



UAV System for Public Infrastructure Inspection

Team 9 | Semester Project

Chapter 1

Introduction & Problem

The maintenance and inspection of public infrastructure are critical for ensuring safety and reliability. Traditional methods are time-consuming, labor-intensive, and hazardous.

The Challenge: Manual Inspection Limitations

Significant Risks

Exposes workers to dangerous environments.

High Operational Costs

Labor-intensive and time-consuming processes.

Delayed Maintenance

Lack of real-time monitoring leads to potential hazards.



Chapter 2

Project Objectives

Our UAV system aims to address these challenges by providing a safer, faster, and more cost-effective solution.

Key Objectives of Our UAV System



Enhance Safety

Reduce human risk in hazardous inspection environments.



Improve Accuracy & Speed

Deliver precise and rapid inspection data.



Real-time Monitoring

Implement automated alerts and continuous oversight.



Reduce Costs

Lower operational expenses for cities and agencies.

Chapter 3

Research & Design

We conducted thorough research and followed a structured design process to develop our solution.

Our Design Process

01

Problem Understanding

Defining requirements and scope.

02

Ideation & Concepts

Brainstorming and sketching initial designs.

03

Prototyping

Developing UAV hardware and software interface.

04

Testing & Iterations

Refining based on feedback and performance.



The UAV Solution: Integrated Features

- Obstacle detection system for safe navigation.
- Real-time monitoring dashboard for immediate insights.
- Automated alert system for critical issues.
- High-resolution imaging for precise defect detection.



HIGH Fidelity Designs

Home

Insights

Reports

Report of Skyline Tower Construction

Immediate attention

On track, but pending

Within expected range

PROJ-5678-2024

1234 Elm street, Downtown City, PHX, 85261

25/80

Inspections

52

Critical Issues

24

Issues solved

42%

87/100

Minor misalignments in pillar, one crack identified in the foundation

2 incident in past week

Worker slipped near Building B12, no injuries. Loose scaffolding on the north side identified

38 min/area

Fastest inspection was 25 minutes (Pillar B2), longest inspection was 52 minutes (Roof framework)

Progress Timeline

Title: Foundation Layout Plan - Building B

Summary: Architectural drawings of the foundation layout of Building B, including load-bearing columns and slab details

Format: PDF

File Size: 6MB

Save

Foundation Completed

The groundwork for the building was completed on schedule, establishing a stable base for future construction

Roofing Installation Began

Installation of the roof commenced, marking a key step towards weatherproofing the building

HVAC System Inspection

A thorough check of the HVAC system to ensure effective climate control and ventilation

Fire Safety Systems Check

The fire safety measures, including alarms and suppression systems, were tested for functionality and code adherence

Surfing mode

SafetyControlCameraAbout

Flight Assistance

Obstacle Avoidance Action

BypassBrakeOff

When enabled and controlling aircraft via control sticks, aircraft automatically bypasses detected obstacles or hovers

Bypassing Options

NormalNifty

When controlling aircraft via control sticks, aircraft passes obstacles proactively and maintains a safe distance from obstacles

Advanced RTH

0.0km/h

H 8.6m

<

Bridge Under View #001

Thermal image overlay

Light Detection and Ranging

Save

Thermal image overlay

Light Detection and Ranging

25 tons

Note

About

Severe Damage

The support beams and bolts exhibit significant rusting, likely due to prolonged exposure to moisture and lack of protective coatings. This corrosion could compromise the structural integrity and load-bearing capacity if not addressed promptly

Safety Checks

Needs urgent maintenance inspection; underwater structural integrity to be assessed

Test Results

Pending structural stress analysis; initial inspection indicates minor fatigue cracks

Photo/Video Library and Inspections

4 Critical Issues

28 Minor Issues

54 No Issues

Latest Inspection

Total Media Captured

Files

All

Filtered

Section

Date

South Building Pillar #B12

Pillar #A12

Corner Pillar D23

Load-Bearing Wall A

Geographical Location

Date

Time

Latitude: 37.7743° N

Longitude: 122.4194° W

October 5, 2024

14:32 (2:32PM)

Thermal image overlay

Light Detection and Ranging

Chapter 4

Impact & Future

The UAV system significantly improved safety and efficiency, with exciting future possibilities.

Conclusion & Future Scope

Key Impact

Reduced inspection time and human exposure to hazards, providing more accurate data for decision-making.

This project demonstrates the potential of UAV technology to revolutionize public infrastructure maintenance for smarter, safer cities.

Future Directions

- AI-powered defect detection.
- Integration with city management systems.
- Large-scale deployment for smart cities.