How Divers use the Rip Entry to Reduce Splash

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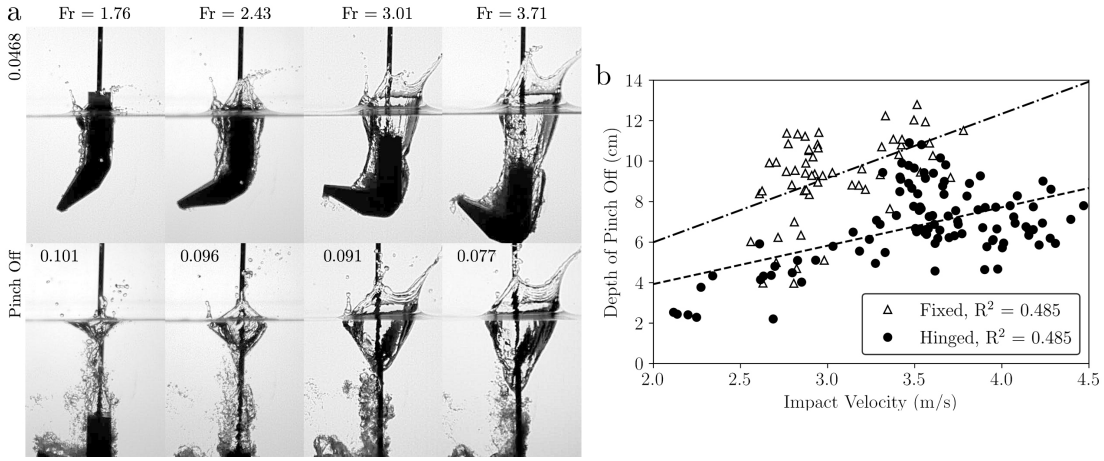
According to the FINA judges manual, an exceptionally good entry – a rip entry – will result in almost no splash [1]. This means that competitive divers are awarded significantly higher scores when they execute a splash-less dive. To perform a rip entry divers impact the water perpendicular to the surface and roll their body in a somersault as they pass through the interface. This technique requires divers to actively change their shape and trajectory during the entry. A recent study found that the speed at which a diver model deforms after impact has a significant effect on the size of the entrained air cavity [2]. This presentation will dive into how deformation after impact changes the splash produced during the entry event.

A single jointed diver model, designed to actively deform after impact, is dropped into a pool of water with guided free fall between 2.1 and 4.5 m/s. The recordings of entry are tracked for impact velocity, air cavity re-attachment, depth of pinch off, and splash production. The dependence of pinch off depth on Froude number are analyzed for hinged models (see Figure a) and fixed models that do not deform after impact. We will use these results to explain how the hinged diver model is able to reduce the pinch off depth by half compared to a fixed diver model in nearly every case (as seen in Figure b) and how these results can be applied to competitive divers.



(a) Entry of a hinged diver model at four different Froude numbers ($Fr = v/\sqrt{gl}$); (b) Plot of the depth of pinch off v. impact velocity for all hinged and fixed models.

References

[1] FINA Technical Diving Committee 2017-2021, "FINA Diving Officials Manual," (2020)

[2] Gregorio, E., Balaras, E., Leftwich, M.C., Experiments in Fluids, **64**:168 (2023)