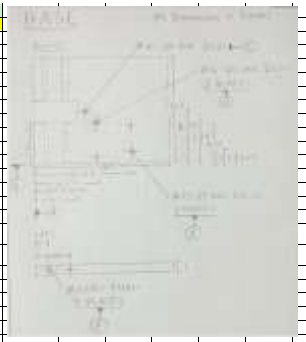
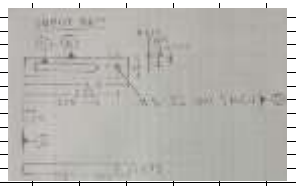
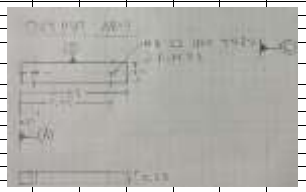
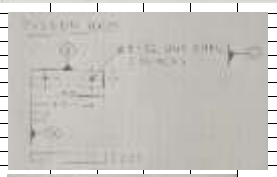
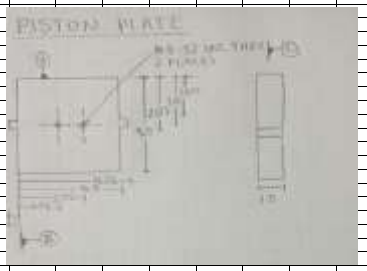
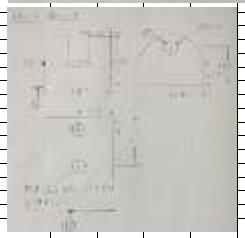
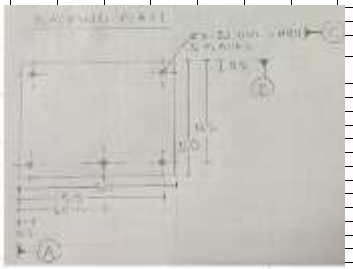
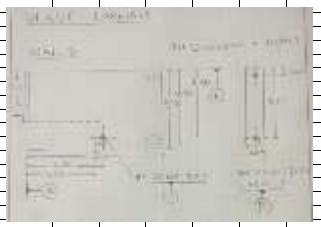
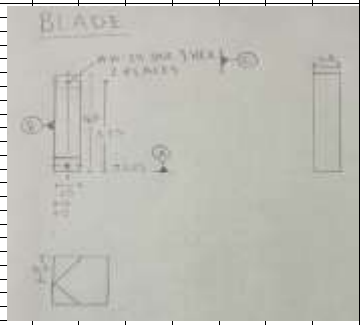
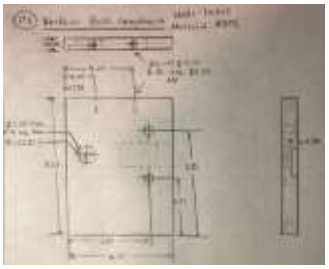
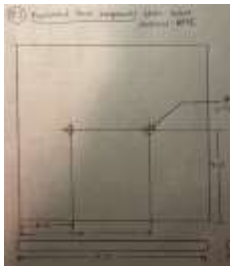
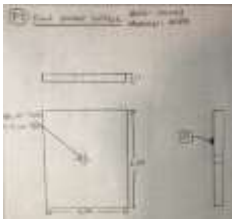
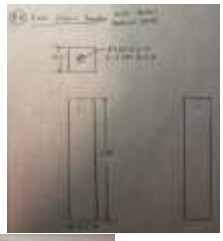
| Process | Category | Unit | Time [MIN/UNIT] | Material Multiplier | Size multiplier | Feature Quantity | Total (Mins) |
|---|---|---|---|---|---|---|---|
| **Design 1 Total** | | | | | | | **311.075** |
| | | | | | | | |
| **Part 1 (Base)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 0.5 | 1 | 2 | 10 |
| Bandsaw | 2D Cutting | in | 0.5 | 0.5 | 1 | 1 | 0.25 |
| Machine 4.5" x 2.5" pocket, thru [A] | Machining | in | 1 | 0.5 | 1 | 2 | 1 |
| Drill 1/4" hole, 0.25" deep [C][D] | Machining | in | 0.2 | 0.5 | 1 | 3 | 0.3 |
| Tap 1/4"-20 hole, 0.25" deep [C][D] | Machining | in | 5 | 0.5 | 1 | 2 | 5 |
| Drill #10-24 hole, 0.25" deep [E] | Machining | in | 0.2 | 0.5 | 1 | 2 | 0.2 |
| Tap #10-24 hole, 0.25" deep [E] | Machining | in | 5 | 0.5 | 1 | 2 | 5 |
| Drill 0.19" hole, thru [F] | Machining | in | 0.2 | 0.5 | 1 | 2 | 0.2 |
| Part 1 total | | | | | | | **21.95** |
| | | | | | | | |
| **Part 2 (Crank input Arm)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 0.5 | 1 | 1 | 2 | 1 |
| Bandsaw | 2D Cutting | in | 0.5 | 1 | 1 | 1 | 0.5 |
| Machine 1.5" x 0.25" pocket, thru [A] | Machining | in | 1 | 1 | 1 | 1 | 1 |
| Drill #8-32 hole, thru [D] | Machining | in | 0.2 | 1 | 1 | 1 | 0.2 |
| Tap #8-32 hole, thru [D] | Machining | in | 5 | 1 | 1 | 1 | 5 |
| Machine finish | Finishing | in | 10 | 1 | 1 | 1 | 10 |
| Part 2 total | | | | | | | **17.7** |
| | | | | | | | |
| **Part 3 (Crank Output Arm)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 1 | 10 |
| Bandsaw | 2D Cutting | in | 0.5 | 1 | 1 | 1 | 0.5 |
| Drill #8-32 hole, thru [D] | Machining | in | 0.2 | 1 | 1 | 2 | 0.4 |
| Tap #8-32 hole, thru [D] | Machining | in | 5 | 1 | 1 | 2 | 10 |
| Machine finish | Finishing | in | 10 | 1 | 1 | 1 | 10 |
| Part 3 total | | | | | | | **30.9** |
| | | | | | | | |
| **Part 4 (Crank Piston Arm)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 0.2 | 1 | 1 | 4 | 0.8 |
| Bandsaw | 2D Cutting | in | 0.5 | 1 | 1 | 4 | 2 |
| Drill #8-32 hole, thru [D] | Machining | in | 0.2 | 1 | 1 | 2 | 0.4 |
| Tap #8-32 hole, thru [D] | Machining | in | 5 | 1 | 1 | 2 | 10 |
| Drill 0.16" hole, thru [C] | Machining | in | 0.2 | 1 | 1 | 1 | 0.2 |
| Machine finish | Finishing | in | 10 | 1 | 1 | 1 | 10 |
| Part 4 total | | | | | | | **23.4** |
| | | | | | | | |
| **Part 5 (Clevis Bearing)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 1 | 10 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 1 | 1 | 0.5 |
