

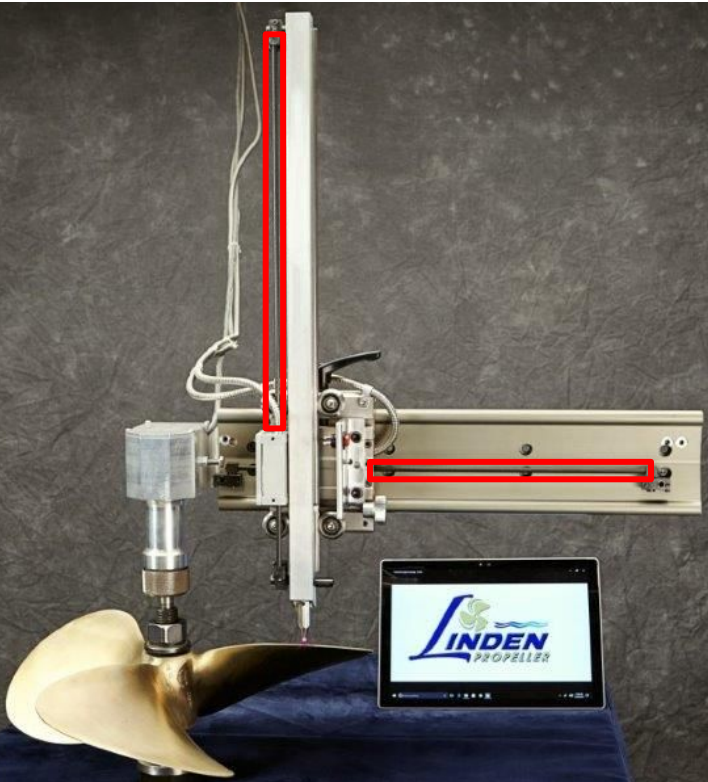
Lightning Talk 3: User Needs and Requirements

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Project Overview



Project Name: Laser Scan Readings for Propeller Measurement

Goal: Replacing propeller measurement system of Linden Propeller

Reason for change:

- Carbon fiber rods attached to scales are brittle
- Expensive to replace/repair
- Extended lead times



Problem Statement

The current system used by Linden Propeller is highly susceptible to damage, forcing the business to stop work in order to repair or replace the carbon fiber rods attached to the scales.

- **Estimated cost per rod: \$850**
- **Estimated cost per year: \$5000 (this includes shipping and production lost)**



User Needs

- A **machine shop worker needs** to perform their work without breaking the device **because** they do not want to delay their work.
- A **small business owner needs** to obtain a cost-effective, durable device **because** they cannot afford to spend a lot of money and time on new devices or repairs to existing devices.
- A **high accuracy measurement engineer needs** to obtain a highly precise and accurate device that operates smoothly **because** they rely on it to produce desirable results.



Users

Machine Shop Worker

A solution that is:

- Durable
- Precise and accurate
- Easy to use
- Compatible with current setup



Small Business Owner

A solution that is:

- Modern (attractive to consumers)
- Durable
- Precise and accurate
- Cost effective



High Accuracy Measurement Engineer

A solution that is:

- Precise and accurate
- Easy to use





Requirements

| | |
|------------|---|
| Functional | <ul style="list-style-type: none">● It needs to be accurate to 5 micrometers● It needs to measure up to 50 inches |
| Physical | <ul style="list-style-type: none">● It needs to be compatible with the current setup● It needs to be small enough to be mounted to the current frame |
| Resources | <ul style="list-style-type: none">● It needs to cost roughly \$1000● It needs to have software compatible with TruProp |



Requirements

| | |
|-------------------|---|
| User experiential | <ul style="list-style-type: none">● It needs to be easy to use● It needs to maintain the current mobility of the setup |
| Environmental | <ul style="list-style-type: none">● It needs to be durable enough for a shop environment<ul style="list-style-type: none">○ Robust use○ Tools dropping○ Dust○ Dirt |



Engineering Standards

[IEEE 2700-2017](#)

This standard provides a common framework for sensor performance parameter definitions across various types, including IR and ultrasonic sensors. It defines terminology, units, and conditions to ensure consistent performance specifications, which are essential for high-accuracy measurement applications in diverse fields.

[IEEE 1454](#)

This standard, part of the IEEE 1451 family, outlines a common interface for smart sensors and actuators, focusing on mixed-mode communication protocols. This is particularly useful for IR and ultrasonic sensors used in integrated systems, such as those in IoT applications, enabling seamless data exchange and standardization across devices.

Conclusions

Prospective Solutions:

1. KEYENCE LK-G5000 Series
2. Magnescale BS78
3. Data fusion of less accurate sensor data (IR/Ultrasound)

Laser technology as a whole is much more expensive than a small business is willing to invest, even if the solution is cost effective

Laser technology on the market does not meet our criteria

