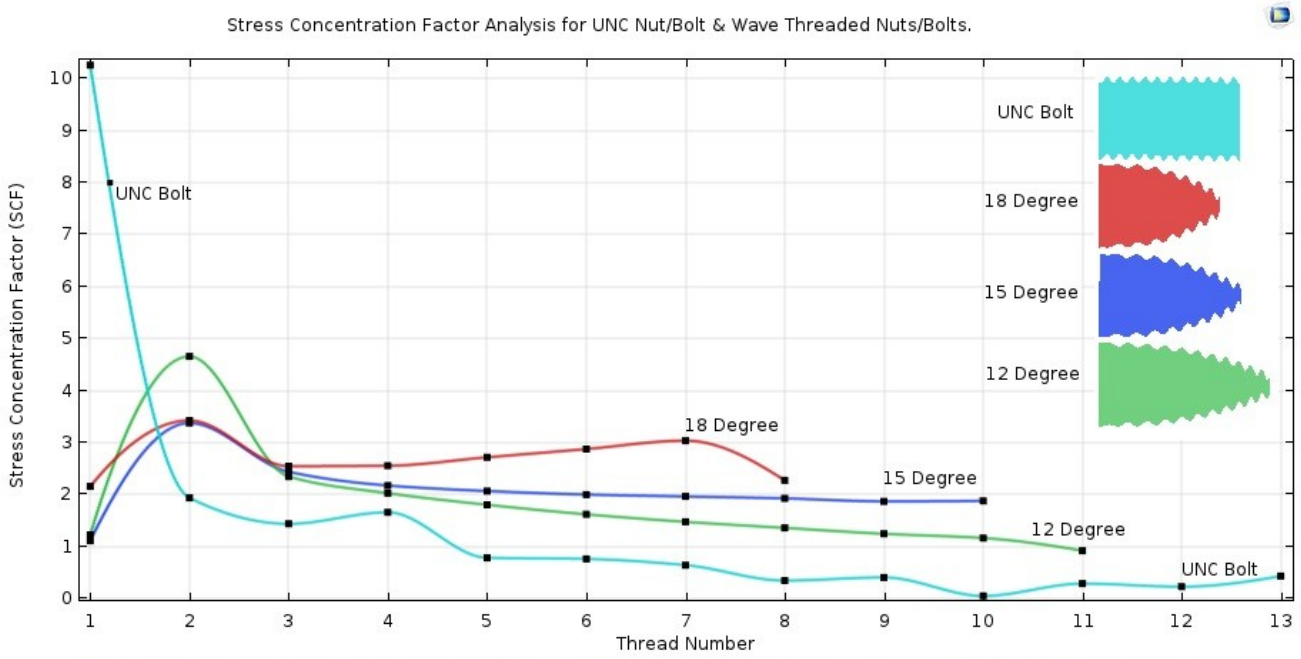
Can the wave thread 3D printed in Titanium make a 25% stronger fastener

Dale E. Van Cor

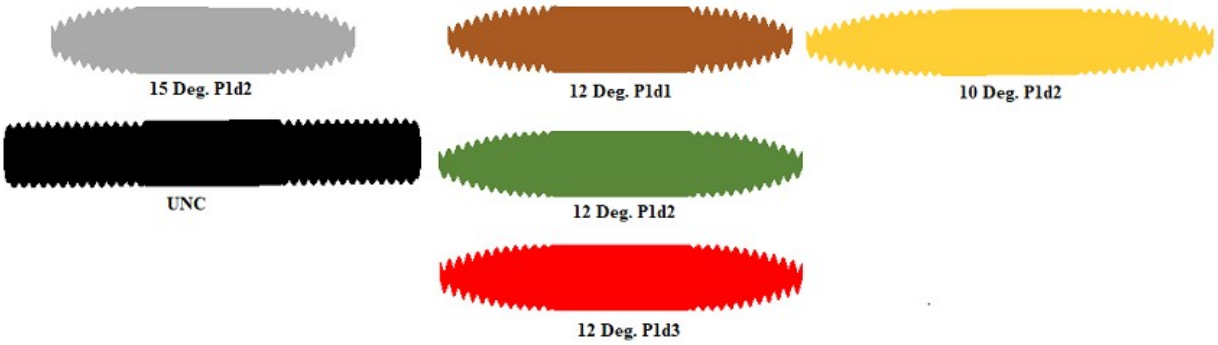
The patented Wave Thread™ is a total surface contact thread (minus tolerances) that engage all the male and female surfaces at the same terminal instant. The most unique aspect is that the wave thread pulls through the end of the bolt, not from the side of its cylinder shape. That is how it is possible to be 25% stronger then standard threads. It is a precision connection with a specific clamp length and does not have a clearance space. It is called a thread because it looks like one, but is structurally a different genre.

The graph below is from an independent company compares the standard UNC thread with different wave threads. The Wave Thread can be designed to evenly distributes stress.