| Machine 1.5" x 0.38" pocket, 0.77" deep [A] | Machining | in | 0.2 | 1 | 1 | 1 | 0.2 |
| Drill #8-32 hole, thru [D] | Machining | in | 0.2 | 1 | 1 | 1 | 0.2 |
| Tap #8-32 hole, thru [D] | Machining | in | 5 | 1 | 1 | 1 | 5 |
| Machine Finish | Machining | in | 10 | 1 | 1 | 1 | 10 |
| Part 5 total | Finishing | | | | | | **25.9** |
| | | | | | | | |
| **Part 6 (Piston Plate)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 0.5 | 1 | 1 | 5 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 1 | 1 | 0.25 |
| Machine 3.875" x 0.25" pockets on outer edges to create guides [B] | Machining | in | 0.2 | 0.5 | 1 | 4 | 0.4 |
| Drill #8-32 hole, thru [C] | Machining | in | 0.2 | 0.5 | 1 | 2 | 0.2 |
| Tap #8-32 hole, thru [C] | Machining | in | 5 | 0.5 | 1 | 2 | 5 |
| Part 6 total | | | | | | | **10.85** |
| | | | | | | | |
| **Part 7 (Blade Carriage Walls)** | | | | | | | 0 |
| Machine setup, install, and remove | Machining | in | 10 | 0.5 | 1 | 1 | 5 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 1 | 1 | 0.25 |
| Machine 4" x 0.25" pocket thru | Machining | in | 0.2 | 0.5 | 1 | 1 | 0.1 |
| Machine 4" x 0.25" pocket 0.25" deep [B] | Machining | in | 0.2 | 0.5 | 1 | 1 | 0.1 |
| Drill #8-32 hole, thru [C] | Machining | in | 0.2 | 0.5 | 1 | 1 | 0.1 |
| Tap #8-32 hole, thru [C] | Machining | in | 5 | 0.5 | 1 | 1 | 2.5 |
| Drill #8-32 hole, 0.25" deep [C] | Machining | in | 0.2 | 0.5 | 1 | 2 | 0.2 |
| Tap #8-32 hole, 0.25" deep [C] | Machining | in | 5 | 0.5 | 1 | 2 | 5 |
| Part 7 total | | | | | | 13.25 for 1 | **26.5** |
| | | | | | | | |
| **Part 8 (Blade Carriage Backing Plate)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 0.5 | 1 | 1 | 5 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 1 | 1 | 0.25 |
| Drill #8-32 hole, thru [C] | Machining | in | 0.2 | 0.5 | 1 | 5 | 0.5 |
| Tap #8-32 hole, thru [C] | Machining | in | 5 | 0.5 | 1 | 5 | 12.5 |
| Part 8 total | | | | | | | **18.25** |
| | | | | | | | |
| **Part 9 (Blade Plate)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 0.5 | 1 | 1 | 5 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 1 | 1 | 0.25 |
| Drill #10-24 hole, thru [C] | Machining | in | 0.2 | 0.5 | 1 | 2 | 0.2 |
| Tap #10-24 hole, thru [C] | Machining | in | 5 | 0.5 | 1 | 2 | 5 |
| Drill #8-32 hole, thru [D] | Machining | in | 0.2 | 0.5 | 1 | 3 | 0.3 |
| Tap #10-24 hole, thru [D] | Machining | in | 5 | 0.5 | 1 | 3 | 7.5 |
| Part 9 total | | | | | | | **18.25** |
| | | | | | | | |
| **Part 10 (Blade)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 3.75 | 1 | 1 | 37.5 |
| Band saw | 2D Cutting | in | 0.5 | 3.75 | 1 | 1 | 1.875 |
| Drill #10-24 hole, thru [C] | Machining | in | 0.2 | 3.75 | 1 | 2 | 1.5 |
| Tap #10-24 hole, thru [C] | Machining | in | 5 | 3.75 | 1 | 2 | 37.5 |
| Machine 3.5" long 1.5" x 1.5" chamfer [A][B] | Machining | in | 0.2 | 3.75 | 1 | 1 | 0.75 |
| Machine 1.5" x 1.5" chamfer [A][B] | Machining | in | 0.2 | 3.75 | 1 | 1 | 0.75 |
| Machine Finish | Finishing | in | 10 | 3.75 | 1 | 1 | 37.5 |
| Part 10 total | | | | | | | **117.375** |

