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Improved ICF implosion performance through precision engineering features[1]

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The thin membrane that holds the capsule in-place in the hohlraum is recognized as one of the most significant contributors to reduced performance in indirect drive inertial confinement fusion (ICF) experiments on the National Ignition Facility (NIF). This membrane, known as the "tent", seeds a perturbation that is amplified by Rayleigh-Taylor and can rupture the capsule. The ICF program is undertaking a major effort to develop a less damaging capsule support mechanism. Possible alternatives include micron-scale rods spanning the hohlraum width and supporting either the capsule or stiffening the fill-tube, a larger fill-tube to both fill and support the capsule, or a low-density foam layer that protects the capsule from the tent impact. In addition to the challenges presented by nano and microscale engineering, it is difficult to model and experimentally verify improvement from these changes. The 3D nature of the proposed replacements and the radiation shadows they cast on the capsule prohibit direct simulation. Therefore a combination of reduced models and experimental verification are used to set requirements and down-select the options. Ultimately the improved capsule support will be used to repeat a DT-layered implosion and demonstrate improved performance.

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