THE CHALLENGES OF TEACHING AN INTRODUCTION TO SYSTEMS ENGINEERING:

LESSONS FROM REAL CLASS EXPERIMENTATION

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BACKGROUND

CHALLENGES TO LEARNING SYSTEMS ENGINEERING

1. Project duration is large (often multi-year) making it difficult and time consuming to experience all of the phases of a project
2. The large project size makes it is unlikely that you will come into a project at the beginning
3. Projects that are large and complex require specialization which can inhibit your exposure to other systems that may interact with the systems you're working on
4. Project to project differences can be large which can increase the feeling of starting over on your next project assignment

CHALLENGES TO TEACHING SYSTEMS ENGINEERING

It’s like teaching sports!

COURSE AGENDA

Week	Topic	Activity
1	Systems Definitions and Concepts	In class design activity
2	Teams are tough and what to do about it	
3	Project management and project rescue	In class project activity. Project introduction and team creation
4	Project life cycle, scope and con-ops	
5	Requirements creation, configuration and management	
6	Exam 1	
7	System architecture and system hierarchy	
8	Analytic Hierarchy Process/Design	
9	Risk	
10	Reliability	
11	Interfaces/Verification	
12	FMEA/FTA	
13	Special topics	
14	Exam 2	Project Completed
15	Project debrief and results	Project Quiz

PROJECT 1

SYSTEMS ENGINEERING PROJECT 1

- Objective: Design a voice activated soccer stats collection application.
  - Teams may consist of 2-3 students

NEW PROJECT

CURRENT SYSTEMS ENGINEERING PROJECT

- **Objective: Photograph the curvature of the earth.**
  - Teams may consist of 7-10 students
  - Total payload must be less than 4 pounds (among other requirements) as this is the FAA threshold for unregulated flying objects.
  - All FAA rules must be followed.

MANY VARIABLES

What angle should the camera be to capture the curvature of the earth?

How do I take the picture at the right moment?

What is the temperature at the maximum altitude?

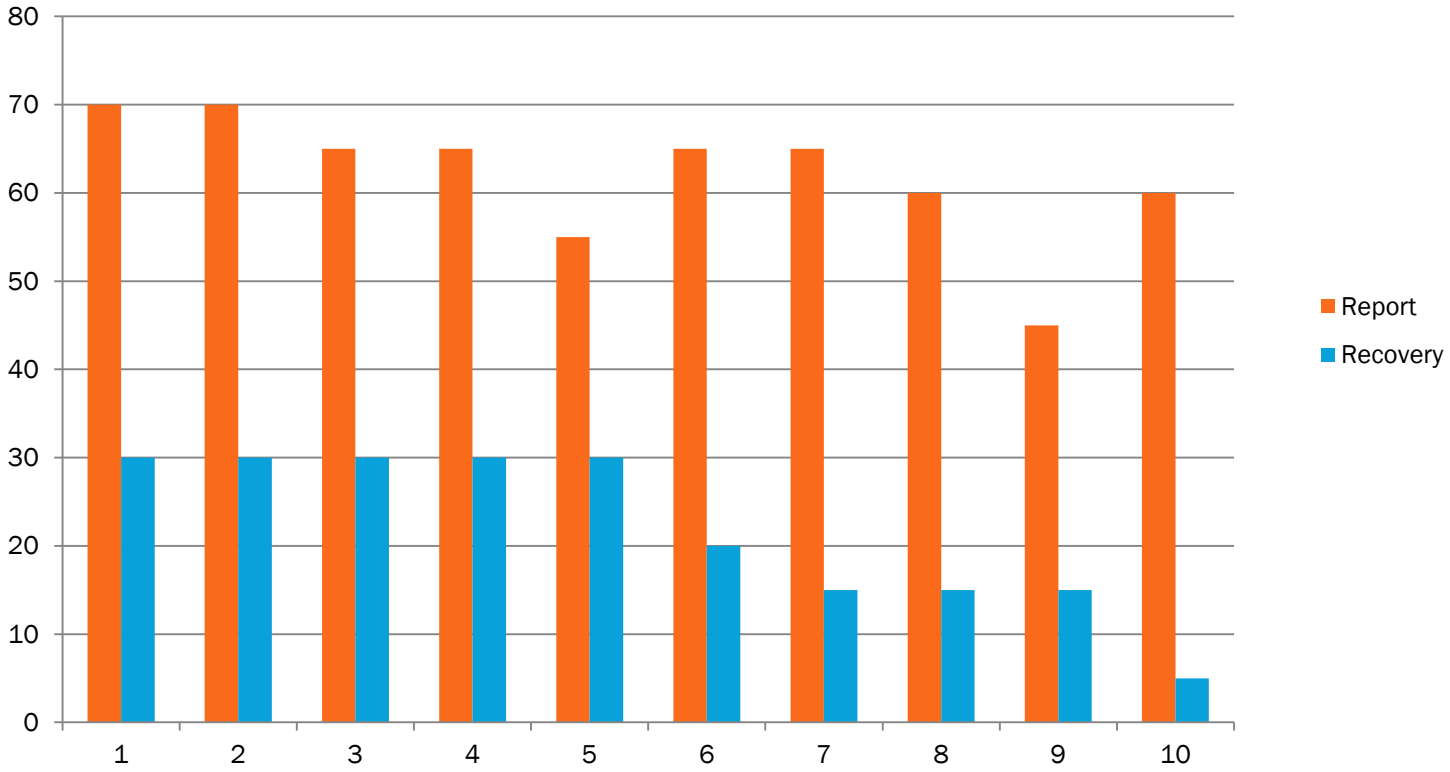
How much helium is needed?

