Night-Vision Device Aided Aerial Forest Fire Detection: Experience in a Control Test Grid

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Previous Research

"Preliminary Assessment of Night Vision Goggle Operations for the Ontario Ministry of Natural Resources" *Jennings et al (1997)*

- The first Canadian investigation into the use of NVDs around forest fires
- NVDs have potential to improve the efficiency of airborne forest fire suppression
- Our study → controlled experiment with planned control fire sources

Previous Research

The San Diego Fire-Rescue Department

- The use of night vision devices by helicopter operators for flight at night was researched since 1971
- Operational in Southern California
- Successfully utilize night vision devices (NVGs & FLIR) for search and rescue, fire fighting and training at night
- Our study
  - Forest type
  - Large pool of observers
  - Controlled experiment

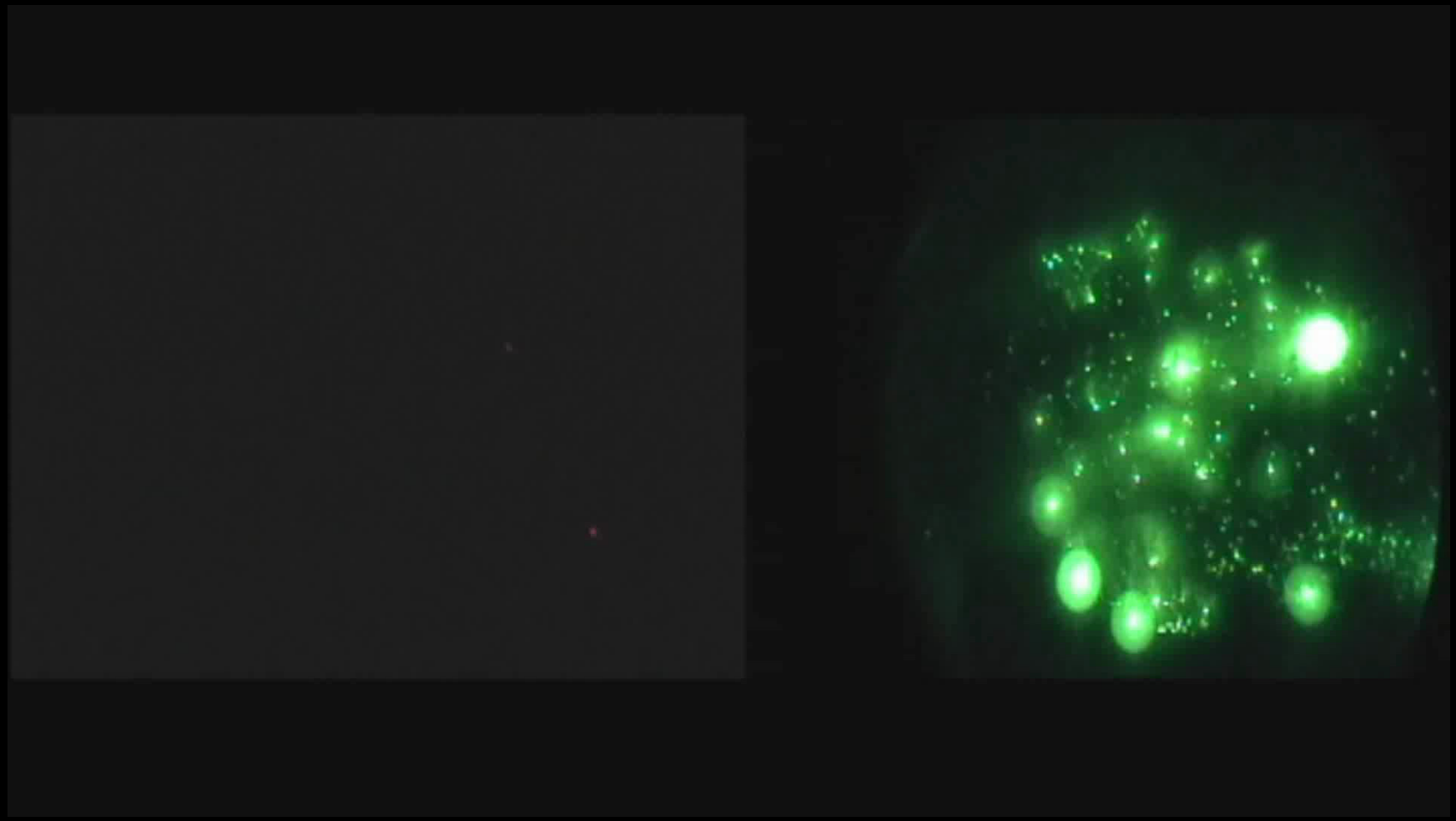
Objectives

- Fly fire-intelligence guided night-time detection patrols following thunderstorm activity
- Identify fires early and permit suppression with minimal delay

Objectives

- Can small fires be detected at night?
- Can wildland fires be discriminated from other light sources?
- Can NVDs be efficient in early wildland fire detection?

