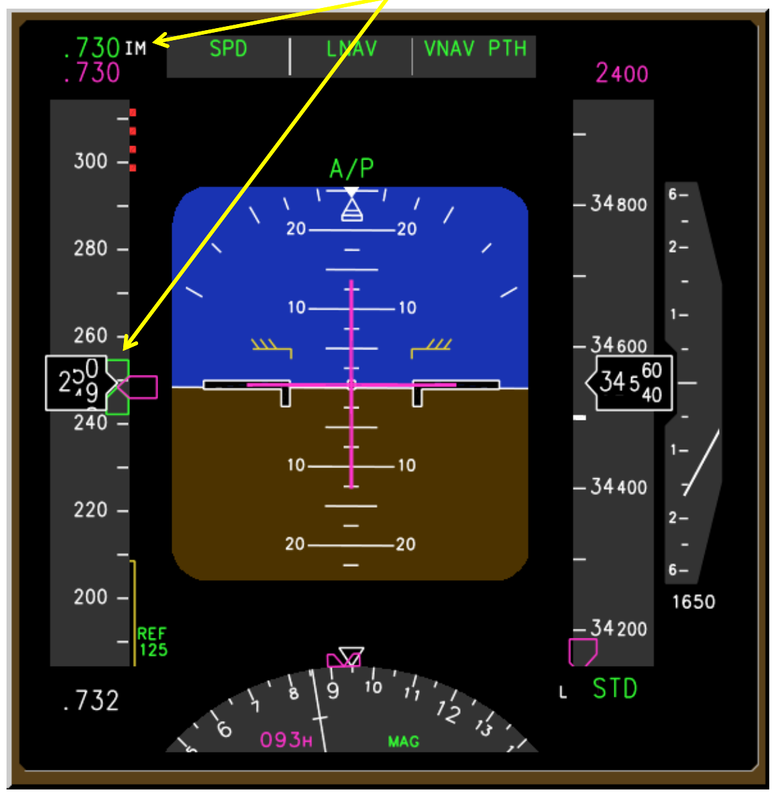
Precise Control to Achieve ATC Sequence and Interval

- Controller and ground automation determines arrival sequence and required spacing interval.
- Information sent as a clearance to the flight crew.
- Flight crew flies aircraft at speeds calculated by an onboard spacing algorithm.

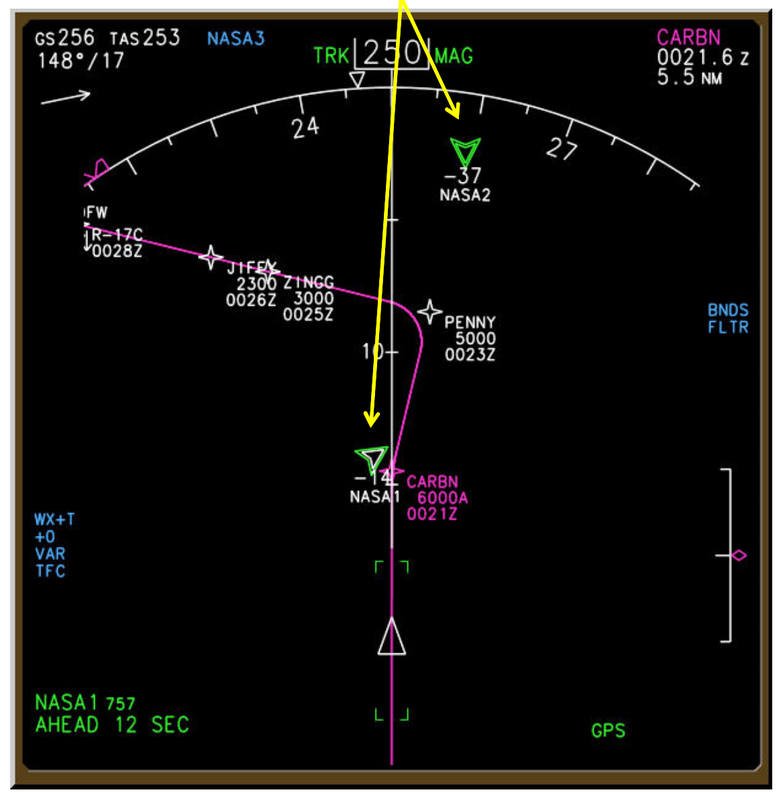
Key Elements

- 4D-trajectory basis enables multi-axis approaches.
- Achieve interval at runway more efficient than fixed interval throughput approach.
- Can offset for aircraft speed differences (weight, type).

IM Speed Guidance on Primary Flight Display



Reference Aircraft on Navigation Display



IM spacing algorithm output on aircraft Multifunction Control and Display Unit

IM Benefits

Maintain High Throughput

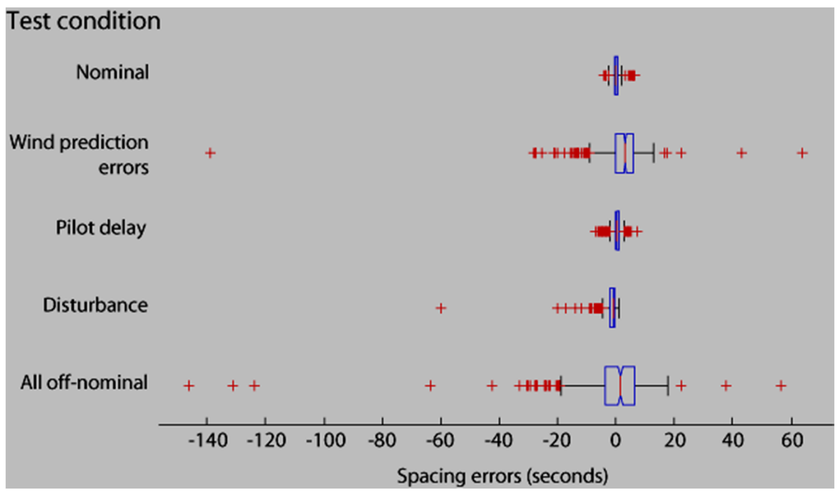
Flight crew delivers aircraft to runway within 5 seconds, even when flying optimized descents.

Reduced Fuel Burn

Optimized descents can be used during high density operations, less fuel is used.

Reduced Workload

Only one clearance from controller needed to meet assigned spacing interval.



NASA's contribution to the FAA IM Concept of Operations is based on Airborne Precision Spacing (APS) research. Results from previous NASA non-piloted and piloted studies over the past 10 years show low flight crew workload and high acceptability of procedures, with 85% of the crews within 5 seconds of the assigned spacing interval.

References: ATM2009, AIAA ATIO 2008-8931, AIAA ATIO 2006-7722

NASA/CR-2010-216204, NASA/CR-2009-215695