ATA ENGINEERING, INC.

www.ata-e.com
sales@ata-e.com | 858.480.2000

Case Study

Impact Study: Proposed Hangar's Wake on Operation of Nearby Runway

OVERVIEW

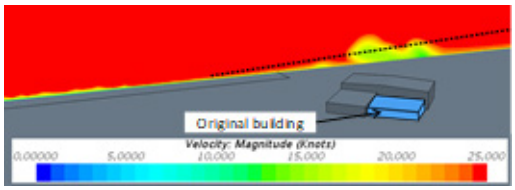
ATA used steady and time-accurate computational fluid dynamics (CFD) simulations to determine the feasibility of a newly proposed helicopter hangar at a regional airport by quantifying how its wake would impact the operation of aircraft landing on a nearby runway. The analysis showed that the larger hangar structure and closer dimensionless spacing from the runway would exacerbate wake effects relative to the original structure. Methods were developed to use data from scale-resolving simulations to quantify perceived changes in headwinds, crosswinds, and downwash for arriving aircraft under conventional and worst-case conditions.

TASKS PERFORMED & KEY OUTCOMES

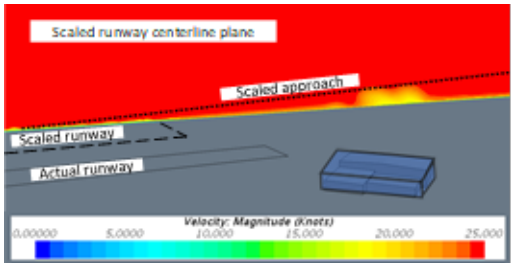
- Calculated wind deficits, wind shears, and turbulent velocity fluctuation magnitudes that aircraft may encounter when flying through the wake.
- Conducted steady Reynolds-averaged Navier-Stokes (RANS) CFD analysis using Siemens' Simcenter STAR-CCM+ to provide the time-mean impact of the hangar, and identified the worst-case direction for the approach velocity field.
- Scale-resolving, unsteady CFD analysis demonstrated time-mean wind velocity deficits generally similar to those from steady RANS, although instantaneous changes in velocity within the hangar wake obtained in scale-resolving simulations were significant relative to stall margin and allowable crosswind speeds.
- Dimensionless scaling analysis applied to existing CFD simulation demonstrated increased wake impact relative to original structure (figures at right).
- CFD simulations informed airport authorities of need for Notice to Airmen (NOTAM) during runway operations under the investigated wind conditions.
- Successfully evaluated the impact of the hangar wake, assessing its effects on the feasibility of the helicopter hangar and its potential influence on other aircraft.

"The ATA Engineering team proved themselves a trusted partner from day 1. Not only did they deliver an accurate, defensible wind shear analysis, they also presented their complex scientific findings in a manner easily digested by the layperson. Looking forward to the next collaboration opportunity with this great team!"

Nick Alex, Principal Consultant, Aviation C&S Companies



Landing approach trajectory passes directly through proposed building wake



Treating proposed building as the original building and scaling approach trajectory and runway plane shows landing aircraft miss current building wake