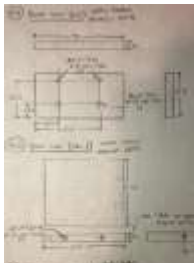
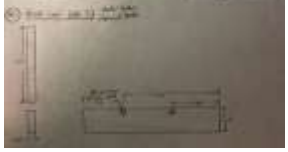






| Process | Category | Unit | Time [MIN/UNIT] | Material Multiplier | Size Multiplier | Feature Quantity | Total (Mins) |
|---|---|---|---|---|---|---|---|
| **DESIGN 2 TOTAL** | | | | | | | **2,900.8 Mins / 48.35 Hrs** |
| | | | | | | | |
| **PART 1** | | | | | | | 0 |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machining Setup, Change | Machining | unit | 3 | 1 | 1 | 3 | 9 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 4 | 0.6 |
| Milling | Machining | in^3 | 1 | 0.5 | 1 | 1 | 0.5 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 3 | 1 | 0.3 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 5 | 18.8 |
| Part 1 Total | | | | | | | **53.2** |
| | | | | | | | |
| **Part 2** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 2 | 0.3 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 2 | 7.5 |
| Part 2 Total | | | | | | | **31.8** |
| | | | | | | | |
| **Part 3** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 1 | 0.2 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 2 | 7.5 |
| Part 3 Total | | | | | | | **31.7** |
| | | | | | | | |
| **Part 4** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 6 | 2 | 3 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 2 | 0.3 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 1 | 3.8 |
| Part 4 Total | | | | | | | **27.1** |
| | | | | | | | |
| **Part 5** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 3.75 | 8 | 2 | 30 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 3.75 | 1.5 | 2 | 2.3 |
| Machine Finish | Finishing | ft^2 | 10 | 1 | 4.875 | 2 | 97.5 |
| Part 5 Total | | | | | | | **149.8** |
| | | | | | | | |
| **Part 6** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 2 | 0.3 |
| Part 6 Total | | | | | | | **24.3** |
| | | | | | | | |
| **Part 7** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machining Setup, Change | Machining | unit | 3 | 1 | 1 | 3 | 9 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Milling | Machining | unit | 3 | 1 | 1 | 2 | 6 |
| | | | | | | | **39** |
| **Part 8** | | | | | | | |
| 3D Print - Slice / Setup | Rapid Prototype | part | 20 | 1 | 1 | 1 | 20 |
| 3D Print - Plastic | Rapid Prototype | in^3 | 45 | 1 | 54.5 | 1 | 2452.5 |
| Part 8 Total | | | | | | | **2472.5** |
| | | | | | | | |
| **Part 9** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 4 | 0.6 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 4 | 15 |
| Part 9 Total | | | | | | | **39.6** |
| | | | | | | | |
| **Part 10** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 4 | 0.6 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 4 | 15 |
| Part 10 Total | | | | | | | **39.6** |
| | | | | | | | |
| **Part 11** | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 8 | 2 | 4 |
| Drilling holes < 1in diam | Machining | in | 0.2 | 0.5 | 1.5 | 2 | 0.3 |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 2 | 7.5 |
| Part 11 Total | | | | | | | **31.8** |



