



# **Unmanned Aerial Systems in the Fire Service: Concepts and Issues**

Dr. Ronald T. Wakeham

Dr. John C. Griffith

Embry-Riddle Aeronautical University FL

Worldwide Campus



# Overview

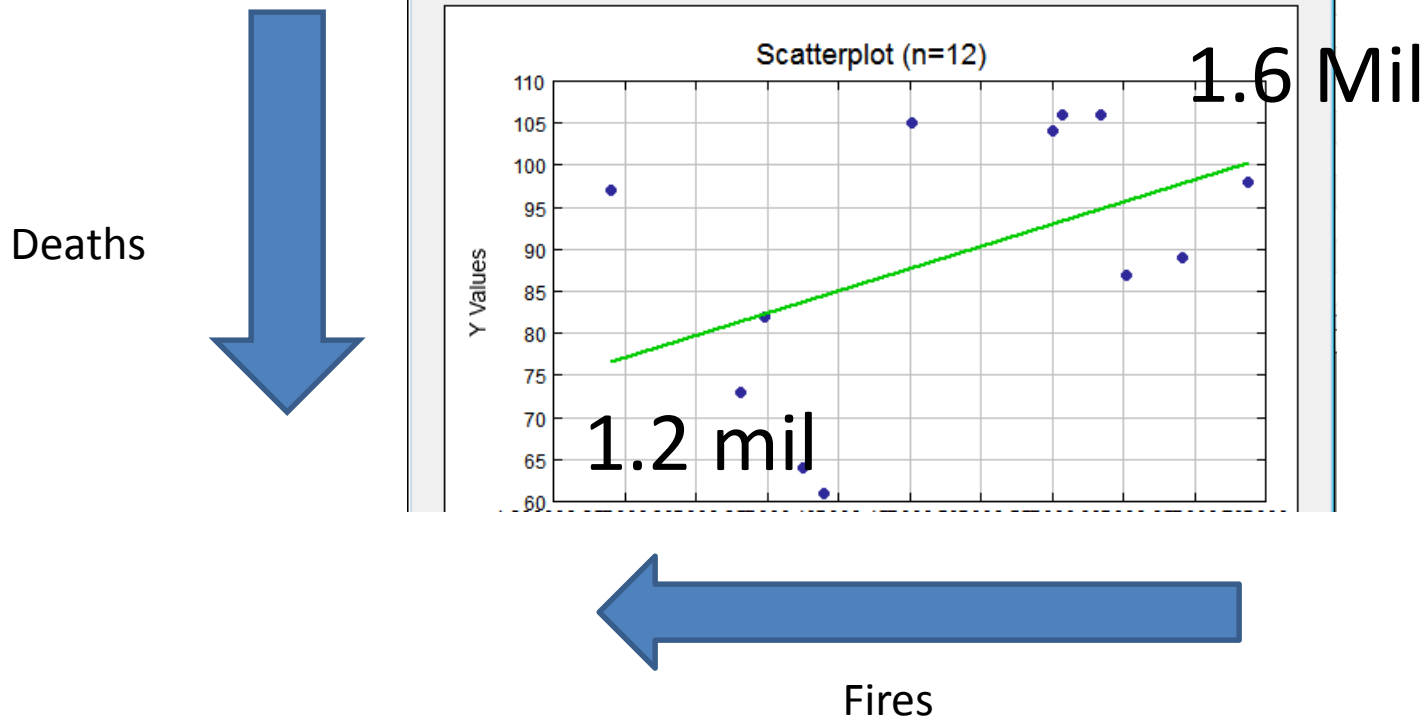
- # of fires and # of firefighter deaths
- UASs – shorten decision cycles?
- FAA's role





# # of fires and firefighter deaths

## There is a correlation but.....





# Fires and Firefighter deaths last 12 years

## 78% variance unexplained

The screenshot shows the Statdisk Sample Editor interface. On the left is a data table with 12 rows of data. On the right is the 'Correlation and Regression - 2' window, which displays statistical results for a regression analysis. A red arrow points to the 'Coeff of Det, R^2' value of 0.215713.

R...	1 Year	2 Fires	3 Deaths
1	2002	1687500	98
2	2003	1584500	106
3	2004	1550500	104
4	2005	1602000	87
5	2006	1642000	89
6	2007	1557500	106
7	2008	1451500	105
8	2009	1348500	82
9	2010	1331500	73
10	2011	1389500	61
11	2012	1375000	64
12	2013	1240000	97
13			
14			
15			
16			
17			
18			
19			

**Correlation and Regression - 2**

Significance: 0.05

Select the columns to be used for the x and y variables.

x variable column: 2  
y variable column: 3

Evaluate

Scatterplot

Residual Plot

Sample size, n: 12  
Degrees of freedom: 10

Correlation Results:  
Correlation coeff, r: 0.4644492  
Critical r: ±0.5759826  
P-value (two-tailed): 0.12822

