Sean Casey the Tornado Intercept Vehicle

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Access to Life Sciences

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Communication Intermediate Two
Learning Outcome 2

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For the attention of Mark Hetherington
And John O'Neill

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1. Introduction

This report has been requested by Mark Hetherington and John O'Neill. The aim of this report is to investigate the work of Sean Casey, briefly look at tornadoes and to evaluate the impact Casey's work has on society.
The report is to be submitted on Monday 25th May 2009.

2. Research Methods / Plan

Information for this report was obtained from the following sources:
Storm Chasers seasons 1 and 2 The Discovery Channel, various websites including the discovery channel website and books obtained from the library.
For a full list of sources used please see the bibliography section.

The planning for this project was as follows:
By 30/09/08 I aimed to have identified my topic and scientific hero.
I can then begin my research on this subject.
By 28/10/08 I aimed to produce a brief outline plan
By 25/11/08 I aimed to have a completed 200 word summary of my hero.
By 13/01/09 I aimed to have my research completed.
By 01/05/09 I aimed to present my power point presentation.
By 25/05/09 I aimed to submit my final report.

3.1 Sean Casey an overview

For almost a decade Sean Casey has travelled the world filming nature's most extreme weather including hurricanes, earthquakes and typhoons.
Every spring for the last 7 years Casey has returned to Tornado Alley to film the "deadly, natural spectacle which has captured his soul, Tornadoes".
Sean Casey is an IMAX film maker and has teamed up with meteorologist Dr Josh Wurman.
Casey and Wurman hope to film a tornado going directly at them and impacting them. They hope that the data obtained can be used to better understand tornadoes.

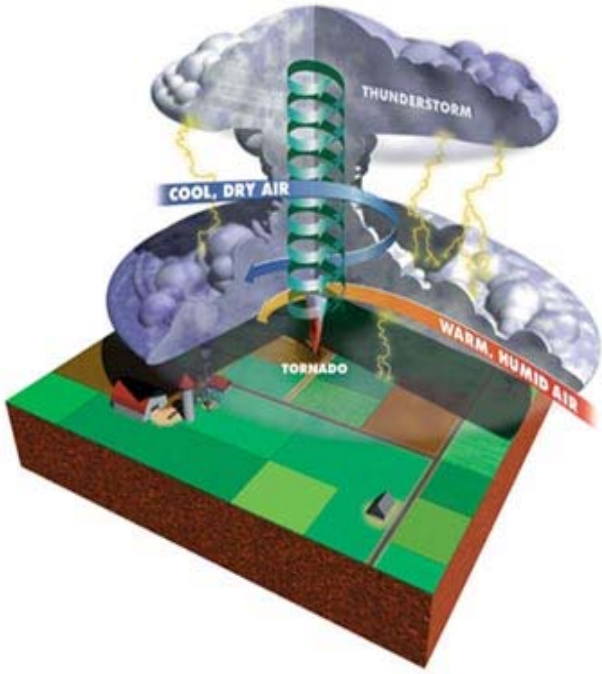
3.2 An Investigation of Casey's work

In order to achieve their goal of intercepting, and making contact with a tornado, Casey and Wurman needed a vehicle that could withstand the strength of a tornado, including the high winds and flying debris. Wurman uses the Doppler radar (known as the DOW or Doppler on wheels) which is a safe distance away from the tornado to predict where it is going to be and advises Casey. Casey will place the TIV1 or TIV2 hopefully into the path of the tornado.
Byron Turk, TIV navigator for the Discovery Channel's Storm Chasers series, describes the process like this: "We find the storm hopefully before it gets dark, and hopefully it produces a tornado, and hopefully there are roads to it," Turk says. "Lots of decisions need to be made on how the supercell is doing, whether another one is more worthwhile, more data comes in and it's just a constant process of making the right decision over and over again. Hopefully."

Casey built the Tornado Intercept Vehicle (TIV). TIV1 was built from a stripped down 1997 Ford f-450 truck. TIV1 was designed to be as heavy, rounded and as low to the ground as the chassis would allow. The TIV's mission is to serve as a protected, mobile mount for an IMAX camera that can film direct tornado impacts. In addition, there are sensors outside the vehicle to collect data, such as temperature, air pressure and wind speed, which can later be analysed.

Casey always considered the TIV1 to be a prototype to test different designs and ideas before building TIV2. TIV1 proved to be a rugged "road warrior". The TIV team's conversion of a dodge 3500 truck into the "ultimate storm chasing machine "The TIV2 retains the overall profile and basic plan of its predecessor, but lessons learned from TIV1 inspired several key customisations. First, a couple of upgrades that any storm chaser could use: a little more armour and more horsepower (from a custom injection system and a supped up transmission). Second, an entirely new running gear assembly, including the addition of a third axle and two more tires, provides a far more stable, all wheel drive. Finally, the troublesome hydraulic claws and winch driven lowering mechanism have been replaced with much simpler and more effective hydraulically operated panels that serve as a metal "skirt" to redirect vehicle flipping winds.

3.3 Impact on Society



What causes a tornado? The diagram on the right has been used to help explain how a tornado forms.
There is a layer of warm moist air which is close to the ground and a layer of cooler, dry air above.
The warm moist air is lighter than the cooler, dry air and causes the warm air to rise (updraft) within the storm.
As the warm air rises it cools and forms raindrops.
The wind changes direction and height (wind shear) and causes the rising column of air to rotate.
A wall cloud forms (the lower, black cloud in the diagram) and a funnel develops.
The formation of the tornado is visible.