| Process | Category | Unit | Time [MIN/UNIT] | Material Multiplier | Size Multiplier | Feature Quantity | Total (Mins) | Notes |
|---|---|---|---|---|---|---|---|---|
| **DESIGN 3 TOTAL** | | | | | | | 2841 | |
| | | | | | | | | |
| **PART 1 (Food Holder)** | | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 | |
| Milling | Machining | in^3 | 1 | 3.75 | 1 | 1 | 3.75 | |
| Machining Setup, Change | Machining | unit | 3 | 1 | 1 | 1 | 3 | |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 3.75 | 1.5 | 8 | 9 | |
| Thread milling | Machining | in | 3 | 3.75 | 1.5 | 8 | 135 | |
| Part 1 Total | | | | | | | 170.75 | |
| | | | | | | | | |
| **PART 2 (Slotted Lever)** | | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 | |
| Turning | Machining | in^3 | 1 | 2 | 1 | 1 | 2 | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 1 | 10 | |
| Milling | Machining | in^3 | 1 | 2 | 2 | 1 | 4 | |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 2 | 1.5 | 1 | 0.6 | |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 2 | 1.5 | 1 | 0.6 | |
| Tapping Hole (hand) | Machining | hole | 5 | 2 | 1.5 | 2 | 30 | |
| Part 2 Total | | | | | | | 67.2 | |
| | | | | | | | | |
| **PART 3 (Rod)** | | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 | |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 1.5 | 1 | 0.3 | |
| Tapping Hole (hand) | Machining | hole | 5 | 1 | 1.5 | 1 | 7.5 | |
| Part 3 Total | | | | | | | 27.8 | |
| | | | | | | | | |
| **PART 4 (Connecting Pin)** | | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 | |
| Milling | Machining | in^3 | 1 | 1 | 1 | 3 | 3 | |
| Machining Setup, Change | Machining | unit | 3 | 1 | 1 | 1 | 3 | |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 1.5 | 1 | 0.3 | |
| Tapping Hole (hand) | Machining | hole | 5 | 1 | 1.5 | 1 | 7.5 | |
| Part 4 Total | | | | | | | 33.8 | |
| | | | | | | | | |
| **PART 5 (Blade)** | | | | | | | | |
| Machining Setup, Install and remove | Machining | in | 10 | 1 | 1 | 2 | 20 | |
| Band saw | 2D Cutting | in | 0.5 | 3.75 | 0.3 | 15 | 8.4375 | |
| Turning | Machining | in^3 | 1 | 3.75 | 1 | 15 | 56.25 | |
| Part 5 Total | | | | | | | 84.6875 | |
| | | | | | | | | |
| **PART 6 (Blade Rubber)** | | | | | | | | |
| Injection Molding | Molding | in^3 | 1 | 1 | 1 | 3 | 3 | |
| Part 6 Total | | | | | | | 3 | |
| | | | | | | | | |
| **PART 7 (Base)** | | | | | | | | |
| 3D Print - Slice / Setup | Rapid | part | 20 | 1 | 1 | 1 | 20 | |
| 3D Print - Plastic | Rapid | in^3 | 45 | 1 | 54 | 1 | 2430 | |
| Tapping Hole (hand) | Machining | hole | 5 | 0.5 | 1.5 | 1 | 3.75 | |
| Part 7 Total | | | | | | | 2453.75 | |



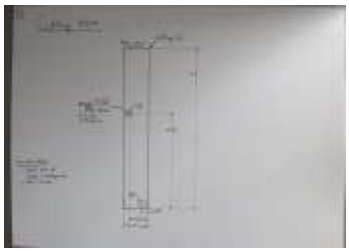
*The two following drilled holes are of different sizes

