Design and Fabrication of a Practical Model of an Airplane Landing Gear (Symbiosis)

Situation

In my second year of B.Tech in Mechanical Engineering at Symbiosis Institute of Technology, Pune , I was enrolled in the Theory of Machines Lab, a course focused on understanding mechanisms and their applications. As part of a group project, we were asked to build a working model to demonstrate a real-world mechanism. I chose to design and fabricate a simple model of an airplane landing gear because I was fascinated by how aircraft move and land safely. This project allowed me to apply concepts like linkages, motion transmission, and basic kinematics learned in class.

Task

My task was to create a small, hand-operated model of an airplane landing gear that could show a retraction and extension mechanism, like those on real planes. The model had to be simple, made from easily available materials. It needed to demonstrate smooth motion and be sturdy enough to show in class and lab evaluations. I also had to explain how the mechanism worked, linking it to the theory of machines concepts like four-bar linkages or gear motion.

Action

I took the following steps to complete the project:

1. Learning and Planning: I read about airplane landing gears in our lab manual and online to understand their mechanisms. I decided to make a tricycle landing gear model with a lever-operated retraction system, using a four-bar linkage to mimic the up-and-down motion. I sketched the design on paper, planning a small model (about 30 cm long) with a wooden base to represent the aircraft body.
2. Building the Model: I used plywood for the base and landing gear frame because it was cheap and easy to cut. For the moving parts, I used plastic gears and metal rods from a local hardware store to create the linkage. I assembled the model with screws and glue, ensuring the gears meshed properly to transmit motion. The landing gear was connected to a hand lever, so when I turned it, the gear would retract or extend.
3. Mechanism and Testing: I designed the four-bar linkage to convert the lever's rotation into the landing gear's up-and-down motion. To make it realistic, I added small rubber wheels to the gear. During testing, the linkage jammed because the rods were slightly bent. I replaced them with straighter rods and lubricated the joints with oil, which made the motion smoother. I tested the model 10 times to ensure the gear moved without sticking.
4. Learning from Theory: I studied the lab's theory of machines notes to explain how my model used a four-bar linkage, where each link's length affected the motion. I calculated the linkage dimensions using basic kinematic equations from class to ensure the gear retracted fully. I also made a chart showing how the lever's angle changed the gear's position, linking it to our lessons on motion transmission.

5. Presentation and Report: I wrote a short lab report describing the model, including sketches of the linkage and a list of materials. During the lab evaluation, I demonstrated the model to my professor and classmates, showing how turning the lever retracted and extended the gear. I explained how the four-bar linkage worked, using terms like “crank” and “rocker” from our textbook, and answered questions about the mechanism’s motion.

Result

The airplane landing gear model was successfully built and demonstrated in the Theory of Machines Lab. It worked smoothly, retracting and extending in about 3 seconds per cycle, and was sturdy enough to handle multiple demonstrations. My professor praised the clear connection to kinematic principles and the model’s functionality. The project helped me understand four-bar linkages and motion transmission better, and I felt more confident applying classroom theory to hands-on work. This experience also sparked my interest in mechanical systems, which later influenced my internship work at Tata Motors.