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UDT 2019 May 2019 - *Nigel Whybrow*



Really Managing to Design

Marine

Land

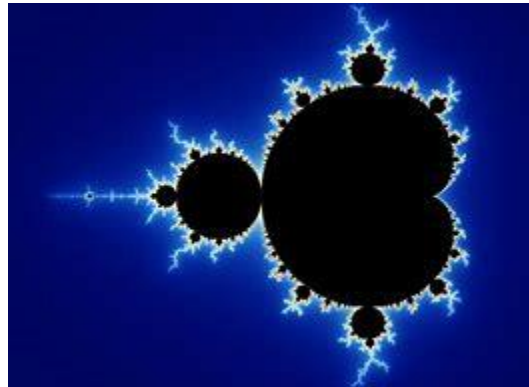
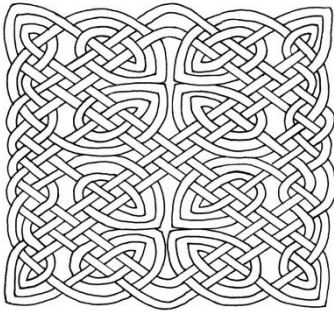
Aviation

Nuclear

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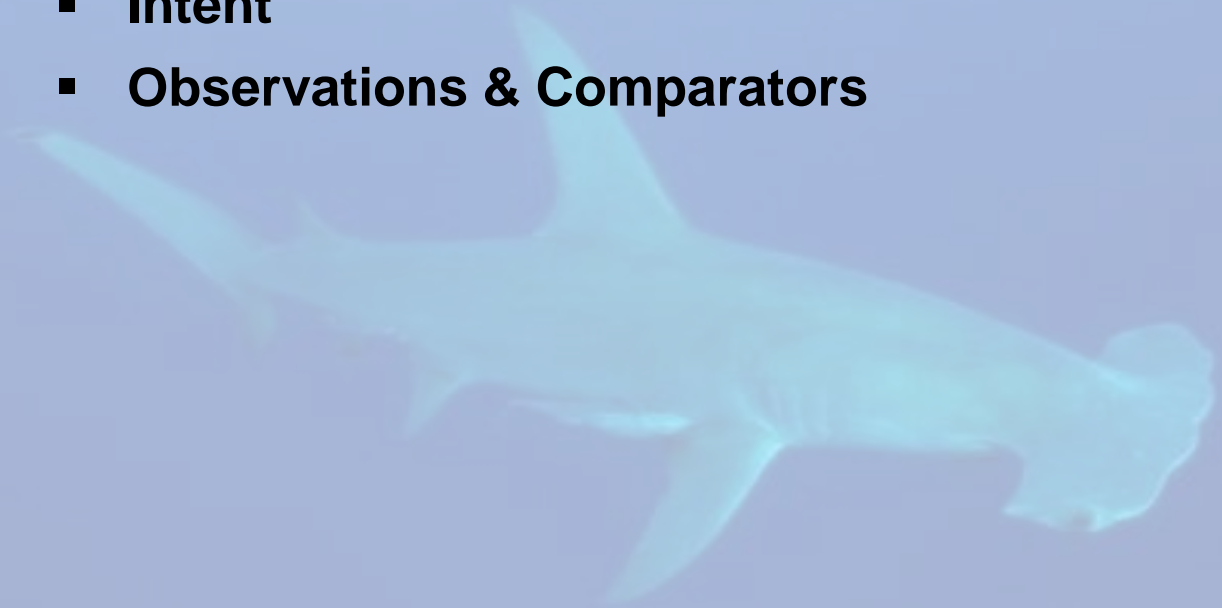
Intent

- **This paper and presentation discuss measures to improve the execution and outturn of major design-based projects in the underwater domain**
- **‘Simple rules need not produce complex solutions’**



Really Managing to Design – Content 1

- **Intent**
- **Observations & Comparators**



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Really Managing to Design – Content 2

- **Intent**
- **Observations & Comparators**
- **Design as an Art**
- **Design as a Science**



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Really Managing to Design – Content 3