How do we track and recover the payload?

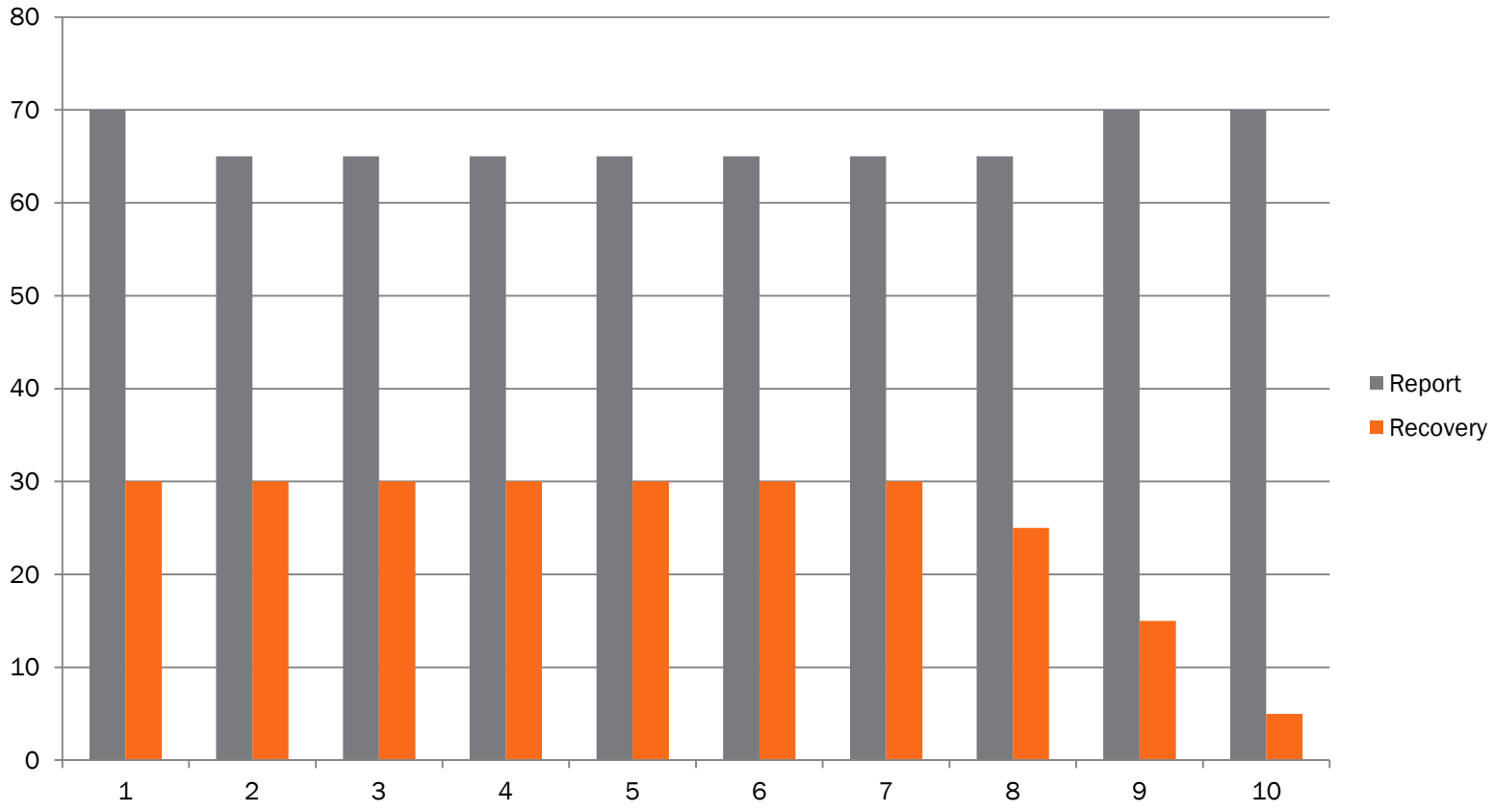
PROJECT GRADING

Grading	Points
Excel Workbook of Systems Engineering documents (depending on quality)	70
Successful Launch	5
Recovery of Payload	10
Photo of the Curvature of the earth	15

Report Grade vs. Recovery Grade (2010)



Report Grade vs. Recovery Grade (2011)



ACTUAL STUDENT PRESENTATION

GRAVITY GURUS

ADAM SIRKOCH

JACOB STRITE

JULIE WALLESHAUSER

JASON BIRO

MELISSA REIDY

KYLE BANDY

ZAHRA MURAD

AZIZ ALSHAMMARI

ABDULLAH ALMURZOHKI

ZACH LOCKS

