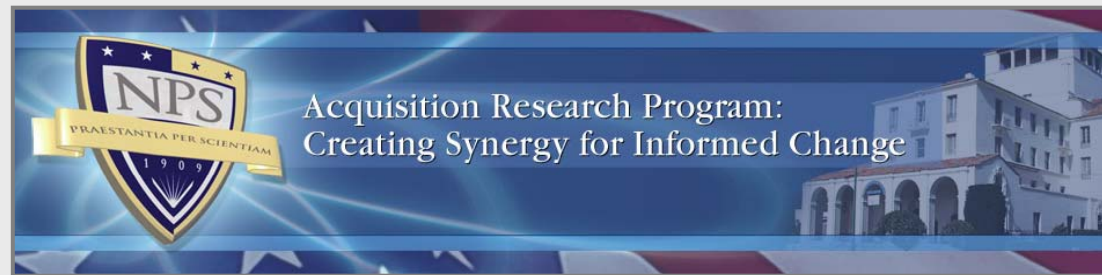




Costing Complex Products, Operations & Support

**Dr Michael Pryce,
Manchester Business School,
8th Annual Acquisition Research Symposium,
Monterey
12th May 2011**

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Background

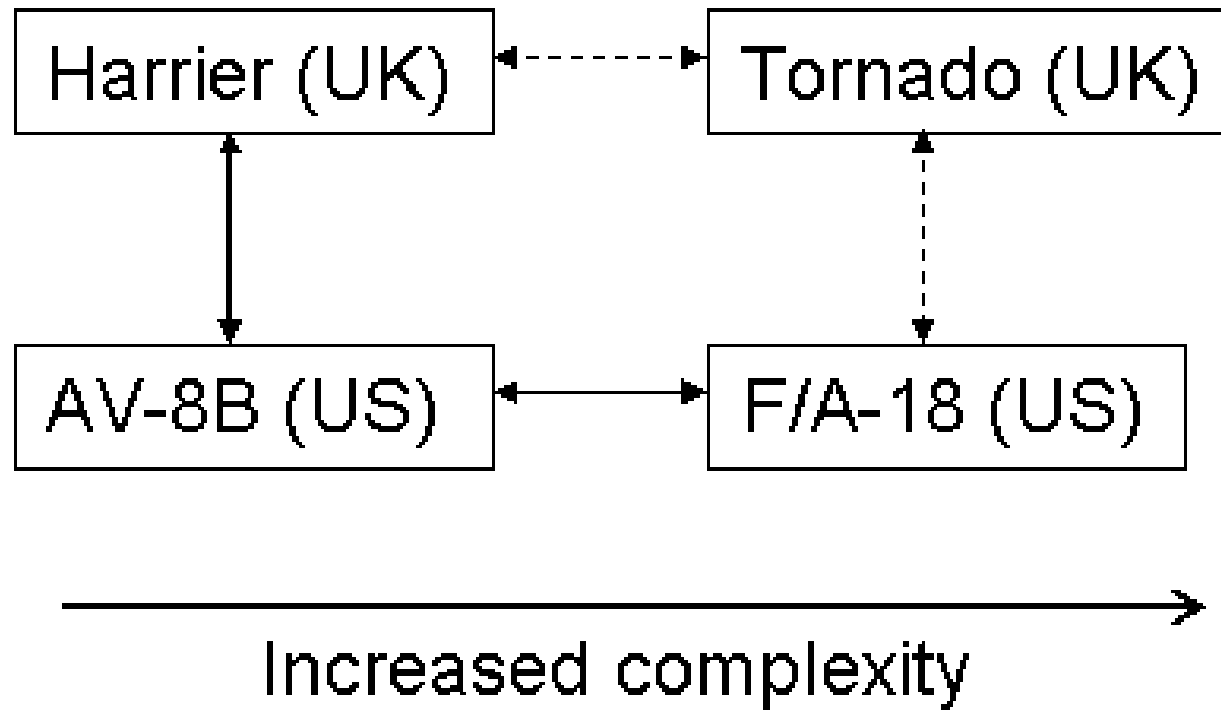
- D.Phil (PhD) in ASTOVL design/policy
- CoPS Innovation Centre, UK
- Understanding nature of design
- Differences and implications
- MBS - NECTISE - Harrier
- Business models for innovation



Research Overview

- Intent is to ‘capture’ complexity/cost variance at early stage of a project, using experience of prior ones.
- Interactions key aspect to be explored, plus ‘core/periphery’.
- “If the same aircraft is flown by the same people every day it doesn’t break.”
- UK based work plus US interviews.
- Aircraft based so far. Ship research also.

