

Abstract

The objective of our work is to design and build a depth gauge that efficiently and accurately measures the depth of a narrow hole, and give feedback via an electronic screen on the device. This design is being made for Lockheed Martin and will allow their employees to measure a large amount of rivet holes both quicker and more accurately than their current solution. Speeding up the measuring process while retaining accuracy will cut down on production time significantly. Our design was founded on the idea of a small hole gauge, we modified the gauge to be set up as a probe and anchor onto the back side of the hole. The probe has been coined as a "split-ball" due to its inner shaft splitting the outer shaft that contains a ball type end effecter. Our prototype has been through many iterations utilizing the on campus Fab Lab to 3D print most of our parts. Our mechanical team has been in close work with our electrical team to ensure that the mechanics and electronics function together seamlessly.

Background

The reasoning behind redesigning the grip gage is to improve efficiency in the workplace through reducing measurement time and as a result reducing costs. The reduction in measurement time adds up as there are thousand of holes that need to be measured on the aircraft. Previous methods of measurement have been proven to be unreliable, too slow, or otherwise



Design and Development of a Smart Tool: Digital Grip Gauge using a Small Hole Gauge

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Internals of Grip Gauge



Grip Gauge Measuring Test Block





CAD Drawing of Rivet Holes on Aircraft



Fully Assembled Grip Gauge

Statement of Work Requirements

Constra

- Single, standa
- High accuracy re
- No excessive for
- Recognize too
- Automatic re
- Digital measu
- Wireless translation
 - Ergonon
 - Safety
 - Cost require

Measurement Steps

- display screen.
- outer rod.
- effector.
- Zero the measurement by pressing "ZERO/ABS" button on lower right side of display screen.
- Push down on front actuator until fully retracted inside tool. This should activate the inner rod to expand the outer rod.
- To take a measurement, place end of rod into hole to be measured, placing front actuator flush with the surface.
- fully inserted.
- Slowly retract the tool body, keeping tension against the tool springs. Tool end effector will catch on back side of hole, clamping tool to surface.
- Ensure the tool is flush and the green "flush" light is on.
- to receiver base.

LOCKHEED MARTIN

int	Satisfied
lone tool	YES
equirement	YES
ce required	YES
l stability	YES
ecording	ΝΟ
urement	YES
of measurement	YES
nics	YES
Y	YES
ement	YES

Turn on display by pressing "ON/OFF" button on lower right side of

Holding tool body in one hand, use other push down on front actuator until fully retracted inside tool. This should activate the inner rod to expand the

Slowly extend front actuator until it is resting flush against outer rod end

- Holding tool body in one hand, push the tool normal to the surface until
- 10. Press the red "Send" button on the left side of the tool to send transmission

11. Push the tool normal to the surface until fully inserted.

12. Slowly retract the tool body, keeping tension against the tool springs. The end effector should be deactivated, and the tool should be removed easily.