MATERIALS USED

Weather Balloon 500g

SPOT GPS

Canon PowerShot A470 with CHDK software

4ft Parachute

Styrofoam Cooler

Duct Tape, Carabineers, Fiber Glass Insulation, String, Zip Ties, Hand Warmers

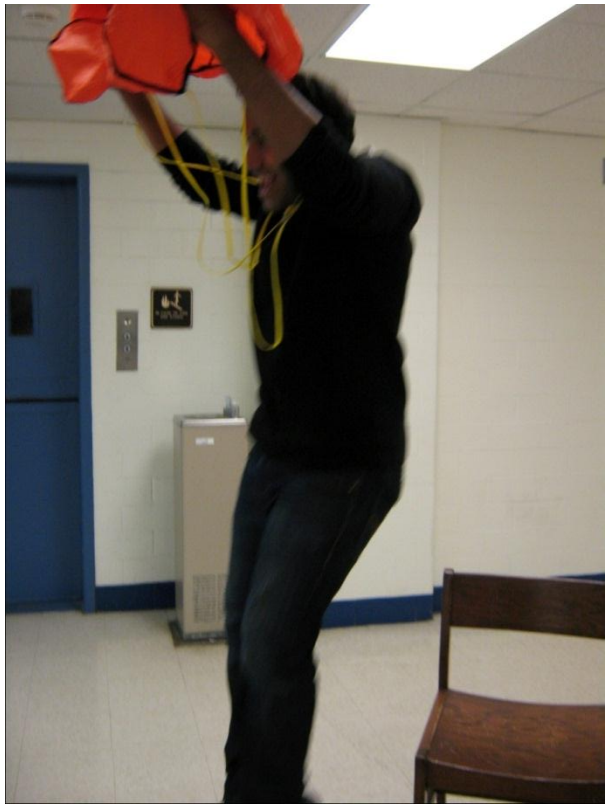
DESIGN PROCESS

DESIGN PHOTO OF PAYLOAD

- Strings were brought from each corner of the box and brought together with a carabiner
- A hole was cut to fit the Lens of the camera

TESTING

- Dropped off of ESB bridge
- Put GPS and camera in freezer
- Left camera on all night to test battery life



