



A Systems Engineering Approach to Unhardened Collective Protection

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Current UK COLPRO systems



Porton Liner

- Integrates with GP tent
 - 3.7m x 3.7m
 - 7.3m x 5.5m
- Interconnection via corridors
- Single/Twin airlock

Current UK COLPRO systems



Winterbourne Liner

- 18ft x 24ft
- No interconnection
- Single airlock

Current UK COLPRO Systems User Feedback

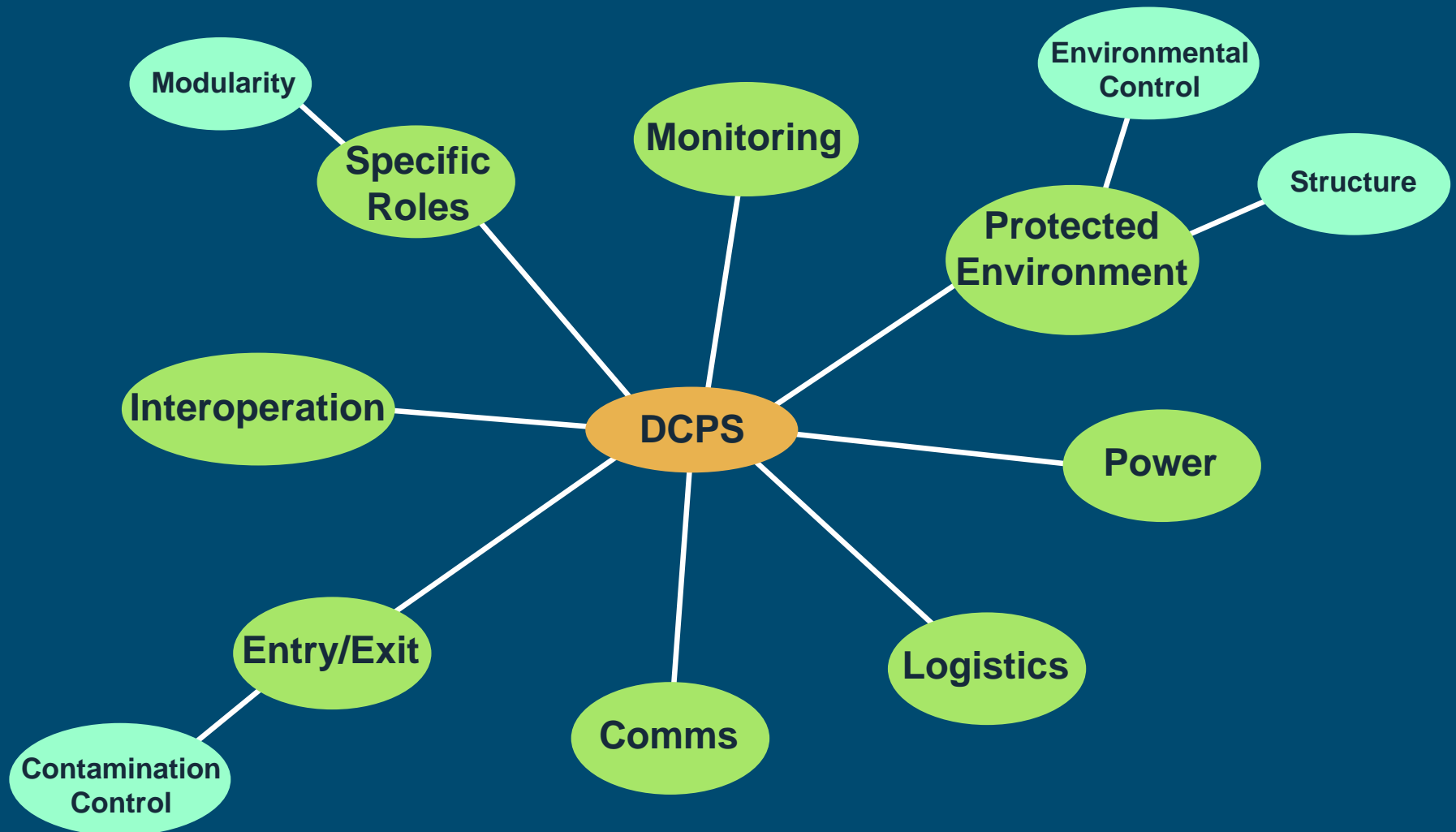
- Logistic burden
 - Too slow to erect/strike
 - Separate elements are too heavy
 - Pack size is too large
 - Too much manpower required
- Lack of modularity
- Restrictive size
- Inadequate thermal control
- Entry/exit slow



