2011-05-11

Costing Complex Products, Operations & Support

Pryce, Michael

Monterey, California. Naval Postgraduate School

The University of Manchester
Manchester
Business School

NAVAL
POSTGRADUATE
SCHOOL

Costing Complex Products, Operations & Support

Dr Michael Pryce,

Manchester Business School,

8th Annual Acquisition Research Symposium, Monterey

12th May 2011

This material is based upon work supported by the Naval Postgraduate School Acquisition Research Program under Grant No. N00244-10-1-0072.

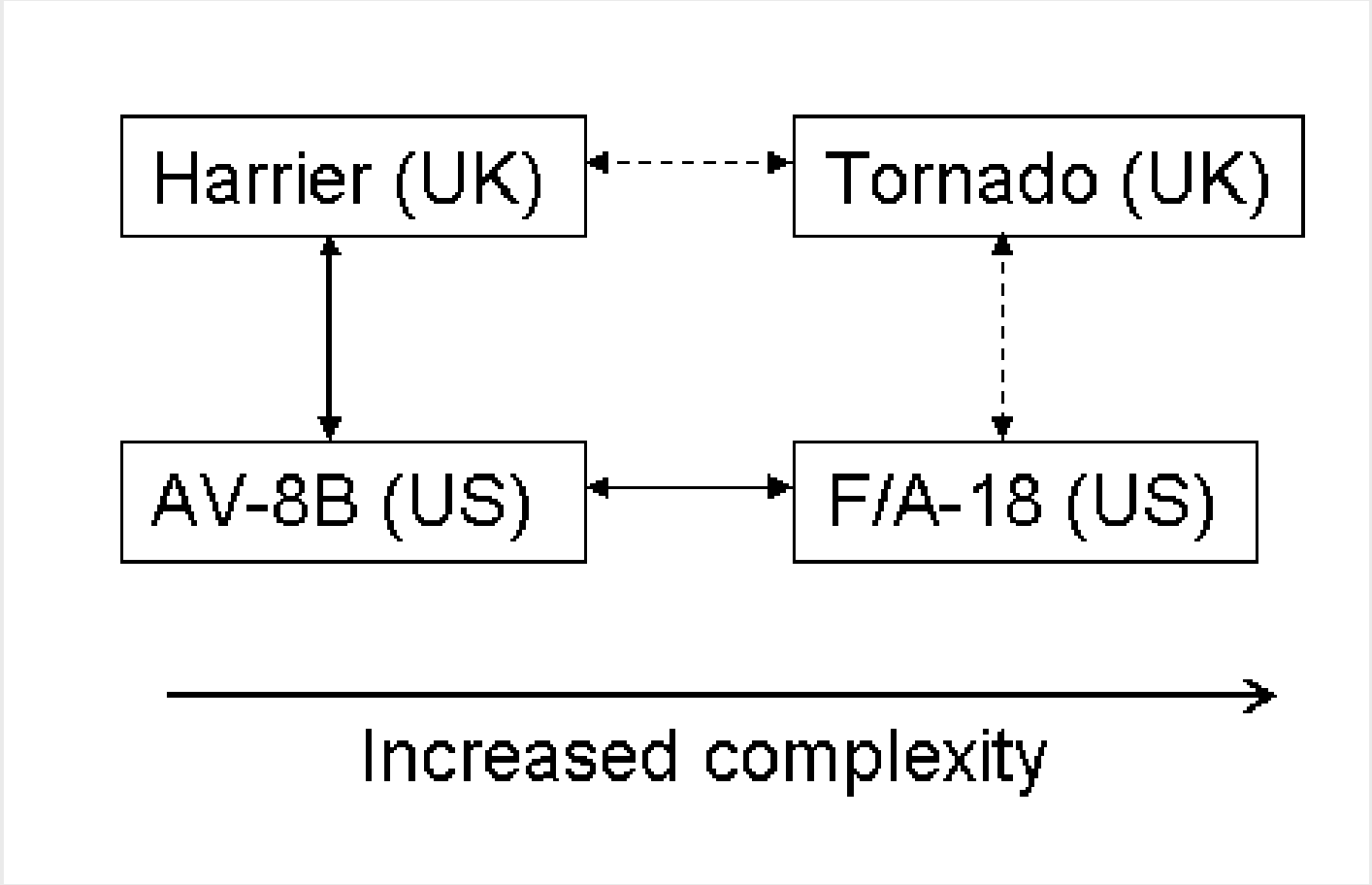
Background

- 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

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

Sortie length effects:

Increasing sortie duration by factor ‘t’ increases occurrences by function √t and decreases rates per flying hour by the ratio 1/ √t

Sources: MACE/BAES/VAMOSC

Initial findings review

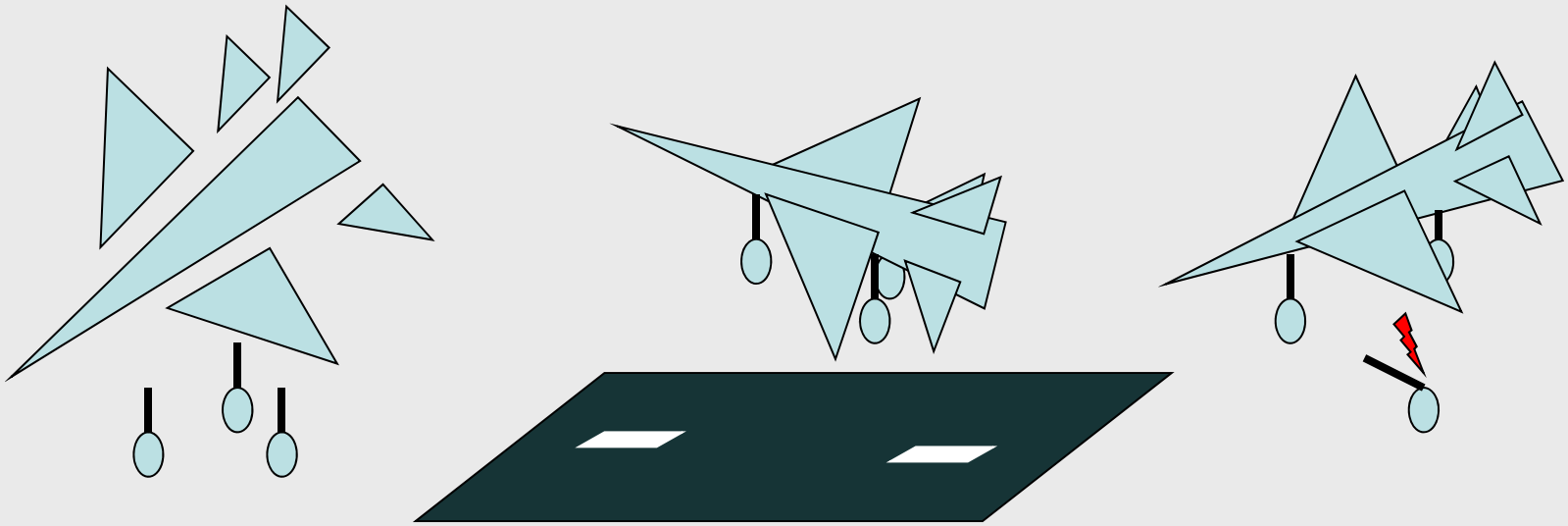
- Assumption is that prediction of these rates (Arisings/Op effects) are more accurate than predictions of costs.
- Literature bears this out.
- Are good proxies for costs, but do not give cost figures.
- Differences mainly due to operational factors, e.g. sortie profile (high/low altitude etc.) as well 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?

Thank You