MRO Processes and Protocols

The operation processes in the MRO facility include:

- **Receiving process**: to receive end items from customers or to receive repaired parts from repair shops;
- **Disassembly process**: to disassemble end items into individual parts;
- **Inspection process**: to inspect individual parts to see if they are defective or not;
- **Store process**: to store end items and parts as needed;
- **Reassembly process**: to reassemble individual parts back into refurbished end items;
- **Shipping process**: to send refurbished end items back to customers or to send defective parts to repair shops.

The operation processes in repair shops include:

- **Receiving process**: to receive defective parts from the MRO facility;
- **Repair process #1, …, #n**: to fix parts;
- **Shipping process**: to ship repaired parts back to the MRO facility.

The operation protocols to be followed in MRO facility and the repair shops are given below.

When an end item is received from a customer, the steps to be followed are (E stands for end item):

E1: Warehouse personnel induct the end item after certain period of being staged, and read its unique identifier (e.g. RFID and barcode).
E2: Check if the disassembly station is available. If yes, go to E3. If not, store the end item in the storing station and repeat E2 after a certain period.
E3: The end-item is taken to disassembly station and disassembled into individual parts.
E4: Check if the inspection station is available, if yes, go to E5. If not, store the individual parts from disassembly in the storing station and repeat E4 after a certain period.
E5: Take the individual parts to the inspection station. Each individual part will be classified as defective or non-defective by the personnel in the inspection station. If a part is non-defective, store the part in the storing station, else go to E6.
E6: Find a repair shop that can undertake the repair job.
E7: Send the defective parts to the shipping station.
E8: Load the defective parts onto commercial carriers' vehicles, which will transport the parts to contracted repair shops.

When a repaired part is received by the MRO facility, the steps are (P stands for part):

P1: Warehouse personnel induct the part.
P2: Check the conditions of the other individual parts that are associated to the same end item as this part. If the conditions all are non-defective, go to P3. If not, place this repaired part in the storing station of the warehouse.
P3: Check if the reassembly station is available. If yes, go to P4. If not, repeat P3 after a certain period.
P4: Take this repaired part to the reassembly station, along with other individual parts in store that belong to the same end item as this repaired part. Reassemble all parts back into refurbished end-item.
P5: Send the refurbished end item to the shipping station of the warehouse.

As to operations in each repair shop assume each part will go through a standard protocol of sequential steps as follows (RS stands for repair shop):

RS1: Receive defective parts from the MRO facility.
RS2: Repair the parts. This may take a varying number of steps for different shops.
RS3: Ship repaired parts back to MRO facility.