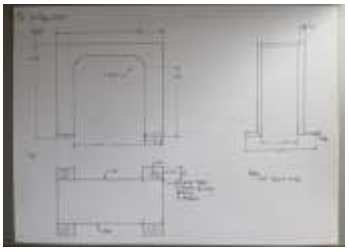


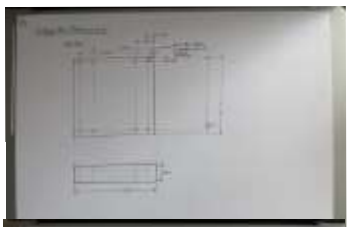


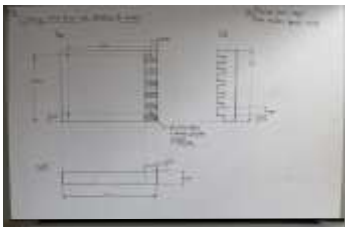


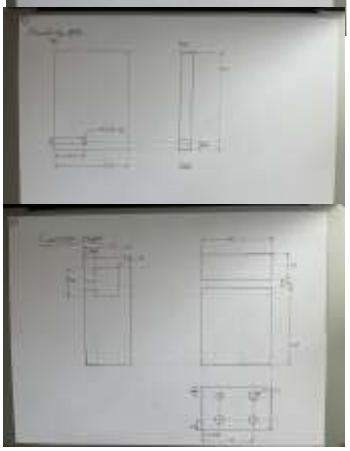
| Process | Category | Unit | Time [MIN/UNIT] | Material Multiplier | Size multiplier | Feature Quantity | Total (Mins) |
|---|---|---|---|---|---|---|---|
| **Design 4 Total** | | | | | | | 700.46775 |
| | | | | | | | |
| **Part 1 (Cutting Blade)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machine setup, change | Machining | unit | 3 | 1 | 1 | 2 | 6 |
| Bandsaw | 2D Cutting | in | 0.5 | 3.75 | 1 | 1 | 1.875 |
| Drilling holes <1 in dia. | Machining | hole | 0.2 | 3.75 | 0.03 | 2 | 0.045 |
| Machine finish | Finishing | ft^2 | 10 | 1 | 5.9 | 2 | 118 |
| Part 1 total | | | | | | | **145.92** |
| | | | | | | | |
| **Part 2 (Safety cover)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machine setup, change | Machining | unit | 3 | 1 | 1 | 1 | 3 |
| Bandsaw | 2D Cutting | in | 0.5 | 1 | 4.75 | 4 | 9.5 |
| Bandsaw | 2D Cutting | in | 0.5 | 1 | 0.65 | 4 | 1.3 |
| Bandsaw | 2D Cutting | in | 0.5 | 1 | 5.4 | 2 | 5.4 |
| Sheet metal bends | Sheet Metal | bend | 3 | 1 | 1 | 4 | 12 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.02 | 4 | 0.016 |
| Tapping Hole (hand) | Machining | hole | 5 | 1 | 0.02 | 4 | 0.4 |
| Part 2 total | | | | | | | **51.616** |
| | | | | | | | |
| **Part 3 (Cutting area attached to blade)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 7.1 | 2 | 7.1 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.2 | 8 | 0.32 |
| Tapping Hole (hand) | Machining | hole | 5 | 1 | 0.2 | 8 | 8 |
| Part 3 total | | | | | | | **35.42** |
| | | | | | | | |
| **Part 4 (Cutting area not attached to blade)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machine setup, change | Machining | unit | 3 | 1 | 1 | 2 | 6 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 7.5 | 2 | 7.5 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 7 | 1 | 3.5 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 7.25 | 1 | 3.625 |
| Milling | Machining | in^3 | 1 | 1 | 0.583 | 6 | 3.498 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.2 | 4 | 0.16 |
| Tapping Hole (hand) | Machining | hole | 5 | 1 | 0.2 | 4 | 4 |
| Part 4 total | | | | | | | **48.283** |
| | | | | | | | |
| **Part 5 (Adjusting plate)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 3.5 | 1 | 1.75 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 4.75 | 1 | 2.375 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 1.05 | 2 | 1.05 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.58 | 1 | 0.116 |
| Part 5 total | | | | | | | **25.291** |
| | | | | | | | |
| **Part 6 (Connector)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machine setup, change | Machining | unit | 3 | 1 | 1 | 5 | 15 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 1.95 | 2 | 1.95 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 4.35 | 2 | 4.35 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 0.7 | 2 | 0.7 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.2 | 2 | 0.08 |
| Milling | Machining | in^3 | 1 | 1 | 0.075 | 10 | 0.75 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.2 | 1 | 0.04 |
| Reamed hole | Machining | hole | 0.3 | 1 | 1 | 1 | 0.3 |
| Hand/Machine Finish | Finishing | ft^2 | 10 | 1 | 1 | 8 | 80 |
| Part 6 total | | | | | | | **123.17** |
| | | | | | | | |
| **Part 7 (Connector mount)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machine setup, change | Machining | unit | 3 | 1 | 1 | 2 | 6 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 1.81 | 2 | 1.81 |
| Milling | Machining | in^3 | 1 | 1 | 0.3 | 4 | 1.2 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.4 | 4 | 0.32 |
| Hand/Machine Finish | Finishing | ft^2 | 10 | 1 | 1 | 4 | 40 |
| Part 7 total | | | | | | | **123.54** |
| | | | | | | | |
| **Part 8 (Lever)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Machine setup, change | Machining | unit | 3 | 1 | 1 | 3 | 9 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 6.95 | 2 | 6.95 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 0.6 | 2 | 0.6 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 0.11 | 2 | 0.11 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.25 | 4 | 0.2 |
| Milling | Machining | in^3 | 1 | 1 | 0.155 | 0.45 | 0.06975 |
| Part 8 total | | | | | | | **36.92975** |
| | | | | | | | |
| **Part 9 (Connecting arm)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 1 | 2.35 | 2 | 2.35 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 1 | 0.37 | 2 | 0.148 |
| Part 9 total | | | | | | | **22.498** |
| | | | | | | | |
| **Part 10 (Supporting beams, 4 total)** | | | | | | | |
| Machine setup, install, and remove | Machining | in | 10 | 1 | 1 | 2 | 20 |
| Band saw | 2D Cutting | in | 0.5 | 0.5 | 3.5 | 2 | 1.75 |
| Drilled hole < 1 in dia. | Machining | hole | 0.2 | 0.5 | 0.5 | 4 | 0.2 |
| Part 10 total | | | | | | | **87.8** |

