ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 4: Capacity-enhancement measures

OPERATIONAL EVOLUTION PLAN OVERVIEW AND SAMPLE RESULTS

(Presented by the United States)

SUMMARY

This paper presents an overview of the U.S. Operational Evolution Plan (OEP), which is designed primarily to relieve congestion. The OEP includes an emphasis on measurable results. Portions of the OEP have been completed; this paper also summarizes some measurements that have been performed on some completed projects.

1. INTRODUCTION

1.1 The Operational Evolution Plan (OEP) is the U.S. Federal Aviation Administration's (FAA) rolling ten-year plan to increase the capacity and efficiency of the National Airspace System (NAS). The commitments and decisions in the OEP have emerged from a close collaboration with the entire U.S. aviation community, including the airlines, cargo carriers, airports, manufacturers, general aviation, the Department of Defense (DOD), the National Weather Service, and the National Aeronautics and Space Administration, all with a focus on air transportation services delivered to the flying public. The OEP represents agreements and commitments of the FAA, DOD and the rest of the aviation community to modernize the U.S. NAS and solve problems in core areas, or quadrants: Arrival/Departure Rates; En Route Congestion, Airport Weather Conditions, and En Route Severe Weather. Each quadrant is summarized below. A more complete description of the OEP can be found at http://www.faa.gov/programs/oep/.

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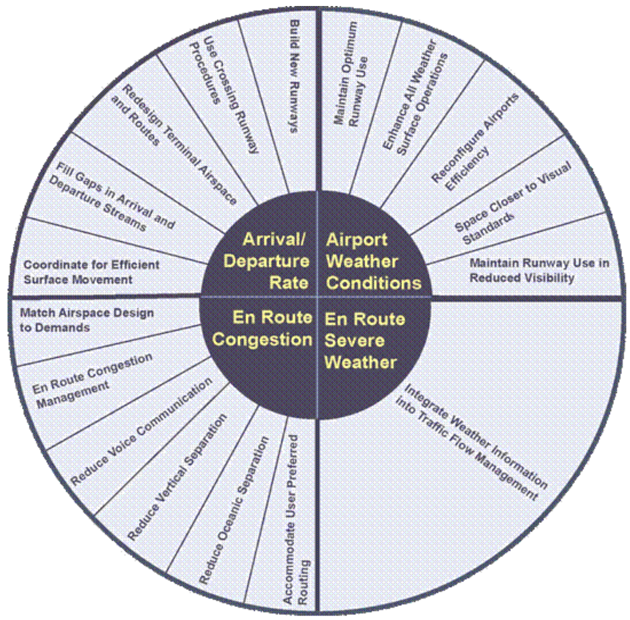

Figure 1. OEP solution sets organized by quadrant (problem area)

1.2 **Arrival/Departure Rates:** There are two main strategies to help airports meet peak demand: build new runways and maximize use of existing runways. New runways can increase the capacity and efficiency of an airport, but may take 10 years to plan, construct and commission. Currently, the OEP includes 12 runways planned at benchmark airports. A combination of air traffic procedures, new technologies, improved airspace design, surface management, and decision support tools are proposed to make better use of existing runways. Procedures will be evaluated for crossing runway configurations at Chicago O'Hare International Airport initially. Terminal airspace redesigns, planned for most of the benchmark airports and metro areas are aimed at improving the transition of arrivals and departures. Traffic management advisory tools that help in managing the arrival stream will become operational at an additional four sites. Also the multi-center capability will be evaluated in the Philadelphia area. Surface management systems are being explored for operational use later in this decade.

1.3 **Airport Weather:** For the benchmark airports, inclement weather operations lower arrival and departure rates an average of 18 per cent. As weather or visibility degrades, runway use may become limited and spacing between aircraft is increased. To make airport operations less sensitive to weather, we need more options for runway configurations and more consistent spacing of operations, much of which requires new technologies. With required navigation performance (RNP) and improved availability of satellite navigation services, precision approaches become available at more airports. A variety of procedures including wake-mitigation, offsets and along track separation, and flight monitoring allow operations to increase on closely-spaced parallel runways as bad weather moves in. In the future, Cockpit Display of Traffic Information may enable visual approaches to continue into marginal visual flight rules conditions. A moving map display may also help with improved surface situational awareness.

1.4 **En-Route Congestion:** In the en-route arena, capacity and efficiency are governed by airspace design, flow planning practices, separation standards and controller workload. Airspace design changes are being made both in the short and long term to fit sectors to the traffic demand and to establish more effective airspace structures in the long run. The long-term plans include routes based in the RNP of the aircraft. The transition to collaborative decision-making and "system thinking" will change flow-planning practices to better match available capacity to the demand. Domestic reduced vertical separation minima (DRVSM) will reduce vertical separation standards from flight level 290 to flight level 410 within the NAS including Alaska and the Gulf of Mexico. Horizontal separation standards of 30 miles are planned in the Oceanic airspace. Controller pilot data link communications (CPDLC) along with tools for accommodating and managing airspace user plans and requests (user request evaluation tool (URET) and traffic manager advisor (TMA)) will assist controllers in managing the forecasted increase in demand.