Night Vision Devices



Night Vision Devices

- Light must be visible from the hotspot
- The NVDs amplify existing ambient light
- Generation III, ANVIS 4949 Binocular NVDs

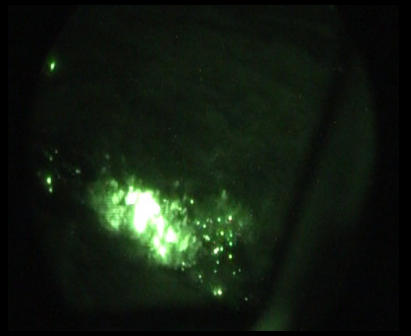
Methods

Part I (Pembroke Study)

The detection targets were small controlled fires (12” x 16”)

Part II (Sudbury Study)

The detection targets were real forest fires



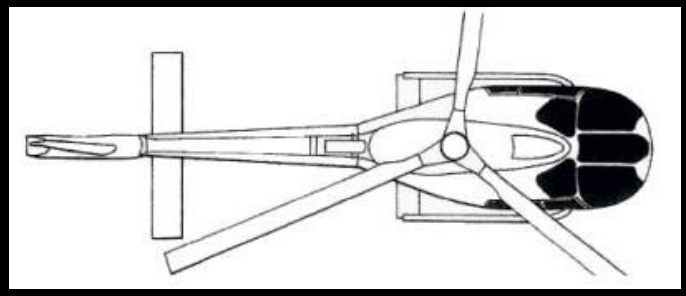
Methods
Pembroke Study

OMNR IR test grid

Methods
Pembroke Study

Roles:

- Observer
- Pilots
- Experimenter
- Audio/video technician
- FireHawk technician



Geographical locations for events:

- Target detection
- Target discrimination
- Fire location

Fire characteristics:

- Intensity
- Size
- Temperature

Methods
Pembroke Study

- Artificial fire logs
- Gel torches
- Charcoal briquettes

Results
Pembroke Study

- The average detection distance was 3,584m
- The average discrimination distance was 1,193m
- The number of light sources & detection/discrimination distances
- Canopy density & detection distance

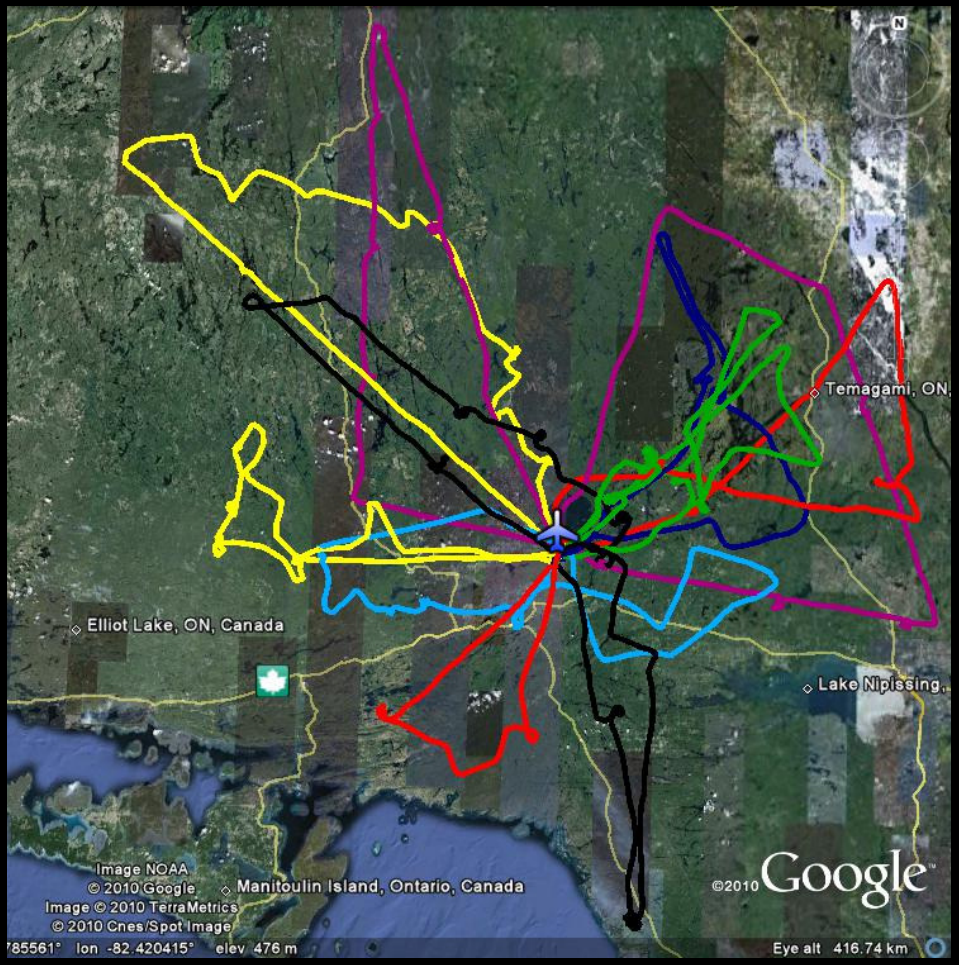
Results
Pembroke Study

- Total number of events – 59
- Number of fires – 23
- Number of campfires – 3
- Number of distractions – 33