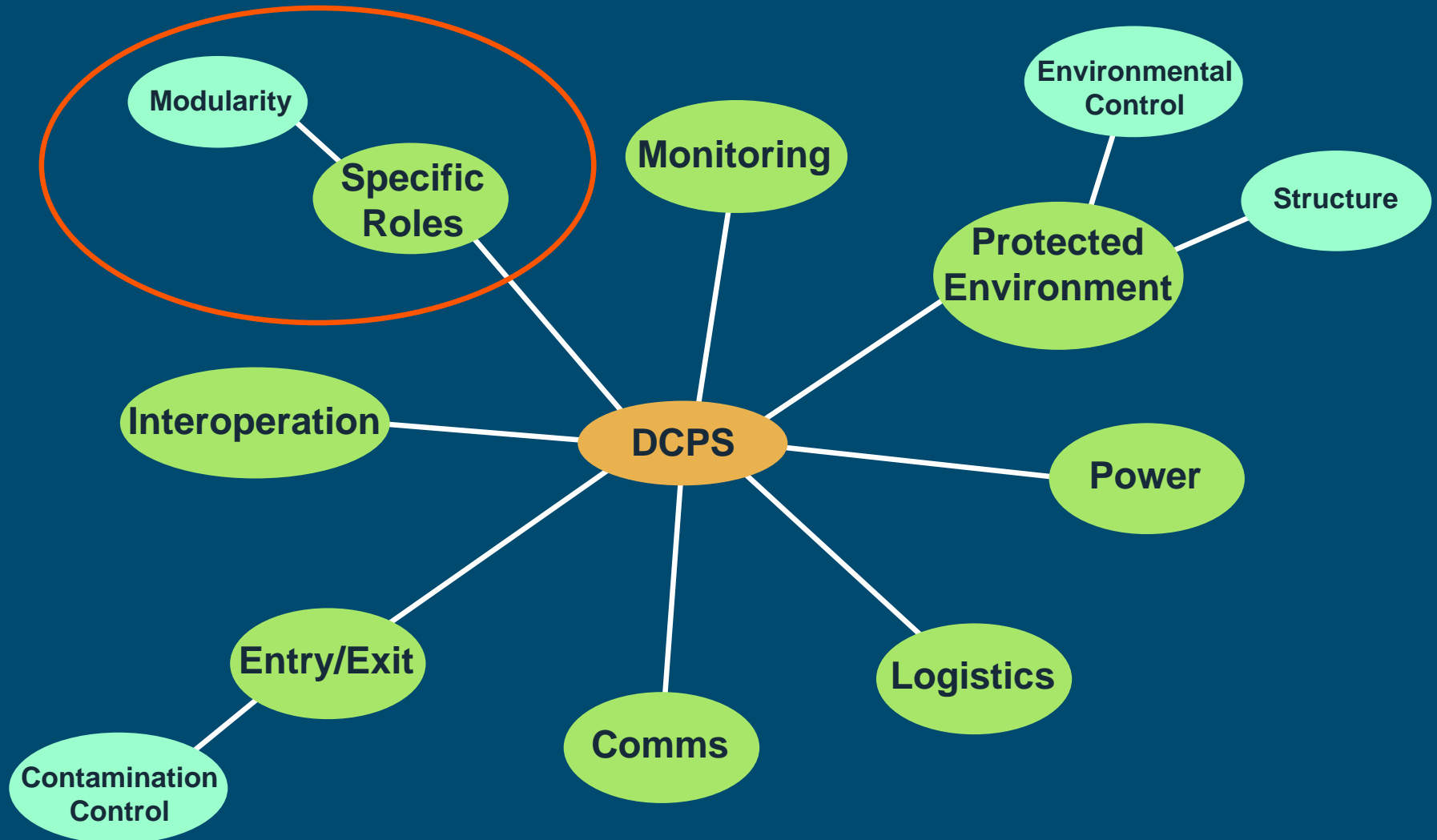
Future UK COLPRO System

- Deployable ColPro System (DCPS)
 - due in service 2014
- Definition and Scope
 - by definition will be mobile/deployable
 - exact nature yet to be defined
 - will incorporate advanced technologies
 - will provide a whole system solution
 - will address the drawbacks associated with current systems

DCPS System Domain (simplified)



DCPS System Domain (simplified)



DCPS - Specific Roles

Essential



Desirable

Role 2+ Medical
Rapid Intervention Hospital
Aircrew FOB
Role 3 Field Hospital
Brigade HQ
Force Support Hospital (part)
RFA Ships
Chartered Ships
Divisional HQ
Joint Forces HQ
REME optical and electronic repair
Accommodation camps

Highly Mobile



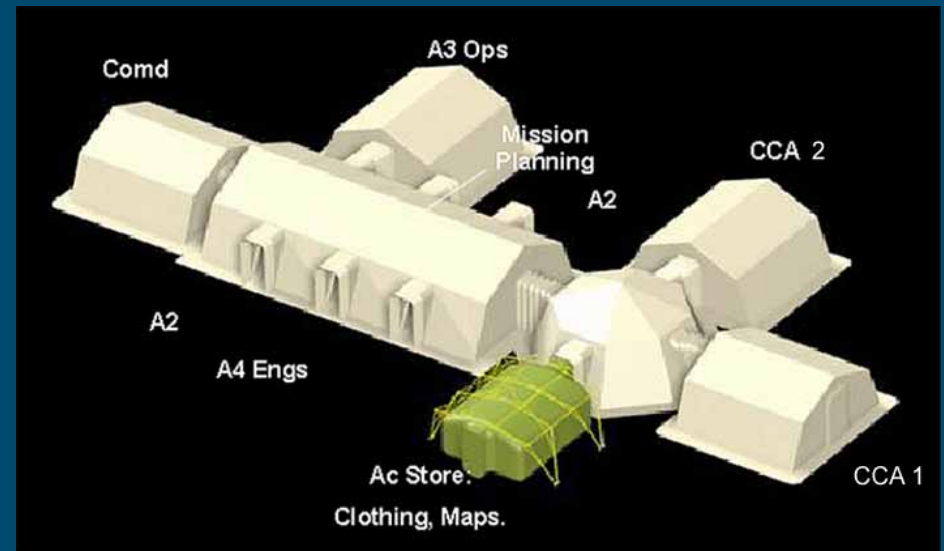
Mainly Static

Role 2+ Medical
Rapid Intervention Hospital
Brigade HQ
Role 3 Field Hospital
REME optical and electronic repair
Divisional HQ
Aircrew FOB
Joint Forces HQ
Force Support Hospital (part)
Accommodation camps
Chartered Ships
RFA Ships