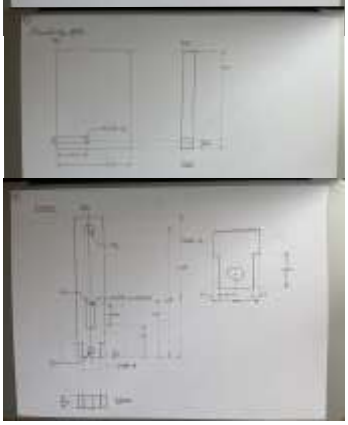


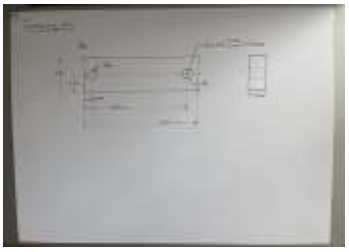


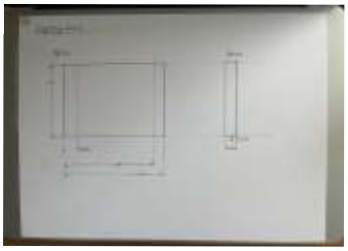












***DESIGN 1 COST ESTIMATES***

| MATERIAL | Unit of Cost [-] | Quantity [-] | Unit Cost [$] | Total Cost [$] | Link to Material |
|---|---|---|---|---|---|
| **Design 1** | | | | | |
| 24" x 24" x 3/4" HDPE Sheet (Base) | ft | 0.315 | $96.23 | $30.31 | https://www.mcmaster.com/8619K484/ |
| 6" x 1" x 1/4" 6061 Aluminum Bar (Bell Crank) | ft | 0.833 | $4.18 | $3.48 | https://www.mcmaster.com/8975K596-8975K768/ |
| 48" x 2" x 1-1/2" 6061 Aluminum Sheet (Clevis) | ft | 0.042 | $115.00 | $4.79 | https://www.mcmaster.com/9246K661/ |
| 12" x 4" x 1" HDPE Bar (Piston Plate) | ft | 0.375 | $11.33 | $4.25 | https://www.mcmaster.com/8671K75/ |
| 6" x 6" x 1" 304 Stainless Steel Sheet (Blade) | ft | 0.111 | $32.02 | $3.56 | https://www.mcmaster.com/8983k213/ |
| 24" x 12" x 1/2" HDPE Sheet (Blade Carriage Walls and Back) | ft | 0.660 | $31.38 | $20.71 | https://www.mcmaster.com/8619k472/ |
| 12" x 6" x 1/4" HDPE Sheet (Blade Plate) | ft | 0.333 | $6.34 | $2.11 | https://www.mcmaster.com/8619K751/ |
| Air Engine Retaining Screws | package (25) | 0.800 | $5.00 | $4.00 | https://www.mcmaster.com/91772a932/ |
| Blade Carriage Retaining Screws | package(100) | 0.040 | $6.44 | $0.26 | https://www.mcmaster.com/92949a199/ |
| Bell Crank Bolts | package (50) | 0.040 | $4.92 | $0.20 | https://www.mcmaster.com/91802A194/ |
| Bell Crank Nuts | each | 2.000 | $0.23 | $0.46 | https://www.mcmaster.com/94600A100/ |
| Bell Crank Threaded Rod Pivot | each | 1.000 | $1.90 | $1.90 | https://www.mcmaster.com/98758A308/ |
| Blade Carriage Assembly Screws | package(100) | 0.070 | $11.65 | $0.82 | https://www.mcmaster.com/92949a199/ |
| Blade Carriage Retaining Rods | each | 2.000 | $1.51 | $3.02 | https://www.mcmaster.com/98758A305/ |
| Knurled Screws for Blade Thickness Adjustment | each | 2.000 | $6.79 | $13.58 | https://www.mcmaster.com/91746A512/ |
| Clevis Pin | each | 1.000 | $2.11 | $2.11 | https://www.mcmaster.com/98381A493/ |
| Clevis Screws | package(100) | 0.020 | $16.40 | $0.33 | https://www.mcmaster.com/92949A203/ |
| | | | **TOTAL:** | **$95.89** | |

