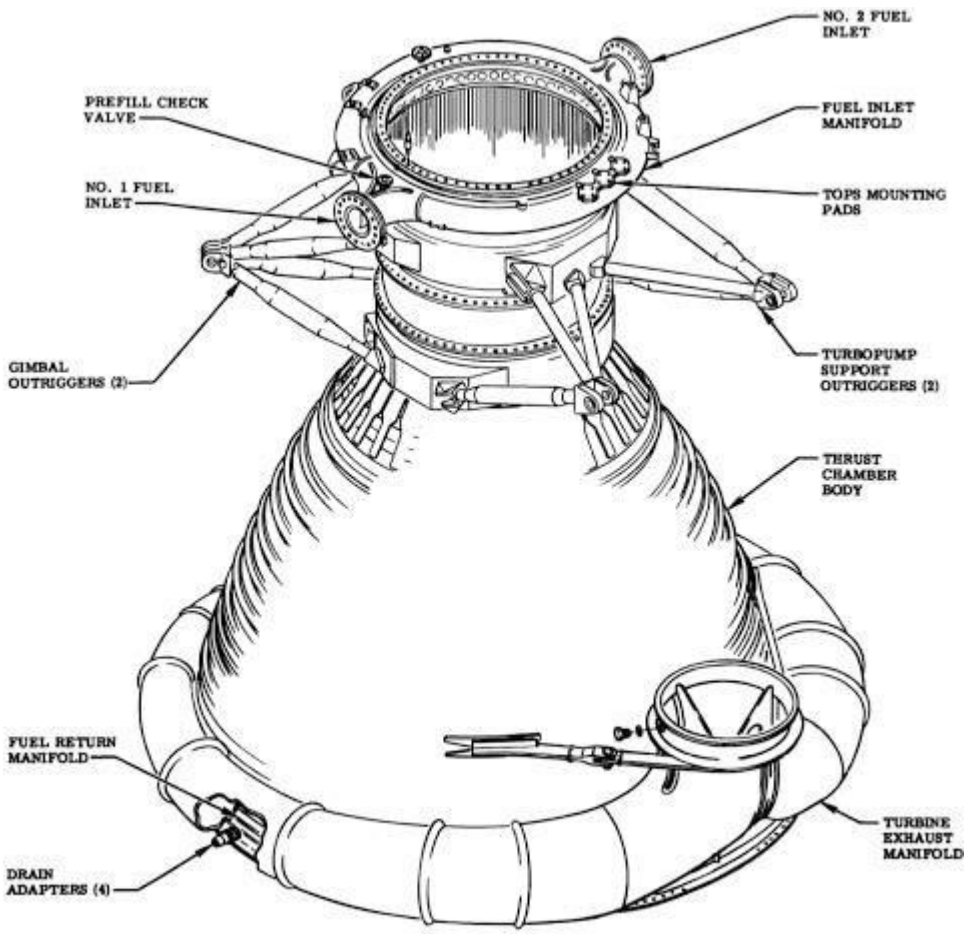
INTRODUCTION

- Rocket thrust chamber is typically just the cylinder, and flame holders are rarely used.
- The combination of temperature and pressure is typically reached in the combustion chamber is usually extreme by any standards.
- Unlike in airbreathing engines, no atmospheric nitrogen is present to dilute and cool the combustion and the temperature can reach true stoichiometric ratios
- This in combination with the high pressure means that the rate of heat conduction through the walls is very high.

CONSTRUCTION AND WORKING

- Double wall construction and Cylindrical section in which combustion of gases occur.
- Narrow towards throat.
- Expanding the nozzle through which the combustion gas expelled.
- It burn the propeller provide by the feed system in the combustion chamber.
- Accelerate the combustion gas to supersonic velocities through the nozzle and to eventually provide a propulsive forced to the engine and the vehicle.