DCPS - Specific Roles

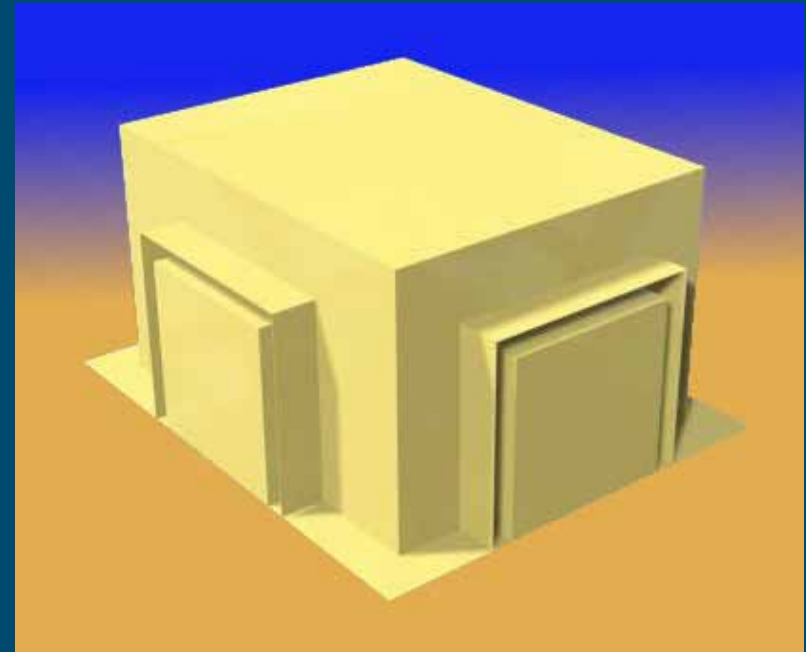
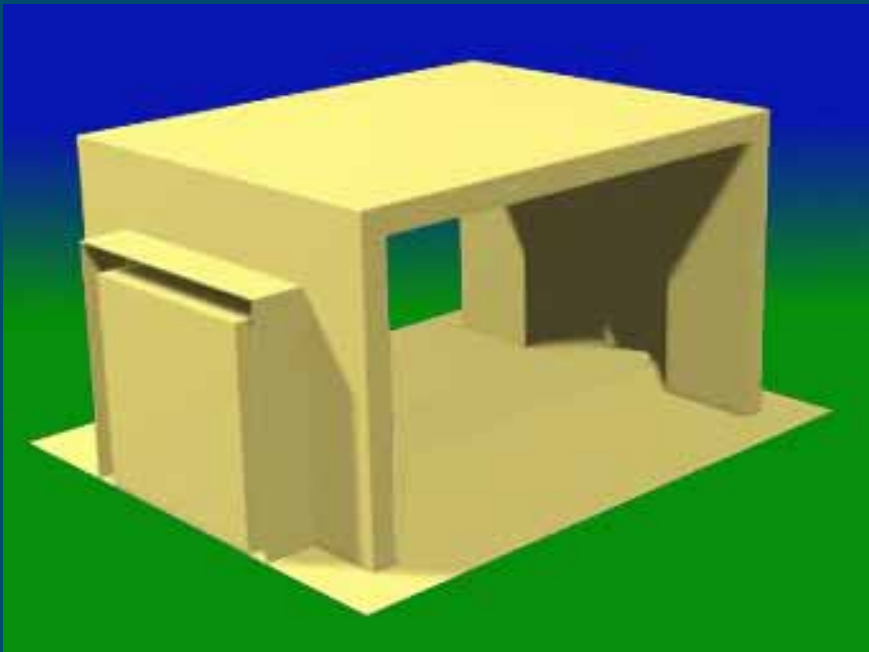
- Proposed high-level System Requirements for unhardened DCPS

- Function as replacement tentage
- Provide protection to IPE levels
- Low logistic burden
- Modularity / flexibility
- Optimise entry/exit flow rates
- Provide acceptable environmental conditions within the TFA