***DESIGN 2 COST ESTIMATES***

| MATERIAL | Unit of Cost [-] | Quantity [-] | Unit Cost [$] | Total Cost [$] | Link to Material |
|---|---|---|---|---|---|
| **Design 2** | | | | | |
| 11.05" x 6.25" x 0.50" Moisture-Resistant HDPE (Vertical Base Component) | in^3 | 0.0156 | $333.79 | $5.21 | https://www.mcmaster.com/8619K117/ |
| 15.25" x 9.00" x 0.25" Moisture-Resistant HDPE (Horizontal Base Component) | in^3 | 0.0297 | $181.26 | $5.38 | https://www.mcmaster.com/8619K116/ |
| 6.00" x 4.00" x 0.25" Moisture-Resistant HDPE (Food pusher surface) | in^3 | 0.0052 | $181.26 | $0.94 | https://www.mcmaster.com/8619K116/ |
| 5.00" x 0.5" x 0.5" Moisture-Resistant HDPE (Food pusher handle) | in^3 | 0.0001 | $333.79 | $0.05 | https://www.mcmaster.com/8619K117/ |
| 9.75" x 0.5" x 0.063" 303 Easy-to-machine Stainless Steel (Blade) | in^3 | 0.4059 | $13.23 | $5.37 | https://www.mcmaster.com/9084K96-9084K961/ |
| 6.375" x 0.25" x 0.25" Moisture-Resistant HDPE (Link) | in^3 | 0.0003 | $181.26 | $0.06 | https://www.mcmaster.com/8619K116/ |
| 6.00" x 4.25" x 0.25" Moisture-Resistant HDPE (Food stopper) | in^3 | 0.0055 | $181.26 | $1.00 | https://www.mcmaster.com/8619K116/ |
| 12.5" x 4.5" x 9" Food Grade PLA (Slicer Compartment) | in^3 | 54.5000 | $0.44 | $23.98 | https://tinyurl.com/3ve4b2xk |
| 6.75" x 4.75" x 0.25" Moisture-Resistant HDPE (Blade cover, top) | in^3 | 0.0070 | $181.26 | $1.26 | https://www.mcmaster.com/8619K116/ |
| 11.30" x 6.75" x 0.25" Moisture-Resistant HDPE (Blade cover, side 1) | in^3 | 0.0165 | $181.26 | $2.99 | https://www.mcmaster.com/8619K116/ |
| 11.30" x 2.50" x 0.25" Moisture-Resistant HDPE (Blade cover, side 2) | in^3 | 0.0061 | $181.26 | $1.11 | https://www.mcmaster.com/8619K116/ |
| Alloy steel shoulder bolts | each | 2 | $5.31 | $10.62 | https://www.mcmaster.com/91259A606/ |
| 18-8 Stainless steel 10-24 screws | package (50) | 0.04 (2 parts) | $7.86 | $0.31 | https://www.mcmaster.com/92949A247/ |
| 841 Bearing Bronze thrust bearings | each | 5 | $0.87 | $4.35 | https://www.mcmaster.com/5906K561/ |
| 841 Bearing Bronze flanged sleeve bearing | each | 1 | $0.86 | $0.86 | https://www.mcmaster.com/6338K563/ |
| Zinc-plated steel Hex Nuts | package (100) | 0.02 (2 parts) | $1.57 | $0.03 | https://www.mcmaster.com/90480A007/ |
| 18-8 Stainless steel 6-32 screws | package(100) | 0.09 (9 parts) | $5.12 | $0.46 | https://www.mcmaster.com/92949A148/ |
| | | | **TOTAL:** | **$63.98** | |

***DESIGN 3 COST ESTIMATES***

| MATERIAL | Unit of Cost [-] | Quantity [-] | Unit Cost [$] | Total Cost [$] | Link to Material |
|---|---|---|---|---|---|
| **Design 3** | | | | | |
| 14.0" x 1.0" x 4.00" + 2.0" x 2.5" x 4.00" 3D Printed PLA (Base) | kg | 1 | $14.00 | $21.28 | Accuracy/dp/B07XG3RM58/ref=sr_1_4?adgrpid=1333708173121651&dib=eyJ2IjoiMSJ9.XhiWn |
| 5.35" x 0.65" x 0.135" ASTM A108 (Slotted Lever) | in^2 | 1 | $2.50 | $1.18 | https://www.mcmaster.com/8910K262-8910K406/ |
| 2.0" x 1.00" Round 6061 Aluminum (Rod) | in^3 | 1 | $68.93 | $0.96 | https://www.mcmaster.com/8974K13-8974K119/ |
| 0.70" x 0.65" x 0.385" 6061 Aluminum (Connecting Pin) | in^3 | 1 | $23.71 | $0.18 | https://www.mcmaster.com/8974K26-8974K134/ |
| 3.0" x 2.5" x 4.00" Stainless Steel (Food Holder) | in^3 | 2 | $19.99 | $40.00 | Stamping/dp/B08DFH41K6/ref=sr_1_14_sspa?dib=eyJ2IjoiMSJ9.6xCSvPPQAL_Z0yZyU3_JOO5k |
| 1.35" 2.5" x 0.125" 304 Stainless Steel (Blade) | in^3 | 15 | $0.73 | $10.83 | https://www.mcmaster.com/8983K221/ |
| OTS Thermoplastic Rubber Caster Wheel | Pack of 8 | 4 | $9.99 | $5.00 | https://www.amazon.com/Casters-Bearing-Furniture-Kitchen-Appliances/dp/B0DBQ1YPX4 |
| 1-64 UNC; 1/4" Length 18-8 Stainless Steel Phillips Flat Head Screw | Pack of 100 | 16 | $8.63 | $1.38 | https://www.mcmaster.com/91771A066/ |
| Loctite Epoxy Adhesive 1 oz | Pack of 8 | 1 | $32.52 | $4.07 | 8/1015749396?wmlspartner=wlpa&selectedSellerId=4886&adid=22222222921015749396_1 |
| 4-40 UNF; 2" Length 18-8 Stainless Steel Hex-Drive Flat Head Screw | Pack of 25 | 1 | $3.99 | $0.04 | https://www.mcmaster.com/92210A121/ |
| 5-40 UNC; 1/2" Length 316 Stainless Steel Phillips Flat Head Screw | Pack of 100 | 1 | $9.80 | $0.98 | https://www.mcmaster.com/91500A312/ |
| 4-40 UNF; 1-1/4" Length 18-8 Stainless Steel Hex-Drive Flat Head Screw | Pack of 25 | 1 | $3.44 | $0.04 | https://www.mcmaster.com/92210a118/ |
| 4-40 UNF; 3/32" Height 18-8 Stainless Steel Hex Nut | Pack of 100 | 1 | $3.69 | $0.04 | https://www.mcmaster.com/91841A005/ |
| 2.1" x 2.5" x 4.00" SBR Rubber Sheet (Rubber Blade Handle) | ft | 1 | $5.04 | $5.04 | Economical Abrasion-Resistant SBR Rubber Sheet, 4" Wide, 3/8" Thick \| McMaster-Carr |
| | | | **TOTAL:** | **$91.02** | |

