

Evaluation of Stream Air Traffic Operations by Adapting Dynamic Density Complexity Measure

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Stream management is a novel air traffic control operational concept in which controllers control streams of aircraft that are functionally equivalent, rather than being responsible for “aircraft in airspace.” One possible benefit of stream management is workload reduction for the same number of aircraft handled. An adaptation of the dynamic density workload measure is used to evaluate stream management operations against current sector based operations within a TRACON environment. This evaluation is completed utilizing FACET software and ASDI data. Preliminary data analysis demonstrates advantages in shifting to stream operations. Input from TRACON controllers demonstrates that this shift cannot be achieved without fully understanding the nuances specific to each TRACON.

I. Introduction

DYNAMIC airspace research is designed to address three primary limitations of the current sector based air traffic control, specifically to (a) balance controller workload, (b) accommodate route flexibility, and (c) integrate automated separation assurance [1]. However, research in dynamic airspace has been largely confined to dynamically modifying sector boundaries and segregating volumes of airspace for better-equipped aircraft, such as using “tubes-in-the-sky”. Such approaches do not address all three limitations noted above.

A new concept, called “stream management” has been proposed. Under stream management, controllers would be assigned a “stream” of aircraft consisting of functionally equivalent aircraft, i.e. aircraft that will be handled together in a similar fashion. An example of a stream in enroute airspace would be aircraft that are utilizing the same routing and are destined for the same geographic area, while in a TRACON a stream may be aircraft utilizing the same arrival gate and destined for the same runway. (The concept of streams is embedded in the Traffic Management Advisor system.) This concept would effectively eliminate the concept of sectors, since controllers would be responsible for the stream regardless of where that stream was located geographically. While this seems, at first, a somewhat radical departure from current operations, stream management in a TRACON would be roughly equivalent to a combined feeder-final operation that has been, or is still being, used in some TRACONS.

One of the primary benefit mechanisms of stream management would be to balance workload across controllers; instead of one controller having a high number of aircraft and another controller having almost none, streams could be assigned to controllers to keep each controller’s workload approximately equal. As a first step in evaluating stream management, estimates of workload under stream management were compared with that of sector-based control.

This paper first discusses the concept of stream management, followed by a description of workload measures used to assess controller workload. The method is then applied to the San Diego area (SAN), which is part of the Southern California TRACON (SCT). A discussion of the results and conclusions follow.

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