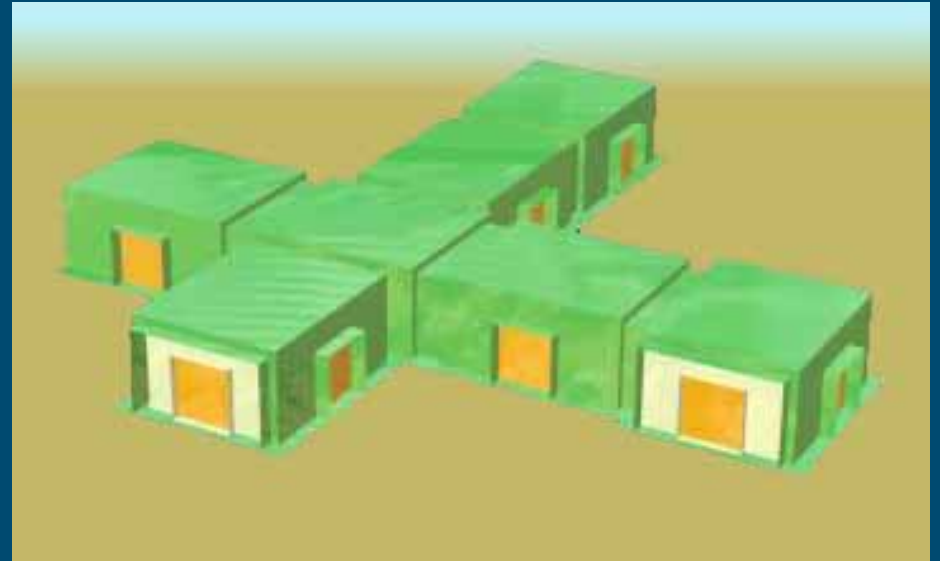
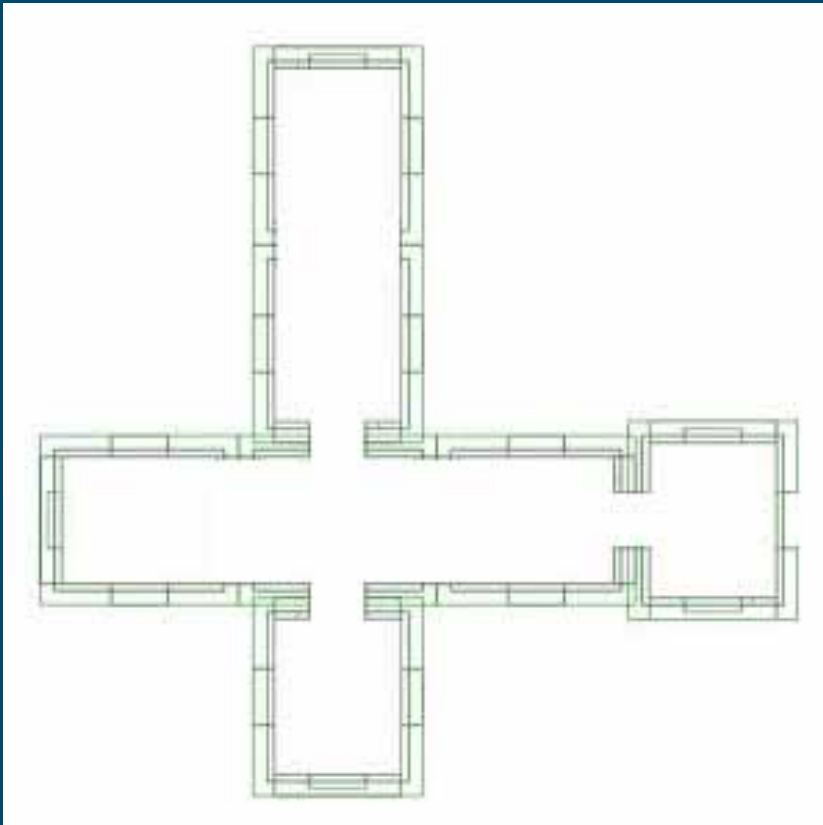
DCPS - Specific Roles

- Modular concept of optimal size and configuration (6m x 4m)
 - provide stand alone facility
 - facilitate minimum and maximum spatial requirements
 - facilitate multi-way interconnection
- Allow the comparison of structural technologies