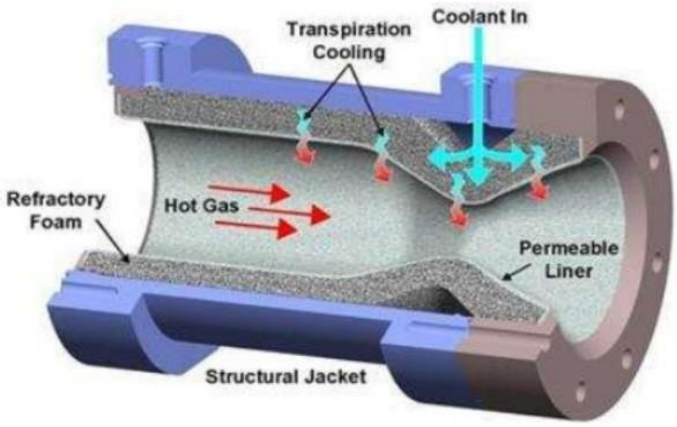
Thrust Chamber

MATERIAL PROPERTIES

- High thermal conductivity
- Creep
- High ductile
- Withstand to maximum temperature
- Mechanical strength
- More life

Material

Construction	Material properties	Material used
Inner wall	• High conductive • High ductile • Creep • Strength	• Copper alloys like • Cu-Cr-Zn-Ti • Cu-8cr-4Nb • Cu-4cr-2Nb • NARloy-Z
Outer wall	• Strength • Withstand to environmental conditions	• Stainless steel



Major Fabricating Steps Rocket Thrust Chamber

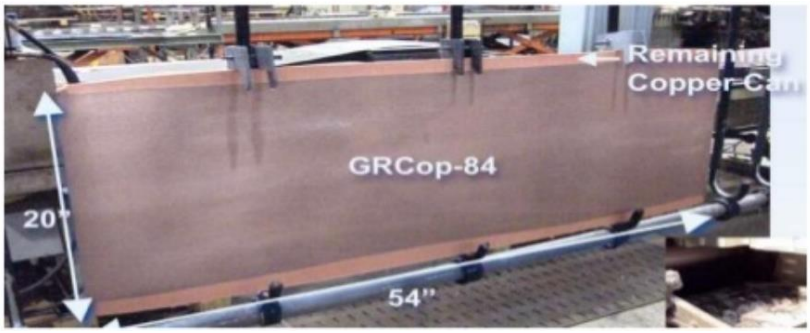
- Powder Production
- Canning
- Extrusion
- De-can and Billet Prep
- Roll/Anneal/Clean
- Form Half Cylinders
- Friction Stir Weld
- Metal Spin
- Anneal
- Machine ID, rough OD
- Coat Liner w/ NiCrAlY and HIP
- Machine ID + OD Cooling Channels

Typical Powder

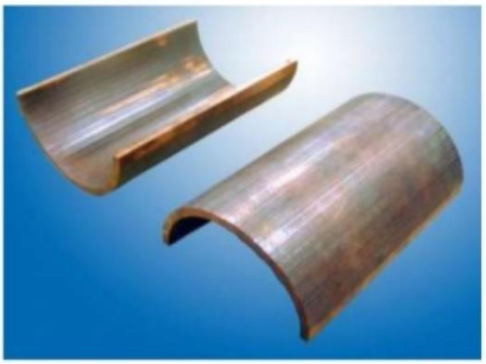
Canning

Hot extrusion

After rolling, annealing and cleaning



Half Cylinders



Hot metal spinning over shaped mandrel

Before and after spinning

Liners were annealed to relieve residual stresses

Plasma coating

APPLICATION

- Rocket combustion chamber to reduce oscillation
- Aircraft
- Spacecraft

Conclusions

- It has a good combination of mechanical properties making it well suited for rocket thrust chambers
- It can be readily formed, joined and machined using conventional techniques for copper-based alloys.
- It fabrication processes can be easily scaled to produce large components
- It can be fabricated into other high temperature, high heat flux components besides rocket engine liners