- Intent
- Observations & Comparators
- Design as an Art
- Design as a Science
- **Effective Management of Design**
 - 3 core strands
 - Key factor - *Authority*
- **Conclusions**

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Observations & Comparisons

- **Observe Major Underwater Systems projects showing:**
 - Growth in platform size and complexity
 - application of safety considerations & processes
 - mixed correlation with increased performance or improved availability
 - Reduction in fleet sizes and the extension of design & build durations and of operational lives
 - New 'Design' and 'Technology' have not mitigated the above trends
- **Comparators**
 - Offshore Oil, Space, Civil Aviation *do not show similar trends in size or technical complexity*
 - Construction *also not showing similar trends in programme complexity* - new approach introduced, 'Progressive design & build'
- **Underwater systems *should not be uniquely different or difficult* - *has 'design' lost its way?***

Design as an Art

- **Inspiration**
- **Intuition**
- **Vision**
- **Creation**
- **Freedom to synthesise**
 - For us ...design as the art of applying technology



Design as a Science

- **Application of :**

- Experience
- Appropriate technology & components

- **Analysis**

- Evaluation & Balance
- Rigour - argument & evidence

- **Structured working**

- Rational steps on secure foundations
- Building to validated and accepted solution

====> *Justifiable Decision Making & Good Design*



Seek the Best of Both

- **Insightful, effective, affordable solutions**
- **Valid, useful and timely outputs, through:**
 - Output focus
 - Inventiveness
 - Thoroughness
 - Functional and material robustness
 - Authoritative decision making



Key elements

- Experience and review of projects and programmes in this domain indicate that successful design projects have adopted an/or generated the following key elements:
 - Appropriate **Design Philosophy**
 - Suitable **Way of Working** (management approach)
 - Realistic **Project Context and Enablers**
- Stakeholder support was corralled and exploited to maintain need and funding through
- **Real (Design) Authority** willing to drive the project

Contribution Focussed Design

- Design philosophy based on achievement of principal functional INTEGRITY
 - Safety, Availability and Effectiveness
- Focus on the leading providers of that Integrity
 - *and* eliminate the lesser contributors
- Attention and system/equipment investment to be on those design elements, SQEP and approaches that *contribute most directly* to the achievement of primary functional Integrity
- Lesser design elements would be *eliminated* unless they can be shown to be a more economic alternative to further enhancement of the primary design element / contributors
- **Simplicity** through *structured reduction of complexity*

Progressive Definition (high level)

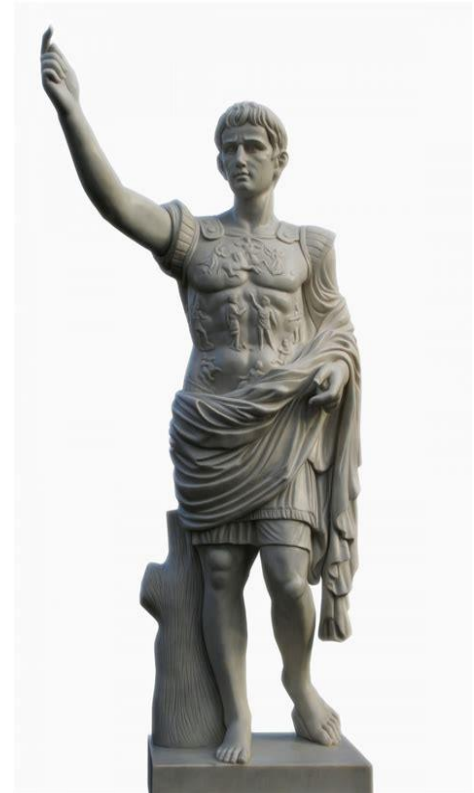
- Stepwise definition – steady closure (low rework)
via:
 - Matched refinement of the **Specification & Design Solution**
 - Direct **Certification** of the design material in train
 - Assessment of **Maturity** of the Design Solution
 - Assessment of the **Suitability** of the Design Solution
 - Authoritative **Direction** & Management
 - Clarity of intent and outcomes
 - Measurement of work completeness, Schedule Adherence, EVM arrangements