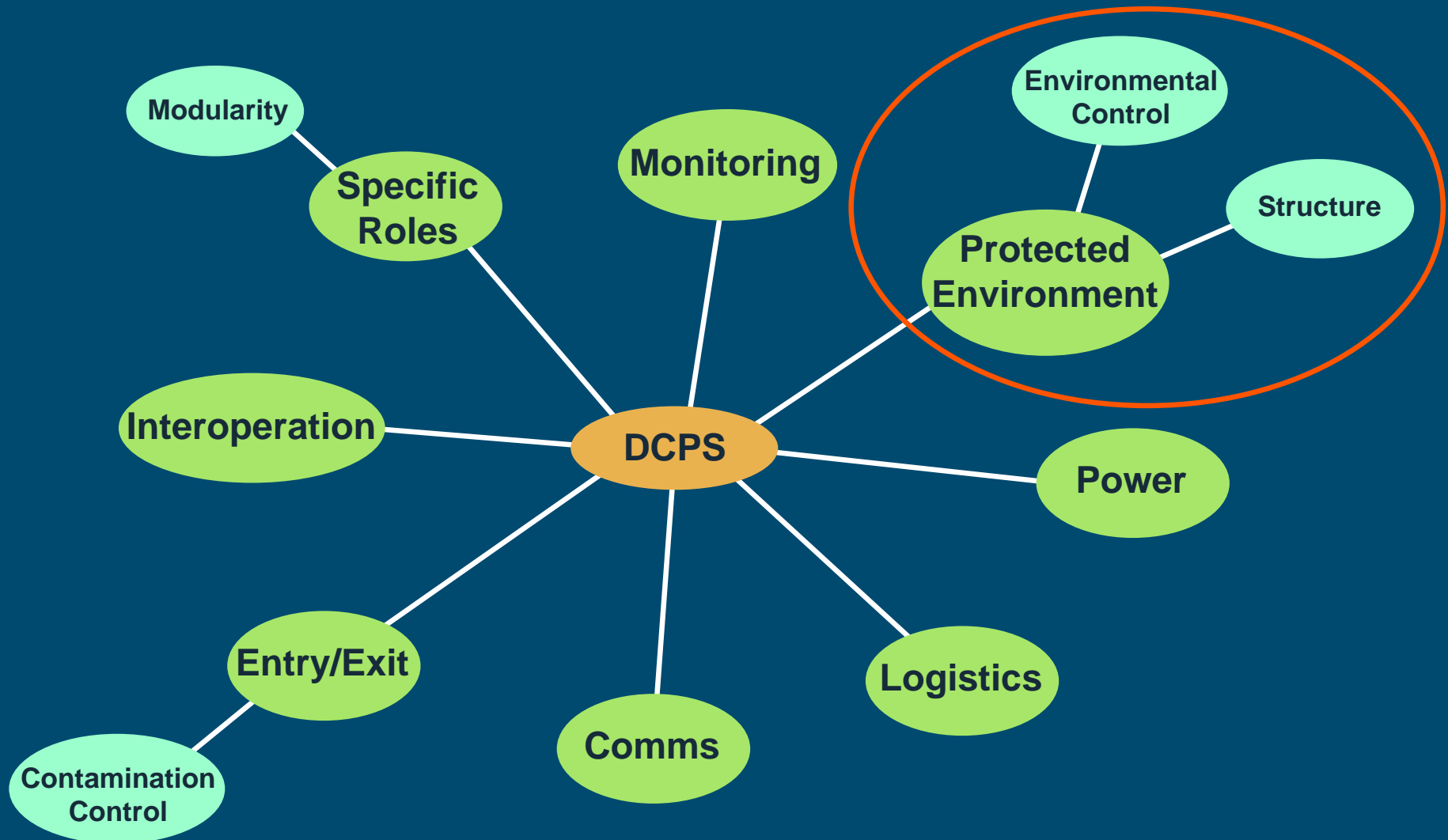


DCPS - Specific Roles

Modules configured to replicate a Role 2+ Medical facility
(as used in Op.Telic)

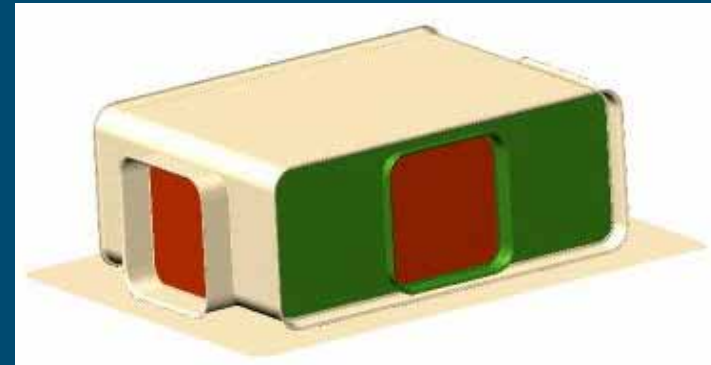


DCPS System Domain (simplified)



DCPS - Protected Environment

- Modules constructed in CAD utilising various structural technologies
 - Aircell
 - Airbeam
 - Frame/tent/liner
 - ISO container
 - Stressed arch
 - Mechanical folding systems
 - Geodesic Dome
 - Geotensic structure
 - Modular panel systems
 - Self-erecting



DCPS - Protected Environment

- Structural technologies down-selected on their anticipated performance against an expanded set of system requirements
- Down-selected technologies
 - Aircell
 - Airbeam
 - ISO container
 - Frame/tent/liner
 - Stressed arch
 - Mechanical folding systems

Exceeds requirements	Meets requirements	Narrowly misses requirement	Completely misses requirement

