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Technical Comment

Brief discussion of previous investigations in the aerospace sciences and technical comments on papers published in the Journal of Aircraft *are presented in this special department. Entries must be restricted to a maximum of 1000 words, or the equivalent of one* Journal *page including formulas and figures. A discussion will be published as quickly as possible after receipt of the manuscript. Neither the AIAA nor its editors are responsible for the opinions expressed by the correspondents. Authors will be invited to reply promptly.*

Technical Comment on "Computational-Fluid-Dynamics Based Advanced Ship-Airwake Database for Helicopter Flight Simulation"

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THE conclusions reached in Ref. 1 are not justifiable to the extent claimed by the authors. Although they demonstrate encouraging agreement with limited experimental data from Ref. 2, a subset of these data should not be used for validation as clearly explained therein. It is inappropriate that the authors have chosen to use these data for their validation. Further to the point, the experimental data available to the authors was for one wind direction only, and it has been well documented in recent literature[3,4] that the airwake flow topology changes substantially with changes in wind direction. Thus, reasonable agreement between computational fluid dynamics (CFD) and experiment at one wind angle cannot be considered as complete validation for a CFD approach. It may be fortuitous in these cases that the off-body flows computed from CFD are a reasonable representation of the real world, but one cannot expect this to be valid in the general case.

Further evidence of the potential problems with the Euler approach presented in Ref. 1 is indicated by the illustrated computed time-averaged flow topologies for the various Royal Navy ships. The streak lines indicate that the flow is generally attached to the flight decks. However, experiments on a simple frigate geometry (Figs. 1 and 2) and Navier–Stokes calculations on a landing, helicopter, amphibious assault ship (LHA) ship (Ref. 4) indicate that the airwakes are often dominated by vortex flows and strong separations that are known to adversely affect helicopter flight operations. Experience has also shown that adverse effects may only exist over a limited wind angle range of perhaps 15–20 deg. Thus, it is misleading and potentially dangerous to state that "all unfavorable wind directions and unsafe landing conditions have been clearly identified for the simulator."[1]

The other issue of importance is the correct representation in the simulator of the unsteady airwake because the pilot response (workload) is strongly correlated to the input turbulence. Reference 2 contains some unsteady-flow airwake validation data, to which Ref. 1 did not attempt any comparison in support of validation. Thus, the CFD data quality cannot be assessed in this regard.

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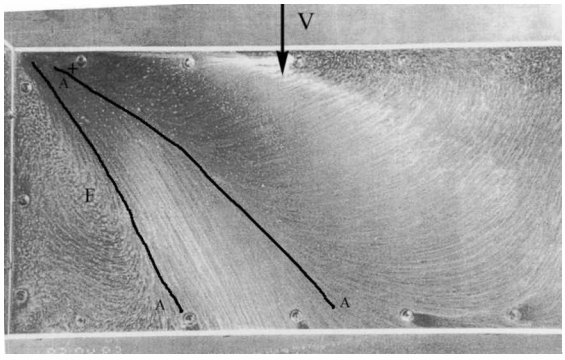

Fig. 1 Surface flow topology over the flight deck of a simple frigate shape, 90-deg wind angle (from Ref. 3).

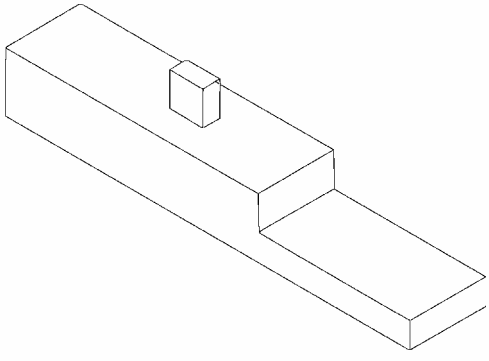

Fig. 2 Geometry of simple frigate shape.

The incorporation of the CFD-generated airwake into the flight simulator is described in some detail only for the time-averaged airwake. Although such spatial gradients in the airwake will require one-time control inputs from the simulator pilot as the airwake is traversed, a high-fidelity flight simulation, which can model pilot workload with confidence, can only be achieved with the incorporation of time-accurate (spectrally correct) airwake turbulence, as described, for example, in Refs. 5 and 6. Bogstad et al.[1] state that the turbulence model is "adjusted" based on pilot feedback. However, without some technical discussion and validation as presented in Refs. 5 and 6, such an approach is inappropriately justified as validation.

References

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