	Hit %	Miss %
Apr 23rd	50%	50%
Apr 24th	75%	25%
Apr 25th	100%	0%
Overall	68%	32%

Method
Sudbury Study

- Planned flight paths over lightning strike areas
- Searching for real forest fires
- The entire flight crew was responsible for detection and discrimination of targets

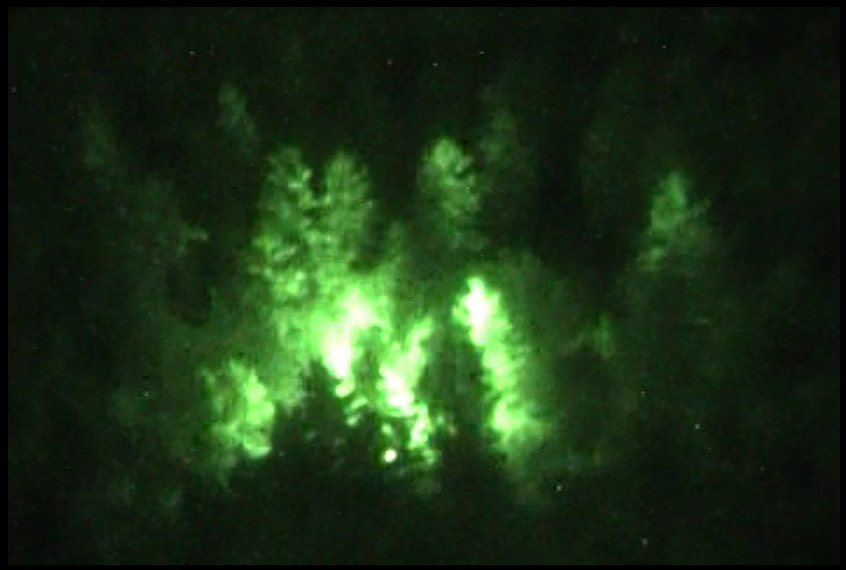


Results
Sudbury Study

- The average detection distance was 6,678m
- The average discrimination distance was 1,618m
- Correlation between the overall discrimination distance and fire size

Results
Sudbury Study

- Total number of events – 70
- Number of fires – 20
  (**5 newly detected**)
- Number of campfires – 15
- Number of distractions – 35



The hit rates were at
57% at a visibility of 10 km, and
48% at a visibility greater than 20 km

Conclusions

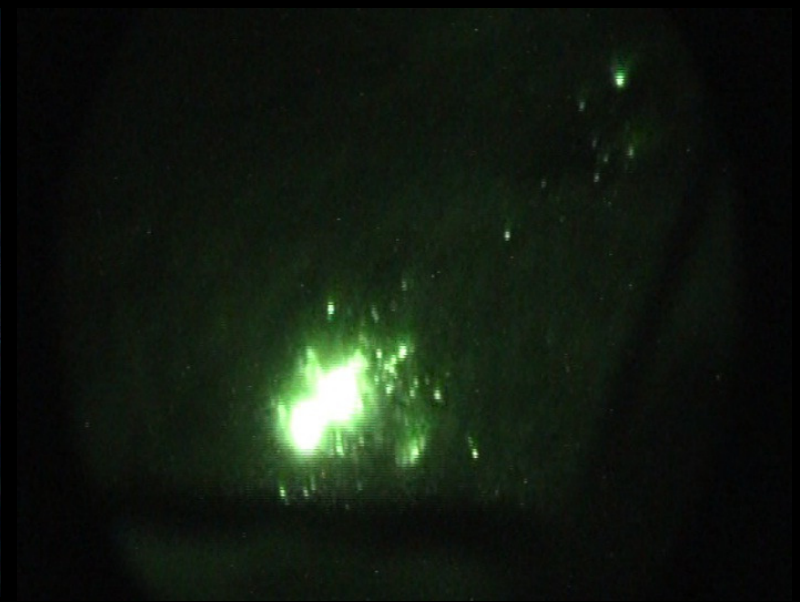
- Can small fires be detected at night with NVDs?

Conclusions

- Can wildland fires be discriminated from other light sources?

Conclusions

- Can NVDs be efficient in early wildland fire detection?



NVDs are an effective tool in early fire detection, especially when flown over lighting strikes corridors by experienced observers with knowledge of the geographical area.


Thank you