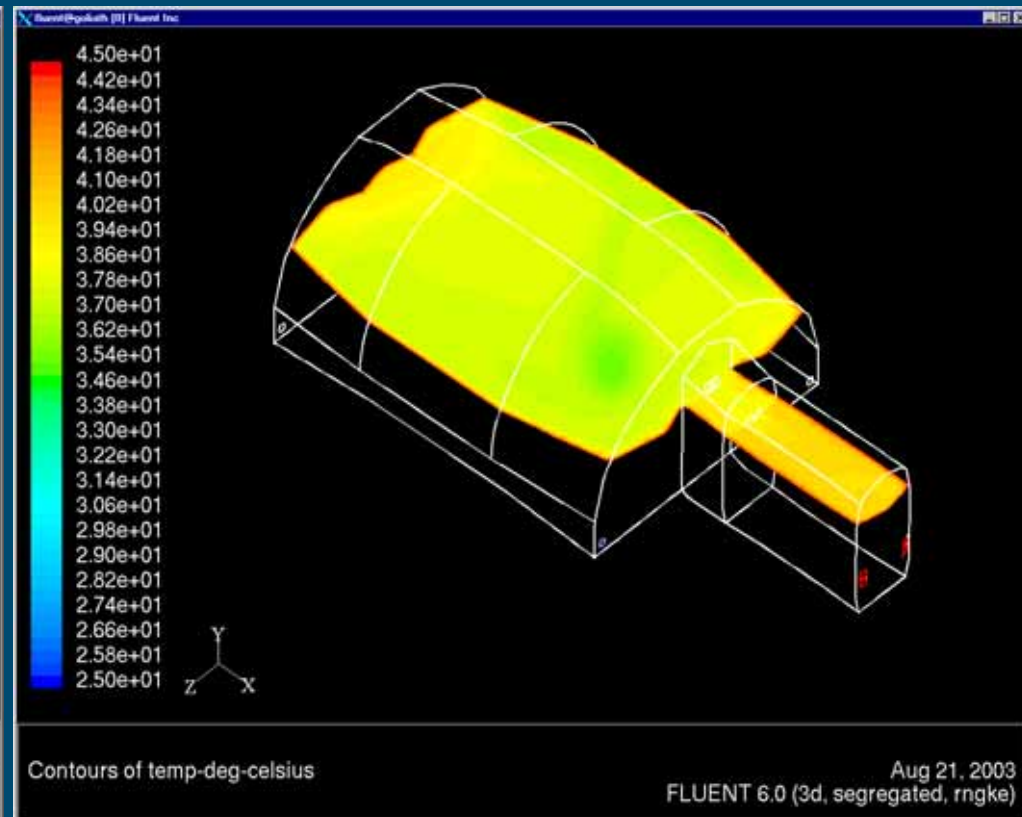
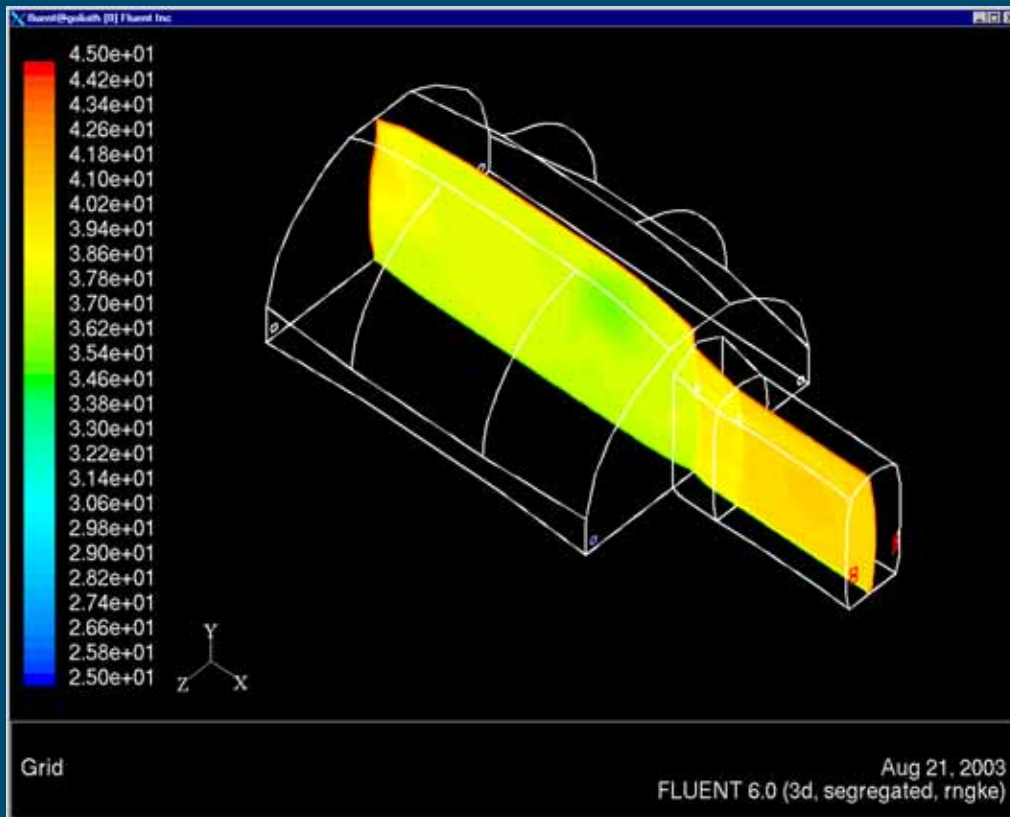
	ISO Container	Airbeam and Aircell	Inflatable Room	Stressed Arch	Flexible-Pole Dome	Frame Tent and liner	Modular panels	Mechanical Folding Systems	Self Erecting	Geodesic Domes	Geotensic Structures	Seal Donor Buildings
Can be designed to connect with vehicles	Yellow	Green	Red	Green	Yellow	Yellow	Yellow	Green	Yellow	Red	Red	Red
Can easily subdivide interior	Yellow	Green	Green	Yellow	Yellow	Blue	Blue	Yellow	Red	Red	Red	Red
Minimum loose parts to transport	Blue	Blue	Blue	Green	Red	Red	Red	Green	Blue	Red	Red	Green
Rapidly erected and positioned	Red	Blue	Blue	Blue	Yellow	Red	Red	Blue	Blue	Red	Red	Red
Low maintenance technology	Blue	Green	Green	Green	Green	Red	Yellow	Blue	Green	Red	Red	Red
Will erect on a solid floor	Blue	Blue	Blue	Red	Red	Yellow	Blue	Green	Blue	Blue	Blue	Blue
Will remain standing stand if AFU fails	Blue	Green	Red	Blue	Green	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Technology resilient to effects of weather	Blue	Blue	Red	Blue	Red	Blue	Green	Blue	Yellow	Green	Green	Green
Technology resilient to military use	Blue	Blue	Green	Blue	Red	Blue	Yellow	Yellow	Yellow	Red	Red	Green
Easily sealed against CW liquid and vapour	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Yellow	Green	Red	Yellow	Green
Allows spacious uncluttered interiors	Green	Blue	Blue	Green	Red	Green	Green	Blue	Red	Blue	Blue	Blue
Suitable for medical trolleys and stretchers	Green	Blue	Yellow	Green	Red	Green	Blue	Green	Red	Blue	Blue	Blue
Technology allows modular development	Green	Blue	Green	Green	Blue	Green	Green	Red	Red	Red	Red	Red
Low cost per unit	Red	Yellow	Yellow	Yellow	Blue	Green	Red	Yellow	Blue	Red	Yellow	Yellow