***DESIGN 4 COST ESTIMATES***

| MATERIAL | Unit of Cost [-] | Quantity [-] | Unit Cost [$] | Total Cost [$] | Link to Material |
|---|---|---|---|---|---|
| **Design 4** | | | | | |
| 2" x 48" x 1/2" Multipurpose 6061 Aluminum (Connector) | in^3 | 0.103 | $43.03 | $4.45 | Multipurpose 6061 Aluminum, 1/2" Thick, 2" x 48" Sheet \| McMaster-Carr |
| 8" x 8" x 3/4" Multipurpose 6061 Aluminum (Connector mount) | in^3 | 0.042 | $58.26 | $2.47 | https://www.mcmaster.com/9246K51/ |
| 2" x 48" x 1/4" Multipurpose 6061 Aluminum (Lever) | in^3 | 0.054 | $23.81 | $1.29 | https://www.mcmaster.com/9246K421/ |
| 2" x 48" x 3/8" Multipurpose 6061 Aluminum (Connecting arm) | in^3 | 0.019 | $33.96 | $0.66 | https://www.mcmaster.com/9246K471/ |
| 1" x 36" x 0.075" 304 Stainless Steel (Blade) | in^3 | 0.164 | $26.93 | $4.41 | https://www.mcmaster.com/1421T21/ |
| 7.35" x 5.15" x 0.02" Aluminum sheet metal (Protector) | in^3 | 0.789 | $7.81 | $6.16 | https://www.mcmaster.com/8973K202/ |
| 2" x 48" x 5/8" 6061 Aluminums (Adjusting piece) | in^3 | 0.161 | $1.79 | $0.29 | https://www.mcmaster.com/3577N136-3577N126/ |
| 7.5" x 7.0" x 0.05" 6061 Softwood(Cutting area) | in^3 | 0.009 | $5.84 | $0.05 | https://www.mcmaster.com/3577n136/ |
| 10-24 Thread 0.375" x 0.125" Nuts Zinc-plated steel (pack of 100) | each | 4 | $2.33 | $2.33 | Zinc-Plated Low-Strength Steel Hex Nuts, 10-24 Thread Size \| McMaster-Carr |
| 0.25" x 0.313" x 0.375" Oil-embedded 841 bronze sleeve | each | 1 | $0.60 | $0.60 | https://www.mcmaster.com/6391K33/ |
| 3.5" x 3.0" x 0.75" Softwood (Supporting beams - 4) | in^3 | 0.073 | $1.79 | $0.13 | https://www.mcmaster.com/3577N136-3577N126/ |
| 7.5" x 7.1" x 0.20" Softwood (Cutting table) | in^3 | 0.099 | $1.79 | $0.18 | https://www.mcmaster.com/3577N136-3577N126/ |
| 18-8 Stainless steel bolts 10-24 Thread 0.19" x 0.75"(Pack of 10) | each | 6 | $8.25 | $8.25 | https://www.mcmaster.com/92314A537/ |
| 18-8 Stainless steel #10 screw 0.19" x 1.25"(Pack of 25) | each | 8 | $6.76 | $6.76 | https://www.mcmaster.com/92314a249/ |
| 18-8 Stainless steel #10 screw 0.19" x 0.75" (Pack of 10) | each | 8 | $8.25 | $8.25 | 18-8 Stainless Steel Hex Head Screws, Made in The U.S., 10-24 Thread Size, 3/4" Long \| McMaster-Carr |
| Zinc-plated steel 0.25" x 0.625" x 0.5" retaining pin (small) | each | 2 | $2.28 | $4.56 | Shoulder-Style Ring-Grip Quick-Release Pin, Zinc-Plated Steel, 1/4" Diameter, 5/8" Usable Length \| McMaster-Carr |
| Zinc-plated steel 0.25" x 0.750" x 0.5" retaining pin (medium) | each | 1 | $7.11 | $7.11 | Clevis Pin with Retaining Ring Groove, Zinc-Plated Steel, 1/4" Diameter, 3/4" Usable Length \| McMaster-Carr |
| Zinc-plated steel 0.25" x 1" x 0.5" retaining pin (large) | each | 2 | $1.82 | $3.64 | https://www.mcmaster.com/98320A130/ |
| Oil-embedded 841 bronze bushing 0.250" x 0.375" x 0.500" | each | 4 | $1.09 | $4.36 | https://www.mcmaster.com/6391K136/ |
| Zinc-plated steel 0.527" x 0.029" retaining ring | each | 5 | $0.00 | $0.00 | Comes with retaining pins |
| 0.375" x 1.438" x 0.75" 2014 Aluminum bearing mount | each | 2 | $13.72 | $27.44 | https://www.mcmaster.com/3971N61/ |
| | | | **TOTAL:** | **$93.39** | |