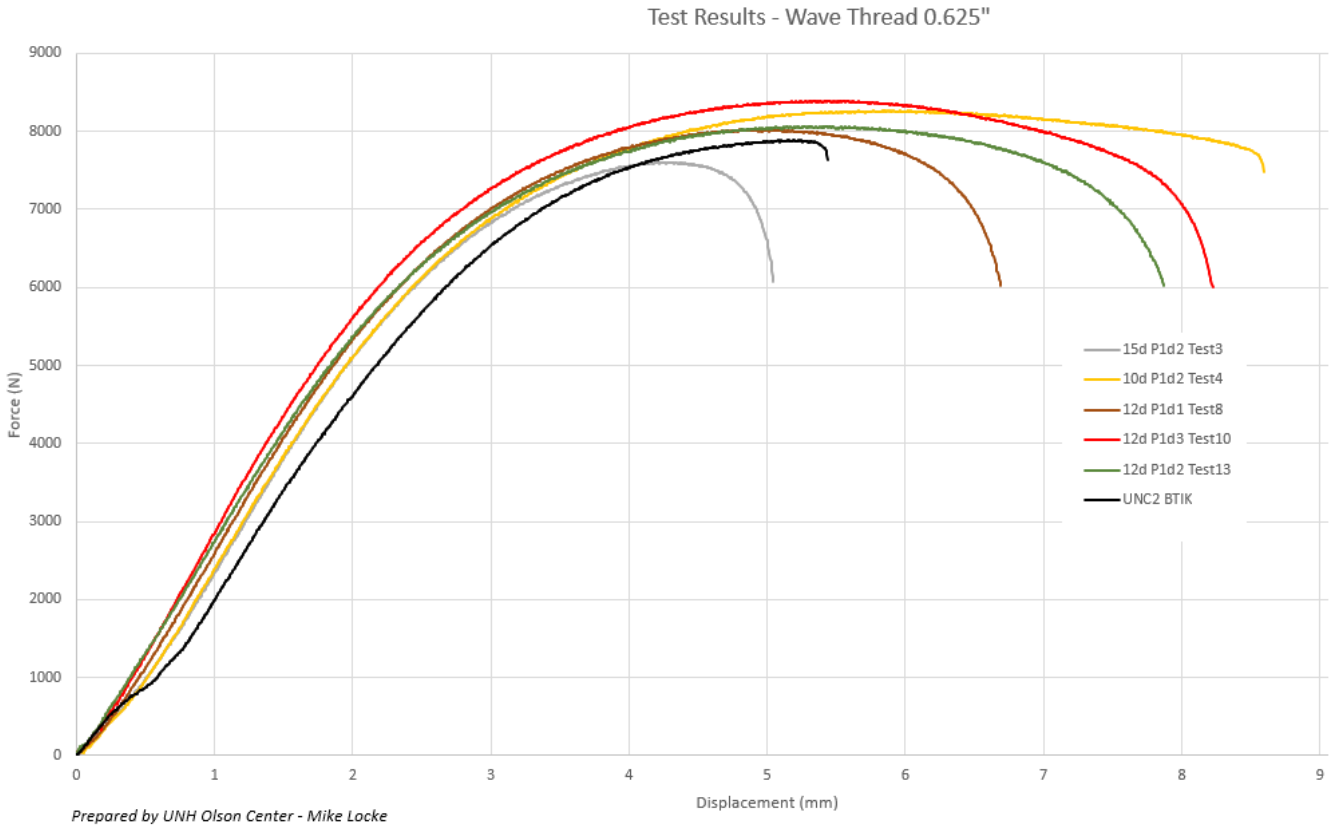
Based on Finite Infinite Analysis using COMSOL Multiphysics software by Carlson Research LLC, Cambridge, Mass.

In 2018 at the University of New Hampshire Olsen Mfg Center, destructive tests were perform on a



variety of wave threaded 5/8" (15.6mm) nuts and studs; and standard UNC threaded nut and stud. They were 3D printed on site with a nylon/carbon fiber material mix. The colors align parts with the following graph lines. That graph is load verses elongation. It is very clear that the 25% greater

strength was not achieved because the material stretched. I was expecting something proportional whose curves would be similar to other materials with different loads.



I believe the wave threaded connections can approach the strength of a solid shaft. That was not proven here. What is needed are metals. I have made the nut and stud STL files available to anyone who is interested in selling stronger fasteners. The objective is proof of concept with destructive test. These files can be used in Finite Element Analysis.

This video link https://www.keyedbrick.com/wave_unc_thread_destructive_test_02.mp4 is the same info plus an explosive destructive test.

There are more aspects to the wave threads, but what is marketable? Why would anyone even consider investing their time into this. If it can be 25% stronger that would be a game changer. Machining the complexity of the internal female wave thread is not practical. That leaves 3D printing. The materials have to resist elongation. That leaves metal.

Who wants to own this?

Some of these files can be downloaded for running Finite Element Analysis and high resolution metal 3d printing. These STL files are at 40 microns resolution. The tolerance between the nuts and studs is 75 micron. The black UNC graph line and the yellow wave thread STL files can be downloaded by double clicking on them. The rest will require an NDA. Questions and comments are welcome.

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black UNC Stud (75 MB) 0.625_unc_z40x100_stud_1.25 shank_BV8B.STL

Nut (27 MB) 0.625_unc_z40x100_nut_class2_BVAQ.STL

yellow Wave Stud (81 MB) 0.625_wave_10d_p1d2_z40x100_nut_c+0.003_BZJ.STL

Nut (40 MB) 0.625_wave_10_p1d2_z40x100_stud_1.25shank_BZJ.STL