ESB BRIDGE TEST

FARM LAUNCH

EVENTS

Launched the balloon on Nov. 10 from WVU Agriculture Farm

GPS never transmitted a signal

Re-ordered all supplies for re-launch

Re-launch was scheduled for Nov. 27

Received call on Nov. 21 (Thanksgiving Break) from “Andy”

RESULTS

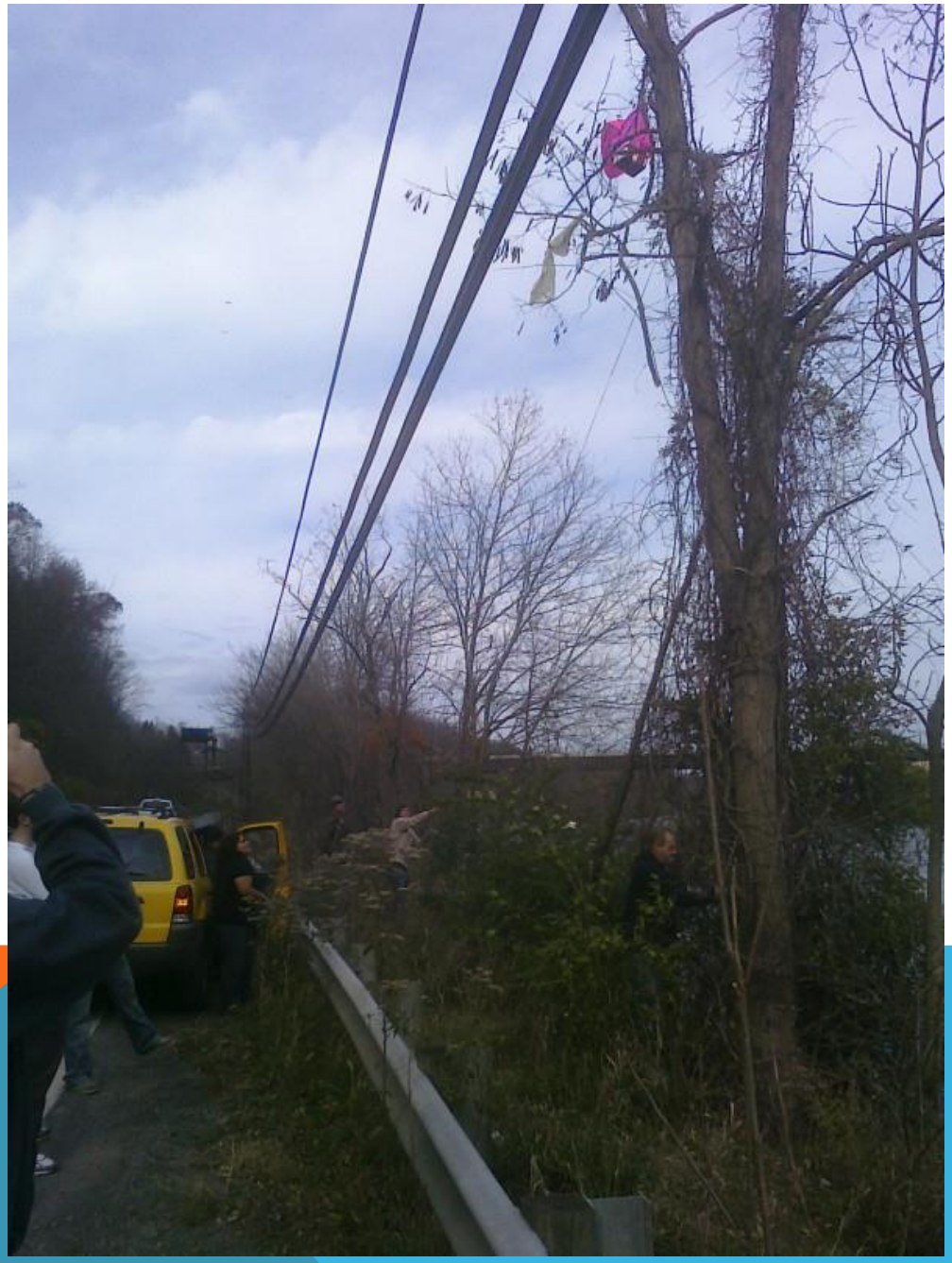
The camera took 1600 pictures

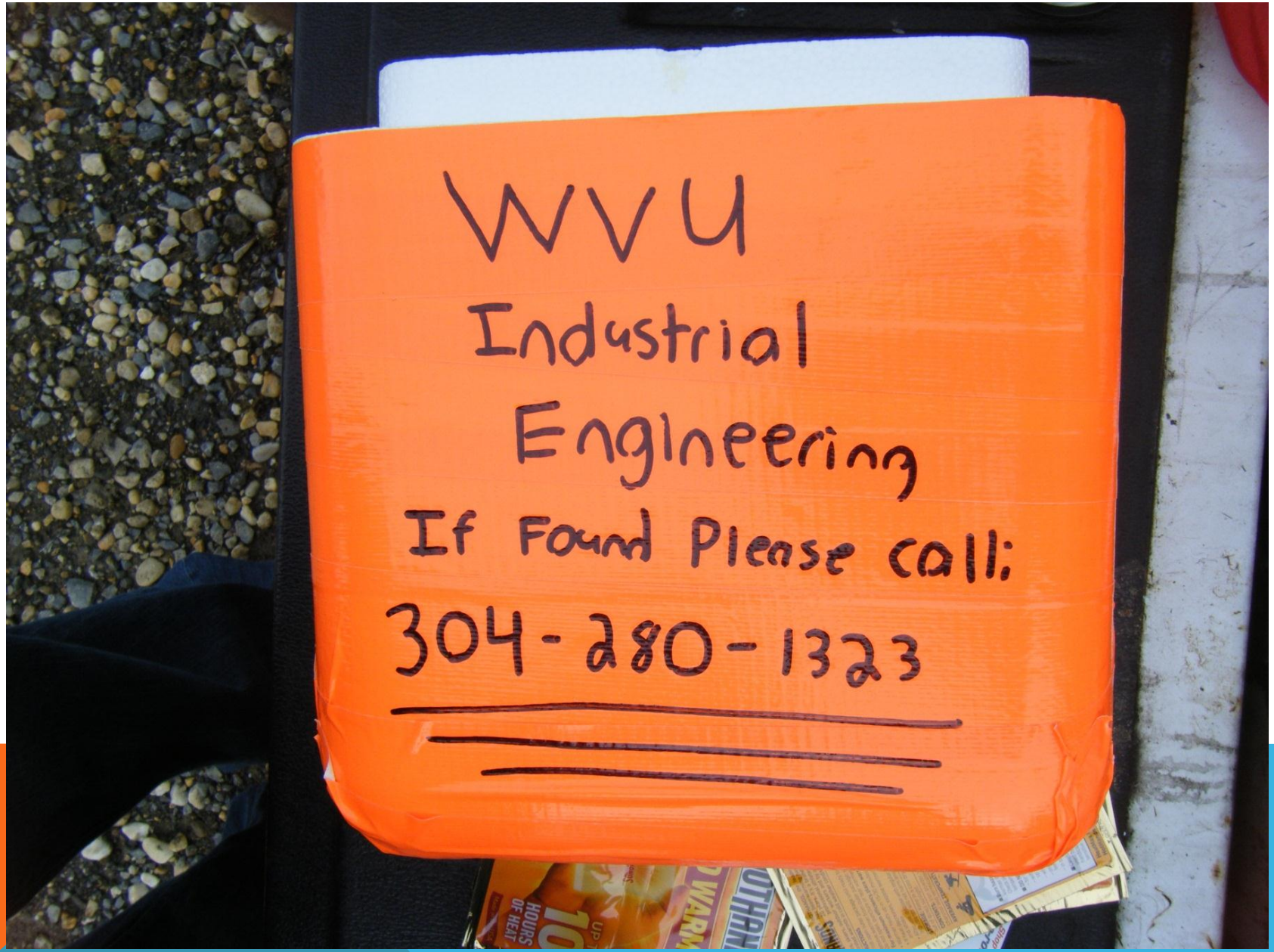
The camera was wet but still functioning

