Tricor Metals & Titanium

TO TOUCH THE SUN

Charles Young, Metallurgist & Business Development Manager, Tricor Metals
Parker Solar Probe

- Designed, built and managed by Johns Hopkins University – Applied Physics Lab
- Titanium Truss Structure Assembly (TSA) Built by Tricor Metals, Wooster, Ohio
Co-Authors

Brandon Clark, Project Manager, Tricor Metals

Timothy J Cole, Lead Mechanical Engineer, Johns Hopkins University - Applied Physics Lab
Parker Solar Probe

- Named for 91 yr old Physicist Eugene Parker
  - Predicted existence of Solar Wind in 1958; U of Chicago professor
- 7 year mission – 24 orbits – 2018-2025
- 3.8 million miles from the sun at perihelion
- Fastest Man-made object – 430,000 MPH
Parker Solar Probe Spacecraft

Titanium Truss Structure Assembly (TSA)
Truss Structure Assembly
Truss Structure Assembly

- Original design using Titanium Gr 9 tubes and Titanium Grade 5 bar
- Tricor/JHU-APL changed design to ALL Titanium Grade 5 during 12 month design discussions
TSA – Design Concerns

- Weight
- Strength to Mass
- Exacting Measurements & Angles
- Dimensional Stability
TSA – Project Time Frame

- Initial discussions started -- October 2011
- Initial design confirmed -- November 2012
- Initial (no fly) Unit shipped – April 2013
- Final 2 Flight Units shipped – April/July 2016
Truss Structure Assembly

- Weight: 55 lbs.
- Height: 47.948 inches
- Top Diameter: 70.0 inches
- Bottom Diameter: 40.687 inches
TSA – Critical Aspects

- Titanium Grade 5 --- Ti-6Al-4V
- Angles and Measurements
- Exact Weight (Mass) of Components
- Stability
TSA – Attachment Points
Fabrication Process

- Machining: 5 axis CNC, drilling & tapping
- Chem Milling: Tubes for exact mass (weight)
- Welding: Hand TIG with Argon shield
- Positioning: FARO® (3D measurements)
Machined Fittings for TSA
Chem Milled Titanium Tube
TSA in Steel Fixture
Tricor Welds on the TSA
TSA – Angles were Critical
Truss Support Assembly
Final TSA Assembly
Testing at JHU-APL

Vibration – Strength / Workmanship
Thermal Vacuum – Space Conditions
Acoustic – Launch Conditions
Vibration Testing
Thermal Vacuum Testing
TSA at JHU-APL with Heat Shield
Parker Solar Probe Assembly
Parker Solar Probe in Shroud & Liftoff at 3:31AM August 12, 2018

Charles Young, Metallurgist & Business Development Manager, Tricor Metals
Solar Probe Details

- Thermal shield: 11.5 cm thick ceramic-coated carbon composite will protect instruments from sun’s rays.
- Faraday cup: will collect solar wind particles.
- Antenna: for communication with Earth.
- Solar panel cooling system.
- Solar panels.
- Antenna.
Thank you for listening.

Charles Young
Metallurgist & Business Development Mgr
Tricor Metals
Wooster, OH
330-264-3299
cyoung@tricormetals.com