Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Computational Fluid Dynamic Analysis of Hydrodynamic forces on inundated bridge decks BUSHRA AFZAL, JUNKE GUO, University of nebraska-Lincoln, KORNEL KERENYI, FHWA Hydraulics Laboratory — The hydraulic forces experienced by an inundated bridge deck have great importance in the design of bridges. Flood flows or hurricane add significant hydrodynamic loading on bridges, possibly resulting in failure of the bridge superstructures. The objective of the study is to establish validated computational practice to address research needs of the transportation community via computational fluid dynamic simulations. The reduced scale experiments conducted at Turner-Fairbank Highway Research Center establish the foundations of validated computational practices to address the research needs of the transportation community. Three bridge deck prototypes were used: a typical six-girder highway bridge deck, a three-girder deck, and a streamlined deck designed to better withstand the hydraulic forces. Results of the study showed that the streamlined deck significantly reduces drag, lift, and moment coefficient in comparison to the other bridge deck types. The CFD results matched the experimental data in terms of the relationship between inundation ratio and force measured at the bridge. The results of the present research will provide a tool for designing new bridges and retrofitting old ones.

Bushra Afzal
University of Nebraska-Lincoln

Date submitted: 11 Aug 2010 Electronic form version 1.4