Synthetic Cable Termination

Overview
NAVAIR is attempting to replace their existing metallic purchase cable with a new, synthetic cable. The synthetic cable is currently not able to be tensile tested because there is no way for the ends to be grasped. The methods for terminating the metallic cable will not work with the synthetic cable, so a new termination method is needed. The synthetic cable is a new design that has yet to be successfully terminated, so an entirely new design must be fabricated.

Objective
Our objective was to develop, model, and test a way to terminate the new synthetic cable to be used by NAVAIR on their aircraft carriers.

Approach
- By visiting with our sponsor, we determined that they were primarily concerned with concept generation, and that all concepts should be properly documented. However, they were also concerned with the safety and the ability of the termination to withstand the indicated forces.
- Patent research was done to analyse similar termination techniques.
- Many different concepts were generated by multiple team members and all concepts were documented and explored as a team.
- SolidWorks models were created for all feasible concepts, and finite element analyses were performed to determine if the parts could withstand the force of a plane landing at full throttle hundreds of times before failure.
- Needed to withstand a force of 98,000 pounds over 3.5 seconds for at least 8100 cycles
- The team settled on one design, dubbed the “Graduator.”
- The budget did not allow for a steel prototype to be constructed, so a proof-of-concept prototype was created out of PVC and Delrin®, to be used for demonstrations.

Outcomes
- The cable is terminated using the readily available tension
- There is a 94% reduction in assembly time – from 9 hours to under 30 minutes
- Can be easily assembled by one or two crewmen
- Test results showed a total factor of safety of \( \sim 427 \)
- Can last for up to 70,000 cycles
- Can be recycled
- One-of-a-kind design