DCPS - Protected Environment

- Environmental modelling utilising CFD
- Validation of model against Porton Liner
 - trials of a half-scale liner in a climatic chamber
- Developed functionality
 - Temperature effects
 - Humidity effects
 - Solar loading
 - Material properties
- Will be used to predict indicative performance of future unhardened DCPS concepts

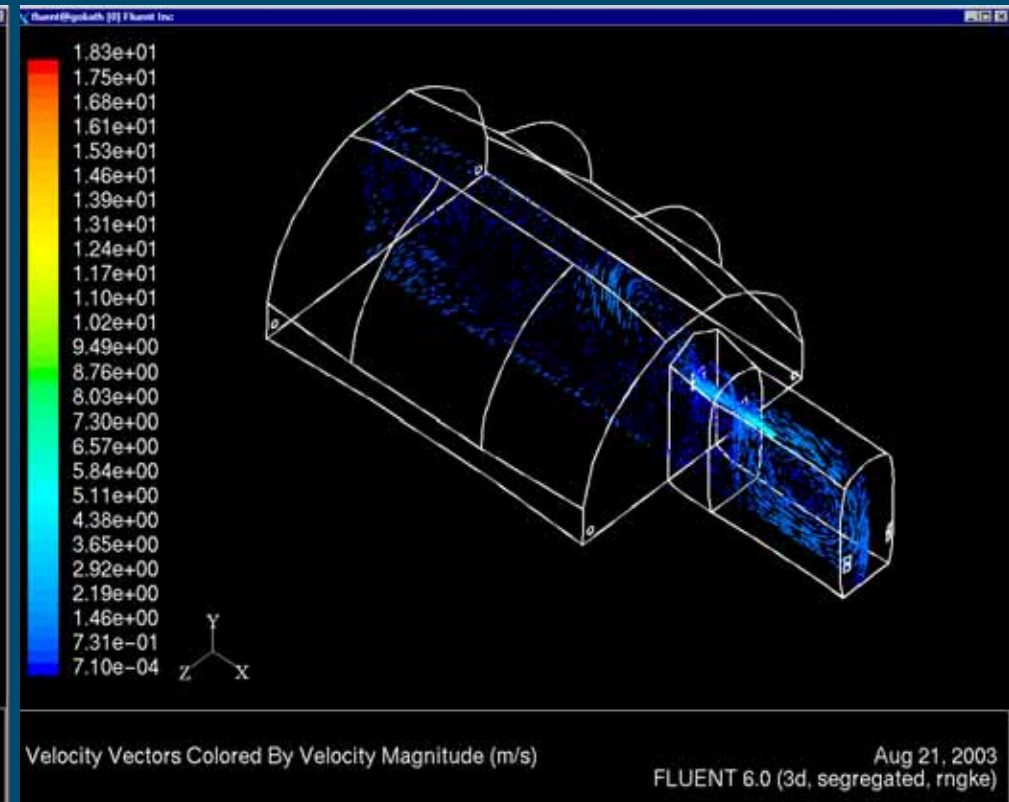
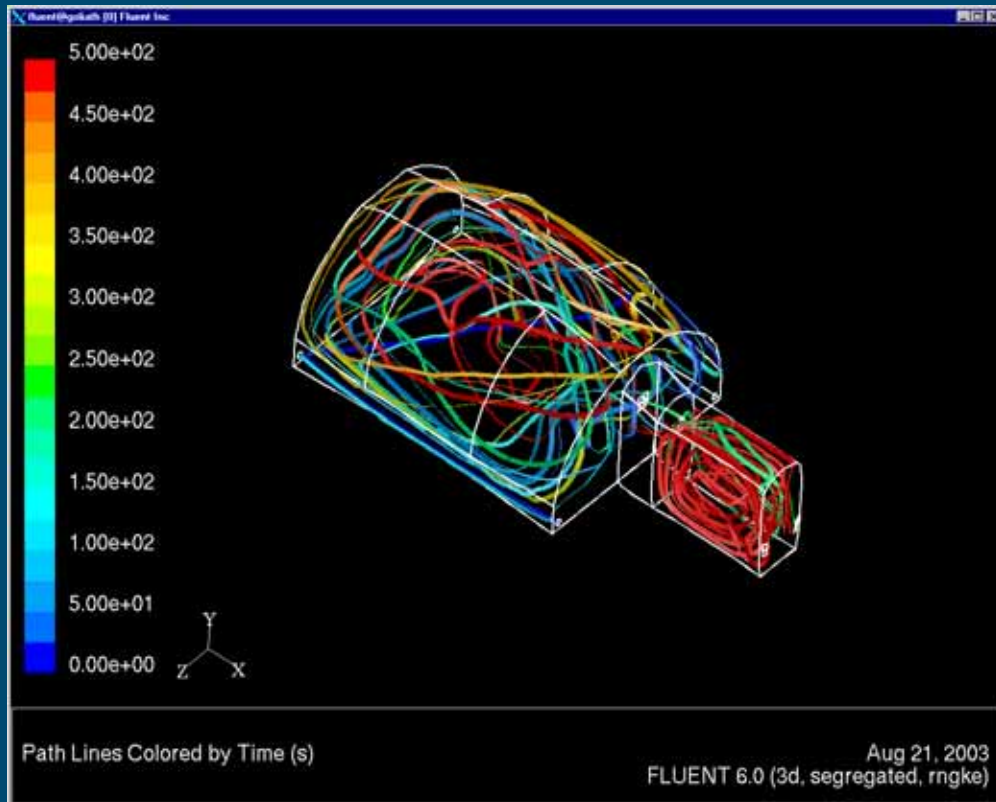
DCPS - Protected Environment