Realistic Project Context & Enablers

- **Ambition and Capacity**
 - Design features to assist assembly and support
 - Margins - modularity & openness, standardisation (not attempting *too much*)
- **Project Pace**
 - Managed transition from Design to Build – not starting build with insufficient maturity so start design early and transition incrementally and consciously
- **Timing (in the Enterprise)**
 - Churn – maintain design iteration and batch size
 - Balanced operation of the enterprise and the programmes to keep the designers, suppliers & builders comfortably busy whilst developing them and the knowledge base
- **Access to New Components (New Technology and designs)**
- **Processes, Tools, Data (IPR) and Information (critical factors)**
- **Location, Accessibility and Security**

Real (Design) Authority

- **Attention (& Experience)**
- **Comprehension & Clarity**
- **Simplicity**
- **Balance**
- **Controlling Mind**
 - Individual / small group empowered informed and able to understand, decide & direct
 - Responsible for the overall goodness of the product and schedule

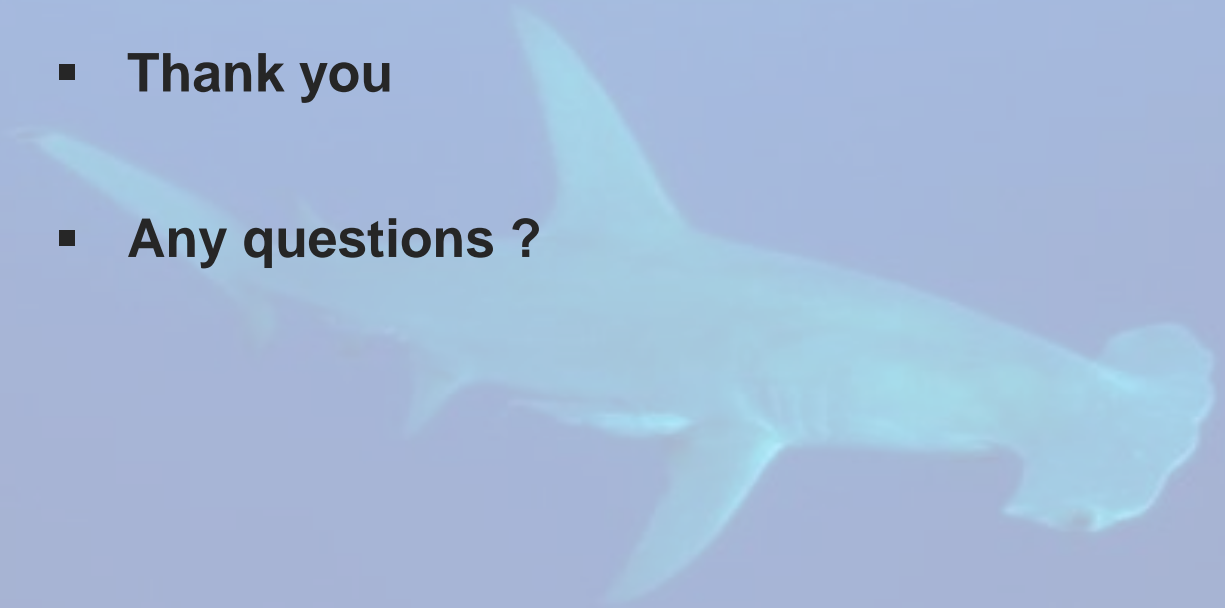


Conclusions (effective design requires...)

- Core team working as **Agent** with Design Authority between Customer & Suppliers
- Three key elements for well managed, good design :
 - Appropriate **Design Philosophy**
 - i.e. *Contribution Focussed Design* (Integrity)
 - Suitable **Way of Working** (management approach)
 - i.e. *Progressive Definition*
 - Realistic **Project Context and Enablers**
 - i.e. *Coherent Requirement* ⇔ *Margins & Pace*
 - These elements must be complementary and coherent
- All enabled and directed through informed and confident decision making, by the **Controlling Mind**

Really Managing to Design

- **Thank you**
- **Any questions ?**



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