Casey designed the TIV to withstand 200 mph winds, which accounts for about 75 percent of the tornadoes that form in the United States. Taking account of this and by paying careful attention to the progression of the storm will reduce the risk of damage or destruction to the TIV.

Tornadoes occur with little or no advance warning. Currently the National severe storms laboratory (NSSL), state that tornado warnings are currently 11 minutes in advance of a tornado touching down. NSSL are hoping to increase the tornado warning lead time to 20 minutes. This makes the work that Casey and Wurman are doing even more important, in order to be able to create an earlier warning system we need to understand more about tornadoes. To be able to understand how strong a tornado is going to be, how big it's going to be, and to forecast more precisely where its going to travel, it needs to be understood what is going on in the lowest 50 to 100ft of tornadoes.

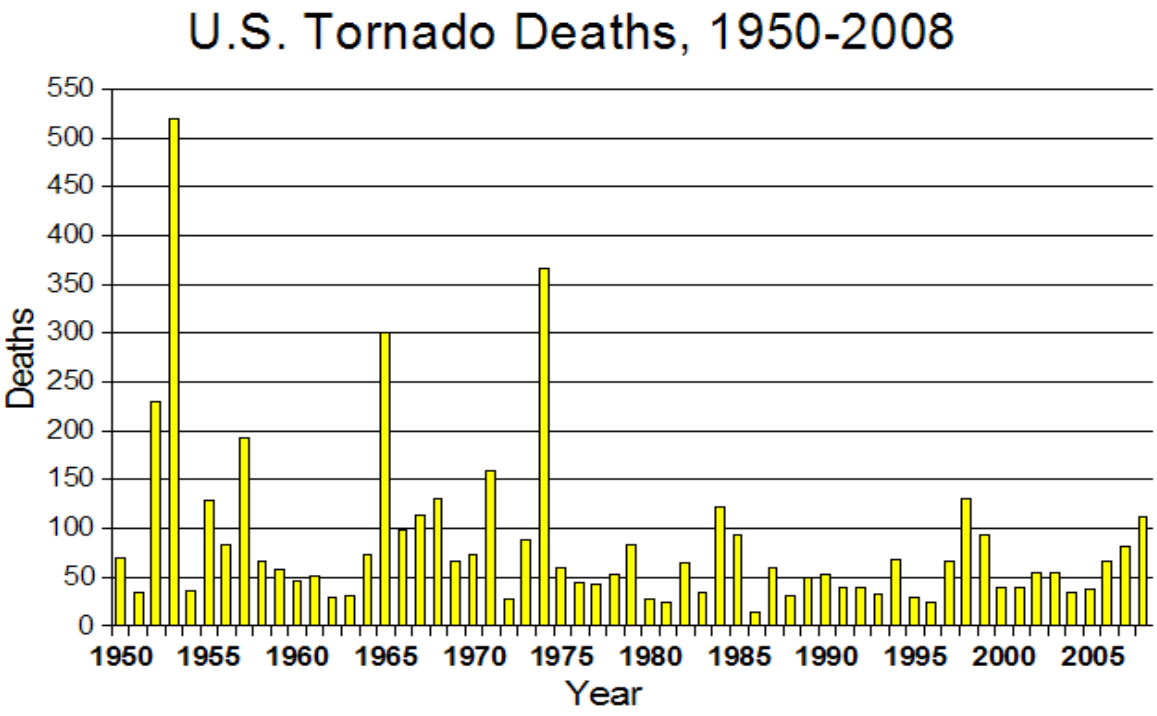
Tornadoes are measured on a Enhanced Fujita scale, also known as EF on a scale of 0-5.
The table below illustrates the scale of tornadoes, the wind speed estimated for a tornado and damage observed.

Enhanced Fujita Scale	Wind Speed	Damage Observed
EF0	65 – 85 mph	Some roof damage. Some shallow rooted trees are pushed over.
EF1	85 – 110 mph	Moderate damage. Mobile homes overturned or badly damaged: windows broken.
EF2	111 – 135 mph	Considerate damage. Roofs torn off well constructed houses. Large trees snapped or uprooted. Cars lifted off ground.
EF3	136 – 165 mph	Cars lifted off the ground and thrown. Large buildings damaged.
EF4	166 – 200 mph	Devastating damage. Well constructed houses completely destroyed. Cars are thrown and become missiles.
EF5	> 200 mph	Incredible damage. High rise buildings suffer significant damage.

4. Conclusion

The findings show that:

- The current warning system is 11 minutes in advance of the tornado a threat.
- Tornadoes are dangerous and can cause severe damage and fatalities.
- The histogram below shows the number of fatalities each year caused by tornadoes. Casey and Wurman hope that by creating an earlier warning system they will be able to allow people more time to prepare for an approaching tornado.
- Casey and Wurman hope to be able to predict more precisely the direct path of the tornado.



5. <u>Evaluation</u>

Overall I am happy with how the project went. This topic was interesting but it was difficult to access enough scientific information for the report.

If I was to do this again I would like to think I will be better organized and complete the work much sooner, so a first draft could be handed in and discussed.

Due to unforeseen circumstances the presentation for this project was moved back to Monday 1st June 2009.

Skills learned through working on this project included: research skills, report writing, oral presentation skills and power point skills.

6. <u>Sign and Date</u>

Tracy Tidbury 25th May 2009

7. Bibliography

The sources are as follows:

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