1.5 **En-Route Severe Weather:** In fiscal year 2002, over 70 per cent of delays were attributed to restrictions due to weather. These results are typical of recent years. Improving forecasts, sharing real-time data and the application of weather information to traffic management planning, as well as integrating weather information into decision support systems will mitigate weather related delays. The disruptions caused by hazardous en-route weather are magnified by the uncertainty in the location, movement and severity of the weather conditions. Forecast accuracy is not well suited to the strategic planning of traffic flow decisions. Joint planning is further hindered by limitations in real-time data sharing capabilities. Operational decision-making by airlines and traffic flow managers will be improved when common awareness of the situation and a methodology to mitigate the impact are coupled with the improved data exchange, training for interpretation of forecasts, and the coordination processes.

2. DISCUSSION

2.1 This section presents a selection of measured 2002 performance results. Overall, capacity at the OEP airports has increased over 2 per cent since OEP inception. Although decreased demand levels did influence overall peak throughput in 2002, the peak visual throughput index at 15 of the 34 airports studied (or nearly 45 per cent) were higher than in 2000. Compared to the OEP baseline year 2000, delays have fallen by approximately 30 per cent, while traffic volume changes have varied throughout the NAS, ranging from 5 per cent at the en-route centers to approximately 15 per cent at designated busy airports.

2.2 The Detroit Metro Airport (DTW) runway became operational in December 2001. Both visual meteorological conditions (VMC) and instrument meteorological conditions (IMC), airport acceptance rates (AAR) were increased (14 per cent and 10 per cent respectively). By spring 2002, the airport capacity VMC index (representing the available capacity, defined as the sum of the maximum AAR and the maximum airport departure rate) was up 16 per cent, and airport throughput VMC index (representing what was serviced on average during the peak of arrivals and departures) was up about 9 per cent. These gains translated into significant delay savings (11 per cent for arrivals and 47 per cent for departures).

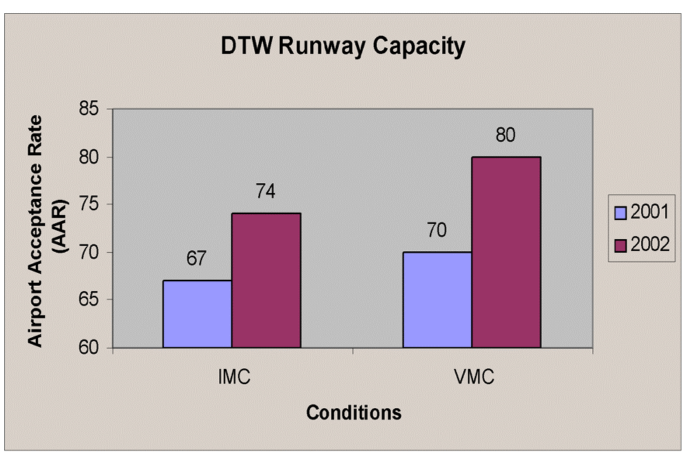

Figure 2. New Detroit runway increases capacity in good and bad weather

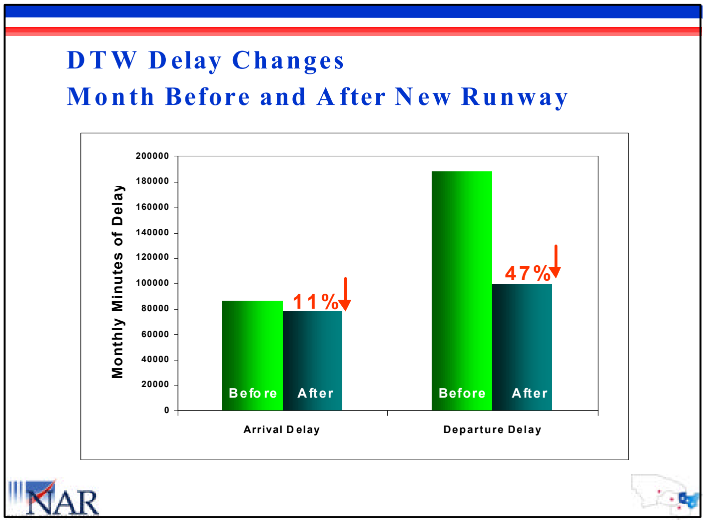

Figure 3. New Detroit runway reduces measured delay; equates to user savings of $3.2M per month, facilitated by airspace redesign

2.3 All choke point actions were implemented, by the end of 2001. An interim analysis was conducted in August 2001 when 70 per cent of the actions were complete. That analysis showed performance improvement in five of the seven choke points, equating to approximately $38M in cost savings to aviation system users. Traffic reduction after the September 11, 2001 terrorist attacks has made it difficult to show the system impacts of the completed actions. However, in the Great Lakes Region en route airspace, where traffic has rebounded to pre-September 11 levels, the actions resulted in impressive reductions in delay (15 per cent to 40 per cent, depending on the choke point).