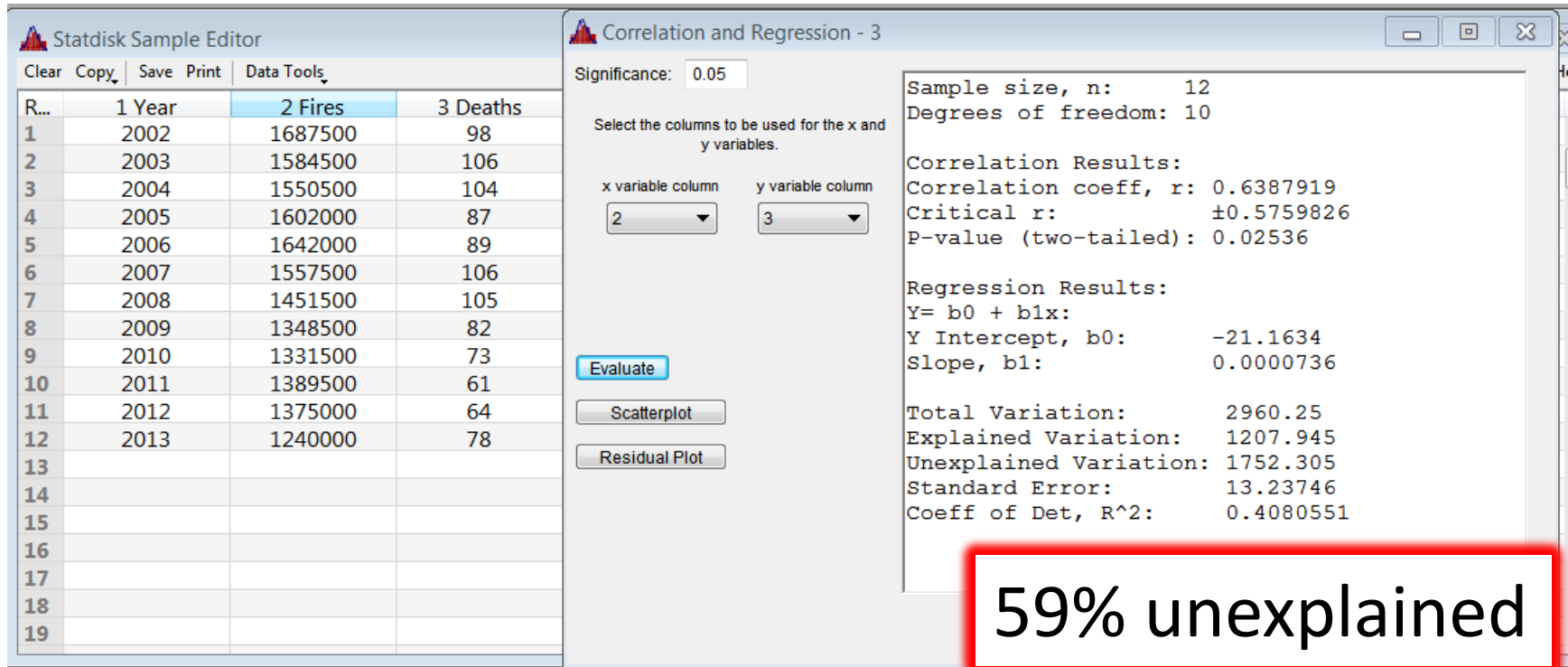
Regression Results:  
Y= b0 + b1x:  
Y Intercept, b0: 10.67642  
Slope, b1: 0.0000531

Total Variation: 2920.667  
Explained Variation: 630.0259  
Unexplained Variation: 2290.641  
Standard Error: 15.13486  
Coeff of Det, R^2: 0.215713

Print Copy



# What about Yarnell fire? was it an outlier?





# UASs, why not?



# UAS Concerns

- Shut down operations if UAS is in the fire area (Pearce, South Australia County FD, 2014).
- Dangers to manned aircraft “if the drone is sucked into the rotor...curtains for the helo” Gabbert, 2014).
- Line of sight
- Below 400ft
- Right to privacy
- Expensive
- Development quicker than rules to govern [NY](#)
- FAA regulations



# FAA and drones

## Use of UASs

- Personal
- Business (Special Airworthiness Certificate)
- Government agencies (Certificate Of Authorization)
  
- 2015 deadline for rules for integration of drones in US airspace
- Test locations through 2017

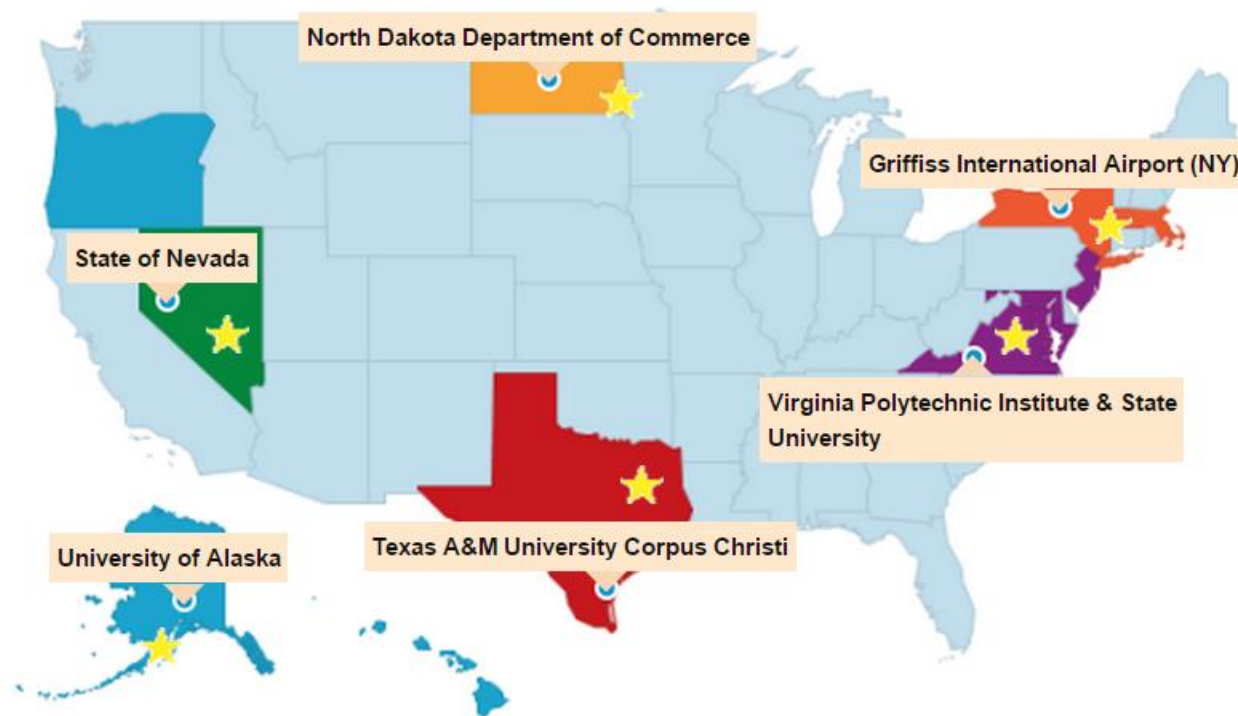
EUROCAE

Australia





# FAA Test sites through at least 2017



[Helo](#)

*Figure 1.* FAA UAS test sites established in 2014. “Test Sites”. FAA, Unmanned Aircraft Systems (2014c).



# Why UAS can help the fire service

- ....Anything we can do to increase the decision cycle (Davis, 2013).
- Situational awareness
- Command and control
- Infrared technologies
- Not just fire - Hazmat
- Use to extinguish fires

Alaska

Portland OR

Maryland



# Video Demonstrations

- <http://knowbeforeyoufly.org/> FAA
- InSitu A20  
<https://www.youtube.com/watch?v=7bbasMvXZJo>
- <http://effaustin.org/2014/09/city-approves-austin-fire-department-drone-study/> Austin FD
- The Raven 1:30-4  
<https://www.youtube.com/watch?v=VzX01Hc1R7g>



# Conclusions

- Relationship of # of fires and fire fighter deaths is not adequate alone
- Each fire is a dynamic situation
- Need tools to improve situational awareness/command and control and faster decision cycle (Davis, 2013)
- FAA test sites
- Fire service testing



# Recommendations

- Need real time experimentation
  - Air worthiness, command and control, crash avoidance
  - Communication of operator with local ATC
  - “visibility of drones”
- Measure Fire Chief attitudes toward UASs
- FAA and fire service need to work together
- Drone developers
  - Easy to deploy and operate
  - Small drones could be used in large structures

# Questions?

- Ronald Wakeham [WAKEHAMR@erau.edu](mailto:WAKEHAMR@erau.edu)
- Dr. John Griffith, [john.Griffith@erau.edu](mailto:john.Griffith@erau.edu)





# HIDDEN URLS

[http://www.syracuse.com/news/index.ssf/2014/11/lockheed\\_martin\\_tests\\_firefighting\\_drone\\_helicopter\\_at\\_griffiss\\_international\\_ai.html](http://www.syracuse.com/news/index.ssf/2014/11/lockheed_martin_tests_firefighting_drone_helicopter_at_griffiss_international_ai.html)

<https://www.youtube.com/watch?v=nZsUL6kzdps>



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