ABET Addendum

1. List two to four Desired Needs of your project that led to your final design objectives.
    - Generate reproducible and quantifiable predetermined motions intended to test motion correction algorithms for fetal cardiac MRI.
    - Representation of fetal anatomy with an emphasis on the heart and motion relevance at ~35 weeks of gestation.
2. List the major Constraints on your design/project

    a) Safety/Regulatory Affairs: Standard safety protocols for MRI scanning were followed.

    b) Risks: If all MRI precautions were considered, the project is low risk and if any the risk could be regarding unpredictable imaging.

    c) Global Impact: Potential to train MRI technicians on fetal cardiac MRI techniques.

    d) Manufacturability: All components have the potential to be individually manufactured but the assembly needed to build the phantom is not likely easily reproducible.

    e) Quality Control/Marketability: If assembly is redesigned to a reproducible approach the phantom could become a marketable tool for fetal cardiologist and MRI technicians.
3. List the major Engineering Standards on your design/project

a) ISO 5725-2:2025: Accuracy (Trueness and Precision) of Measurement Methods and Results: Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method

b) ISO/IEC 16466:2025: Information technology : 3D printing and scanning :Assessment methods of 3D scanned data use in 3D printing
4. Explain Ethical, Environmental, or Societal concerns for practical applications of your project.
    - **Ethical**: The phantom helps ethically test motion correction algorithms without additional pressure and personal data from expecting patients.
    - **Environmental**: Depending on our phantom's life cycle, the disposal of the phantom can create additional waste that may not be recyclable or degradable.
    - **Societal**: Possible conversations and controversy regarding the goal of simulating a fetus.
5. Describe Active Teamwork and Leadership in your design group

a) When possible each team member would provide aid to other members.

b) In total there were four subprojects and two were considered major subprojects, through these subprojects members took leadership and supporting roles throughout the project.

c) During team meetings, check-ins would occur to clarify current goals and progress. In these meetings, additional support was distributed based on our progress so far.
6. What were the most significant motivating factors that led you to

a) acquire new knowledge: the real life application and aid that this phantom would provide.

b) be self-initiating: the challenge to learn new concepts for the first time.

c) persist against challenges and setbacks: the overall effort of the team.
7. What are your most innovative and/or entrepreneurial ideas for this project:
    - Creating motion controlled motion during an MRI scan was challenging, therefore the simple hydraulic system was one of the most innovative aspects of the phantom.