ASME Technical Brief Outline:

A **technical brief** reports results that are of significant and archival value to the engineering community; however, these works are more limited in scope and length than a research paper. A technical brief may contain any of the following:

* preliminary report of a result not yet fully developed or interpreted
* commentary on a technical issue of potential interest to readers

Technical briefs undergo full peer review. A technical brief may also be known as a technical note or a brief note.*Recommended Length: 2500 words*

Reference: “Lowering the Barrier of Surgical Endoscopy With a Novel Articulating Retractor”

**Abstract:**

*Background:*

*Clinical Motivation:*

* TEES is a minimally invasive surgical technique – list benefits
* One-handed surgery
* Tools for TEES (such as...) are being developed but according to Needs Analysis study they are still not sufficient to facilitate the technique
* Need: a tool to reach structures visualized by the endoscope and suction (as per Needs analysis paper) -> nitinol notched tube compliant joints that can accomplish this

*Design Constraints:*

* Current tools used: incorporate suction with dissector tip, round knife, but their tip geometry doesn’t enable reach in hard to reach hidden recesses within the middle ear where cholesteatoma is usually found (sinus tympani and attic) – need to reach areas visualized by the endoscope (as per needs paper)
* Size constraints:
  + Size required: 2.7 mm endoscope + tool inside of 5mm average diameter ear canal
  + Average ear canal diameter
  + Size of current instruments that have suction
  + These yielded the current tube diameter (OD, ID)
* reach required
  + include picture of 3D model with endoscope and current tools (double bend Thomassin and show that it is unable to reach and barely fits within the ear canal with its double bend)
* Tip forces required (middle ear surgery forces paper)

**Overview of Instrument Design:**

<Figure (picture and CAD?) of instrument with tip and handle labeled>

*Tool Operation:*

* Use figures to describe how the thumb wheel maps to bending the tool
* Laser and suction

*Tip Design:*

* OD/ID for suction
* size to fit alongside endoscope in ear canal
* bending angle to reach boundary of endoscopic viewing field
* material NiTi for superelastic property and biocompatibility
* length is same as current instrument – Rosen Needle
* can withstand tissue forces during dissection or (suction or laser)
* laser cut – reference ASME contact aided compliant joint paper that describes this joint design

*Handle Design:*

* single-handed operation
* ergonomically comfortable handle held like a pen in order to perform precise microscopic movements and so it is used similar to other instruments in ear surgery

*Fabrication Methods:*

* laser cutting nitinol tube
* 3D printing parts (list them)
* milling parts (list them)

**Methods and Results**: - outline testing methods to validate the tool:

*Tip Curvature:*

* describe curvature of the tip (refer to ASME CCM paper)
* pictures of tip taken from microscope
* include figure of tip reaching sinus tympani and attic

*Mechanical Testing:*

* Tip force to break experiment
  + At straight (0deg), halfway bent, fully bent \*\*this hasn’t been tested before
  + What direction at tip? – many directions – 0deg, 90, 180, 270
  + Compare to forces encountered during middle ear surgery, force to dissect soft tissues, etc. (generally <2N)
  + Results:
* Cyclic loading experiment
  + How many cycles until the tip breaks
  + Results:
* Torque experiment
  + When the instrument is introduced into the ear, the tip twists, and thus this test was performed to measure how much it can twist before it breaks or plastic deformation
  + Use Torque testing jig in the lab
  + Results:

Discussion:

* Limitations of the design, and areas of improvement
* Test results
* Innovation

Conclusion: