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Lessons in history: The regulation of “*horse-less carriages*” and “*pilot-less aircraft*”

An introduction to research into the risk management
of unmanned aircraft

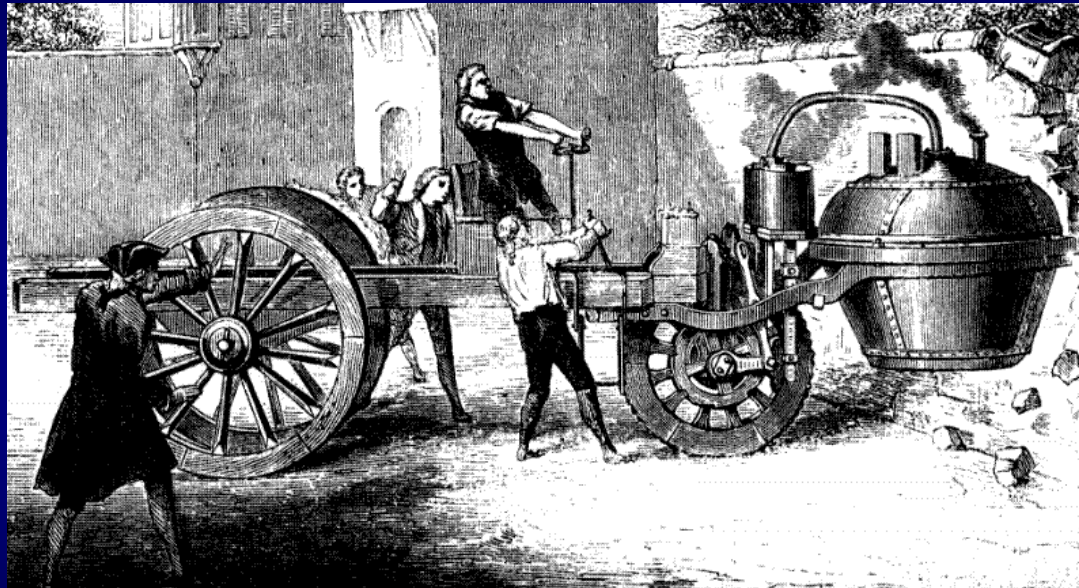
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Horse-less carriages

- ◆ First self-propelled vehicle believed to be developed in 1769 by Cugnot ^[1]



- ◆ Increasing public opposition towards automobiles on public roadways

Regulation in the UK

- ◆ 1865 Highways Act – The “Red Flag Law”
 - ◆ Max speed limited to 4 mph (2 mph in towns)
 - ◆ Must be preceded by a man on foot with a red flag or lantern ^[1,3]
- ◆ True proponents were competing industries



Impact of regulations

- ◆ 1865 Act stultified the UK Automobile industry^[1]
- ◆ Act was amended in 1878, then again in 1896, with the “Emancipation Act”
- ◆ In 2005, more than 800 fatalities of “other road users” in the UK ^[4]
 - ◆ Question the effectiveness of regulations, despite nearly 150 years of refinement?

Introduction to pilot-less aircraft

- ◆ Unmanned Aircraft Systems (UAS)

- ◆ Diverse range of aircraft



- ◆ Large number of applications



- ◆ Greatest challenge facing UAS industry is the development of regulations to manage the risks

Parallels

- ◆ Technical issues associated with the removal of the pilot ^[5]
 - ◆ *Removal of the temperamental horse*
- ◆ UAS are a new user in the airspace system
 - ◆ *Automobile using existing roadways alongside other road users*
- ◆ Social, economical and political influences
 - ◆ *Competing industry*
 - ◆ *Limited understanding of complex technology – dread/fear of unknown*
- ◆ Uncertainty of the risks
- ◆ A precautionary management philosophy has been adopted by air safety regulators: ^[5]
 - ◆ *Limitations on operations over populous areas*
 - ◆ *Requirement for a chase plane*

Risk research at ARCAA

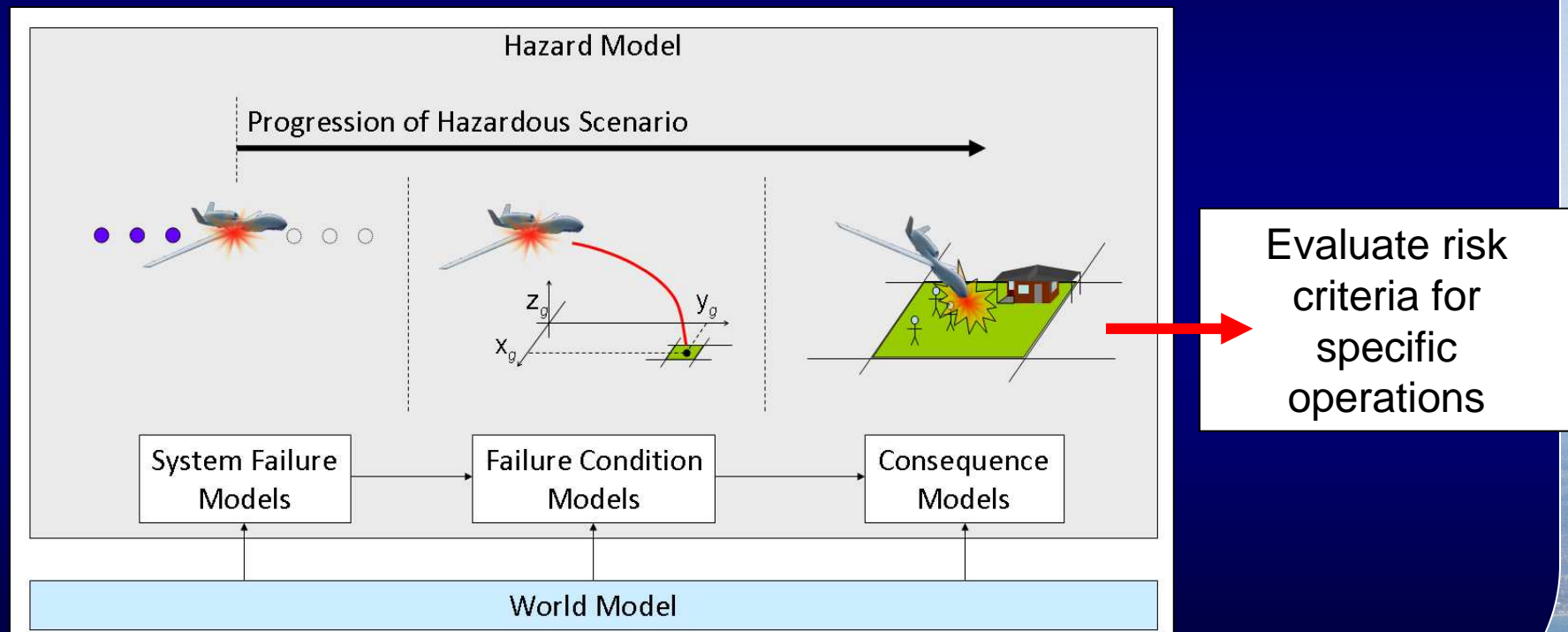
- ◆ Primary aim is to provide a greater degree of rationality, objectivity and transparency in the definition of safety policies, regulations and standards governing new technologies.
- ◆ Approach is applicable to any technology, with the current application being UAS

Overview of UAS risk research

- ◆ Determine suitable safety-requirements
 - ◆ *UAS should be at least as safe as conventional aviation*
- ◆ Develop assessment tools to relate safety-requirements to requirements on the design, manufacture, maintenance and operation of UASs

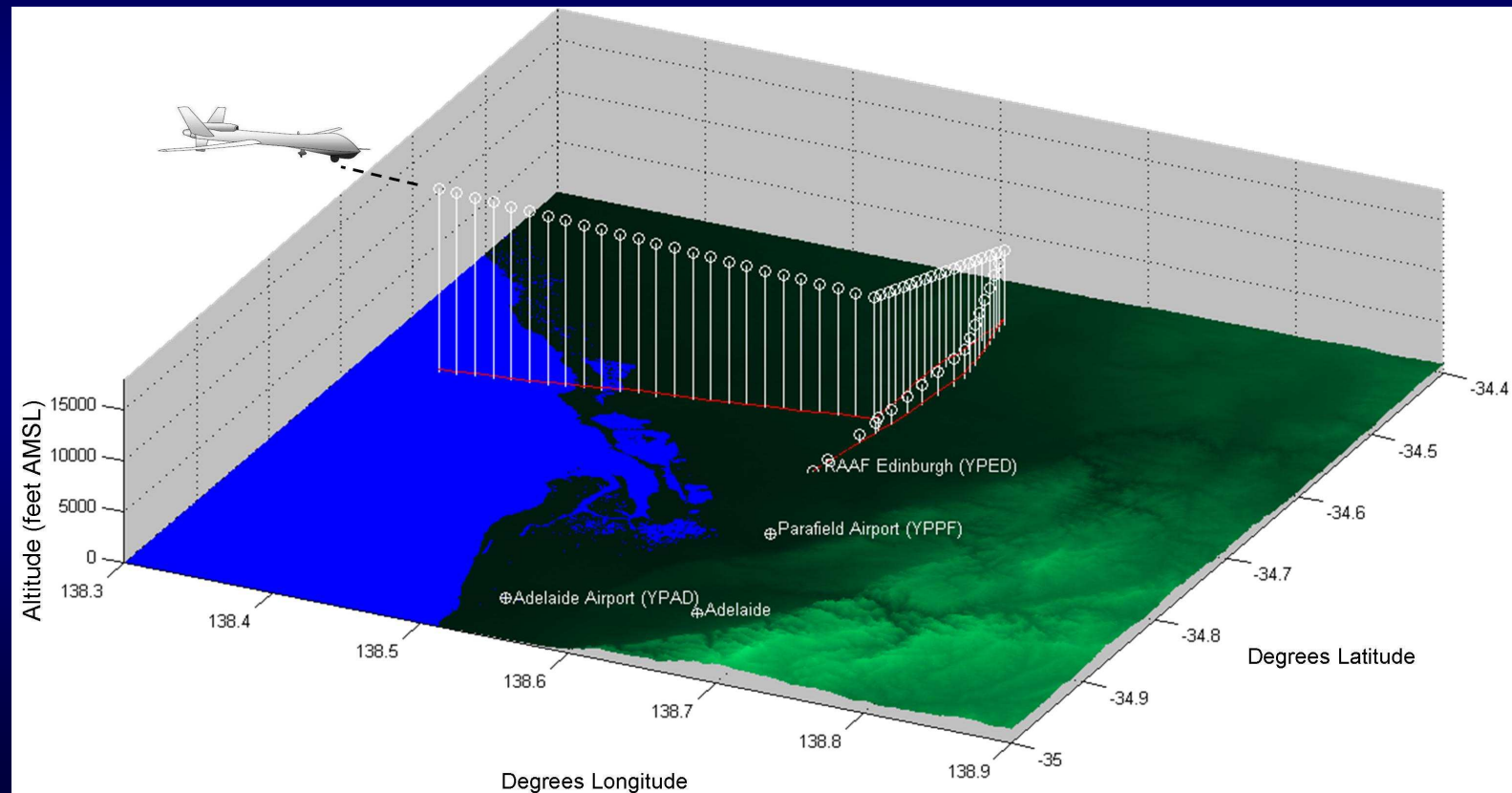
Risk assessment tools

- ◆ Risk modelling and simulation provides justifiable mechanism for relating safety-requirements to requirements on design



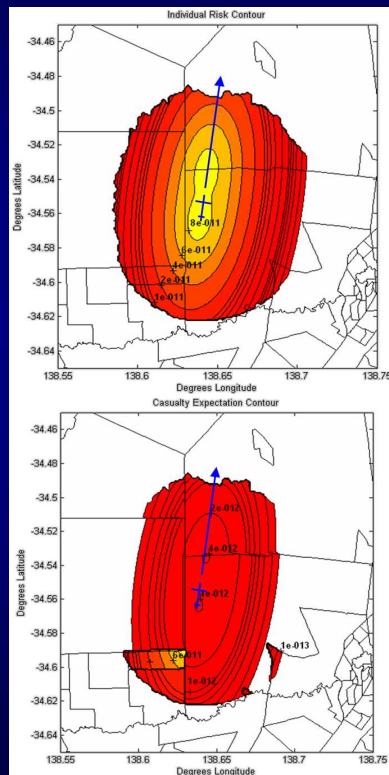
Case-study

- ◆ Evaluation of Mariner North West Shelf Trials – approach to RAAF base Edinburgh [6]

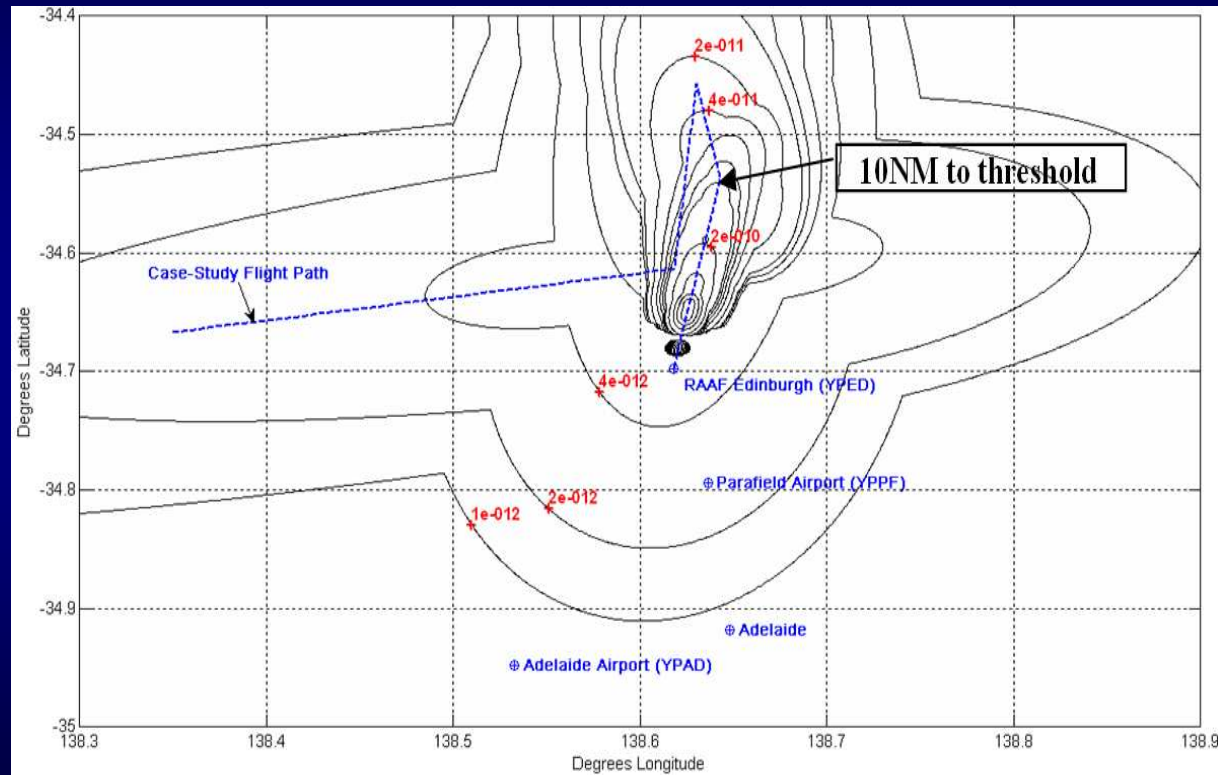


Example results

Example Risk Contours



Example Aggregated Casualty Risk Contours



Example results sourced from [6]

Summary

- ◆ History has shown us that there are recurring issues in the risk management and integration of new technologies into society ^[4]
- ◆ Need for tools to assist risk-informed decision making to address these issues
- ◆ The focus of this research is to explore systematic and justifiable methods for relating safety-performance requirements to requirements on design

QUESTIONS?

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References

- [1] Flink, J.J. (1988) *The Automobile Age*, Cambridge, Massachusetts: The MIT Press.
- [2] Fallon, I., O'Neill, D. (2005) *The world's first automobile fatality*, *Accident Analysis and Prevention*, 37(4), 601-603
- [3] Richardson, K. and O'Gallagher, C.N. (1977) *The British Motor Industry 1896-1939: A Social and Economic History*, London: MacMillan Press.
- [4] DFT (2006) *Road Casualties, Great Britain 2005*, Transport Statistics, Department for Transport (DFT), London
- [5] Clothier, R., Fulton, N., Walker, R., *Pilot-less aircraft: the horse-less carriage of the twenty-first century?*, *Journal of Risk Research*, **in press**.
- [6] Clothier, R., Walker, R., Fulton, N. & Campbell, D., (2007), *A Casualty Risk Analysis for Unmanned Aerial System (UAS) Operations Over Inhabited Areas*. presented at the Twelfth Australian International Aerospace Congress, 2nd Australasian Unmanned Vehicles Conference, Melbourne, Australia, 20th-22nd March. [Link to publication](#)