Cases





Initial findings

Type	Arisings	Op Effects
RAF Harrier 1 ^(A)	2564	61.9
RN Harrier 1 ^(A)	1449	51.9
Tornado ^(B)	2122	140.0
AV-8B ^(A)	1096-1330	24.1-29.8
F/A-18A/B ^(B)	1265	33.5

Sortie length effects:

Increasing sortie duration by factor 't' increases occurrences by function \sqrt{t} and decreases rates per flying hour by the ratio $1/\sqrt{t}$

Notes: Some AV-8A/C ^(A) and UK/US Phantom ^(B) data used for comparison

Sources: MACE/BAES/VAMOSOC



Initial findings review

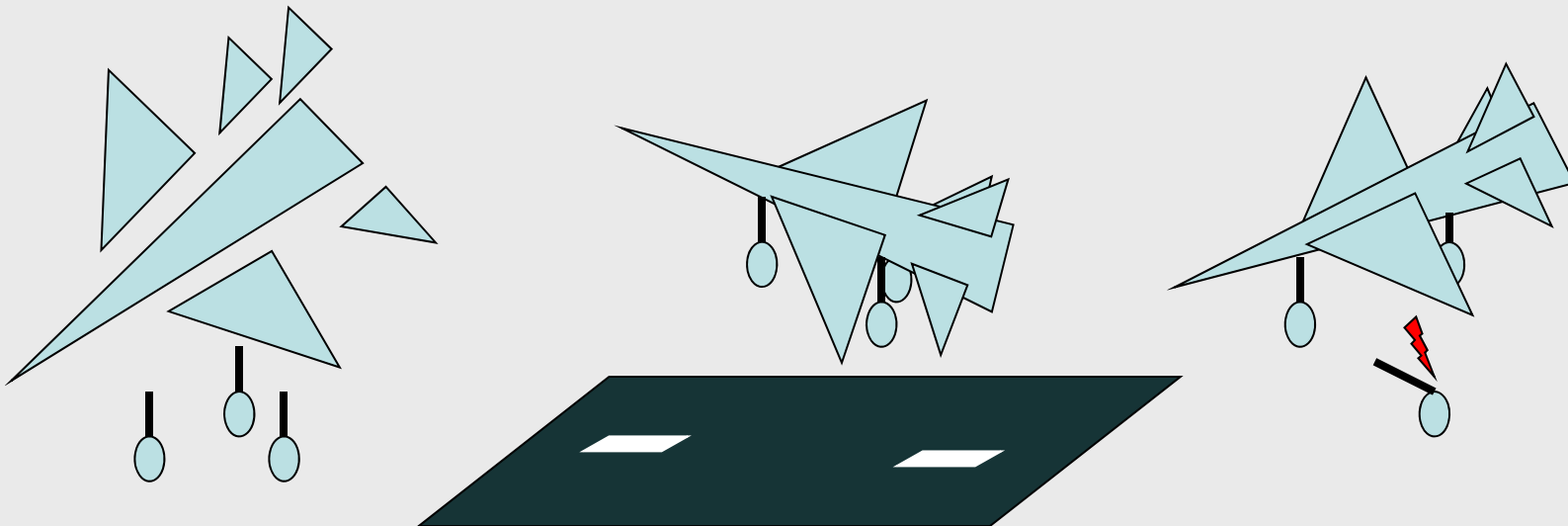
- Assumption is that prediction of these rates (Arising/Op effects) are more accurate than predictions of costs.
- Literature bears this out.
- Are good proxies for costs, but do not give cost figures.
- Differences mainly due to operational factors, e.g. sortie profile (high/low altitude etc.) as well as length. Also differences in US/UK 'accounting', different services' trade structures etc.
- These are largely peacetime rates, but UK Harrier does include some combat deployment. Peacetime vs. deployed rates are affected by servicing/spares policy (repair vs. replacement).

Undercarriage example

Undercarriage – high value, long lead time. Special material/firms. Built to last.

Exposed to heavy loads throughout life. Emerging technologies – composite struts/electric braking.

Heavy maintenance burden, frequent inspection, many sources of fatigue/damage. Special trade in US.



Undercarriage costs

Harrier I LCC costs - %

Mech & Struct.	30.59
Propulsion	35.98
Tactical Avionics	21.99
Nav/Comms	4.41
Other	7.03

Source: MACE/BAES

Of which undercarriage
16% (i.e. 4.9% overall)

Fuel system and flying
controls similar. Other
systems less. (Note: Structure is
high for Harrier at c. 32% of Mech & Struct.)

OSMC/OSCAR

Similar hardware.

Different approaches.



- COTS benefits.
- But 'old way' too.
- 'It depends!'



Summary

- How to go from ‘thought to thing’ in an affordable way?
- Is supporting what we build affordable?
- Can we learn from old systems when new ones differ?
- Is it possible to ‘capture’ the future in costing?

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Thank You