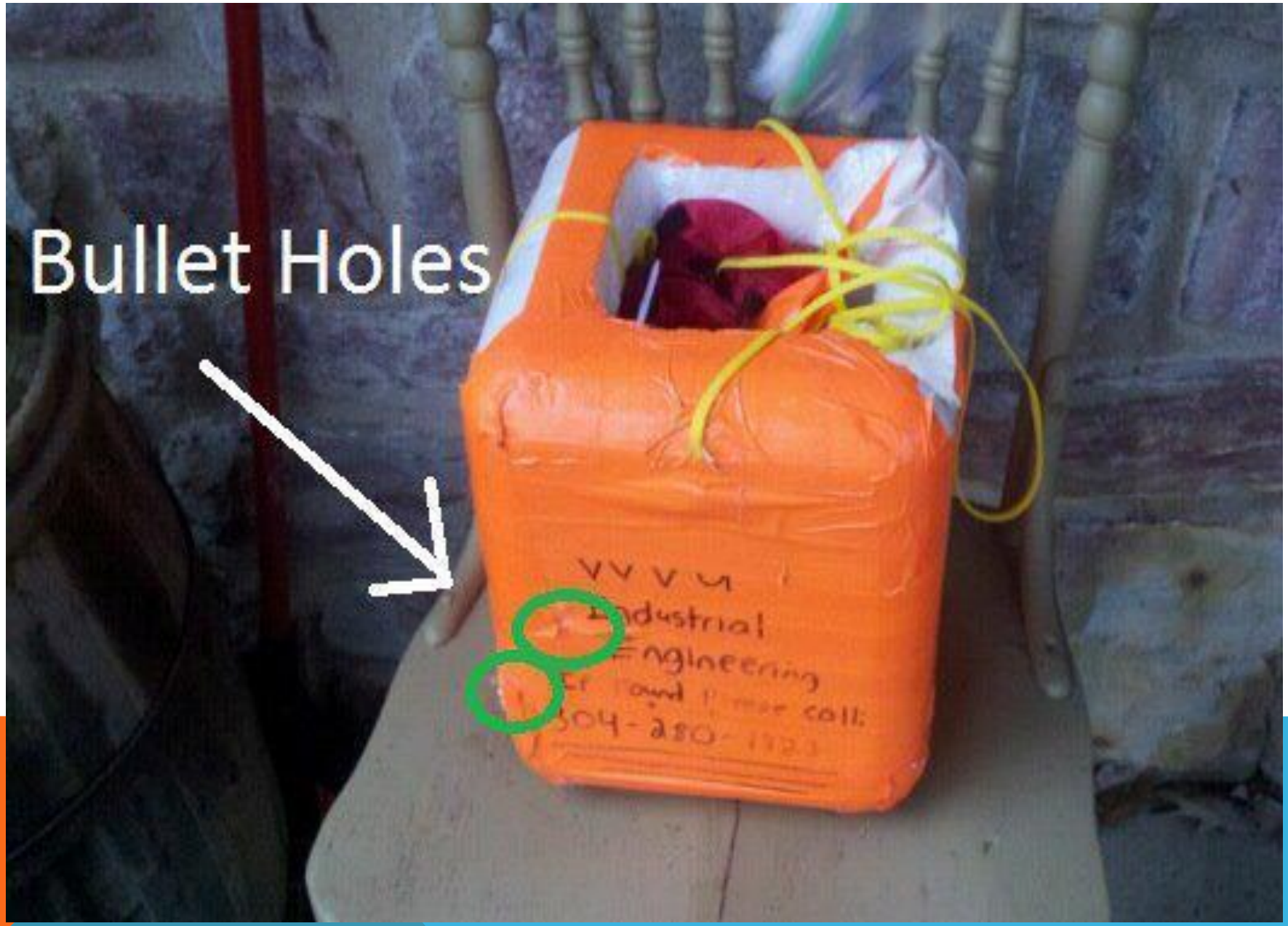
TEAMWORK


WEST VIRGINIA

SOME LESSONS LEARNED




WVU
Industrial
Engineering
If Found Please call:
304-280-1323


Bullet Holes


Canon
PowerShot A470
AiAF


FUNC
SET

MORE STORIES….

Retirement Community

Blisters

Martinsburg Field

Procrastinators

SUCCESS