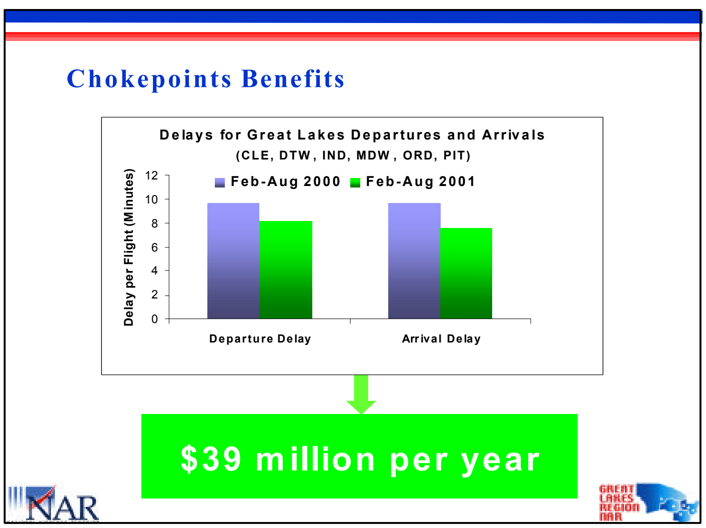

Figure 4. Measured delay per flight reductions at 6 airports due to chokepoint actions

2.4 The URET has allowed restriction removals and lateral amendments; the latter have saved approximately 7000 nautical miles (nmi)/day at Indianapolis and 3 500 nmi/day at Memphis Air Route Traffic Control Centers (ARTCC).

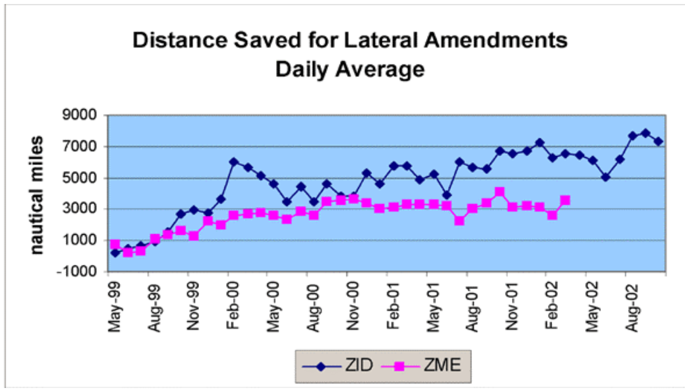

Figure 5. URET saves thousands of miles per day per facility; equates to $1.5M per month per facility

2.5 Chokepoint actions, collaborative decision making (CDM) and URET together allowed the maximum hourly measured occupancy in the Cleveland, Indianapolis and Chicago ARTCCs to reach 102.5 per cent of the 2001 levels.

2.6 The TMA is in use at seven ARTCCs supporting arrival metering and merging. Three sites (Dallas, Minneapolis, and Los Angeles Centers) experienced a 5 per cent increase in throughput, and the Denver ARTCC experienced a 2 per cent gain.

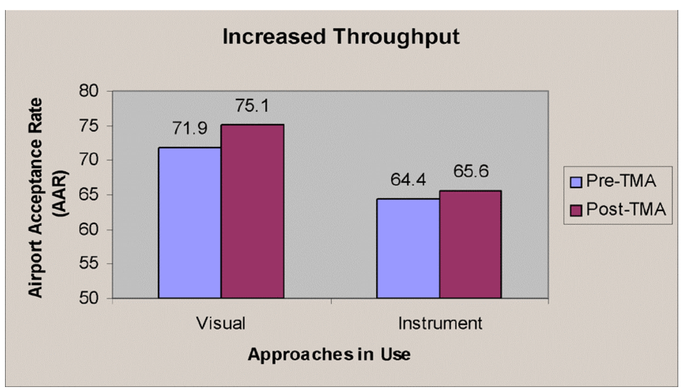

Figure 6. TMA increases measured throughput by 2 per cent to 5 per cent per facility

2.7 Precision runway monitoring (PRM) in the Minneapolis Airport provided an increase in arrival rates of better than 6 per cent based on a measured four more flights per hour, while in operation.

3. CONCLUSION

3.1 The FAA continues to analyze different dimensions of capacity and efficiency. These findings suggest a variety of measures will be required to capture the results of terminal and en-route effects. ICAO should consider the OEP results when developing a comprehensive set of measures for capacity and efficiency.

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