Porton liner CFD model - temperature profiles



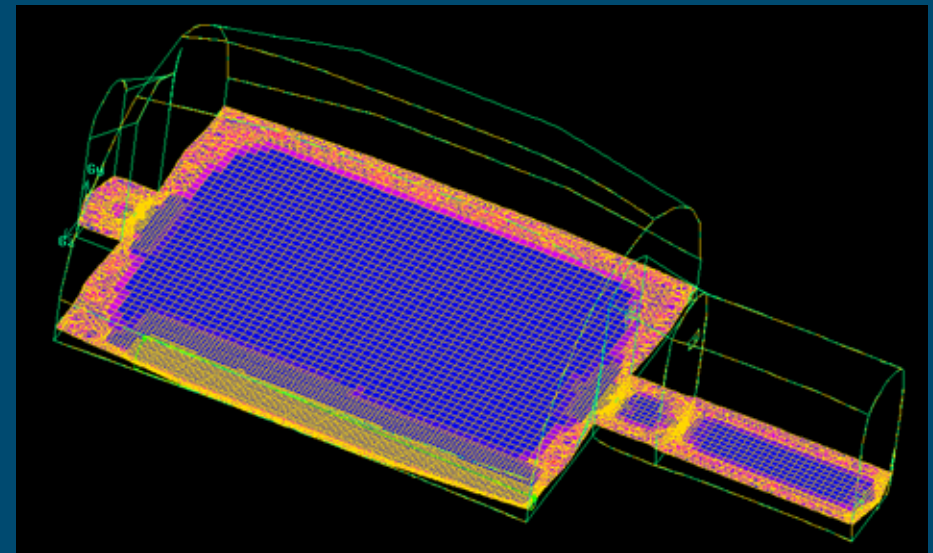
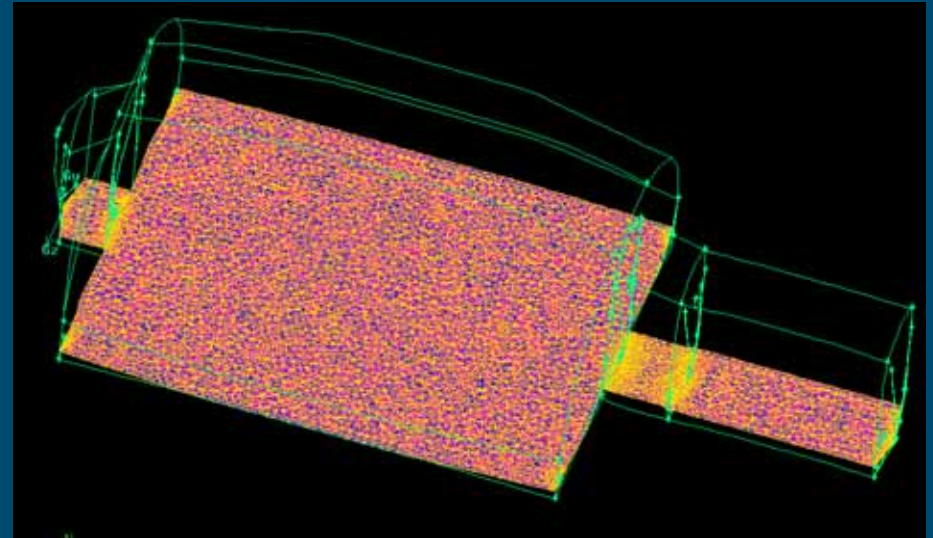
DCPS - Protected Environment

Porton liner CFD model - particle and velocity profiles



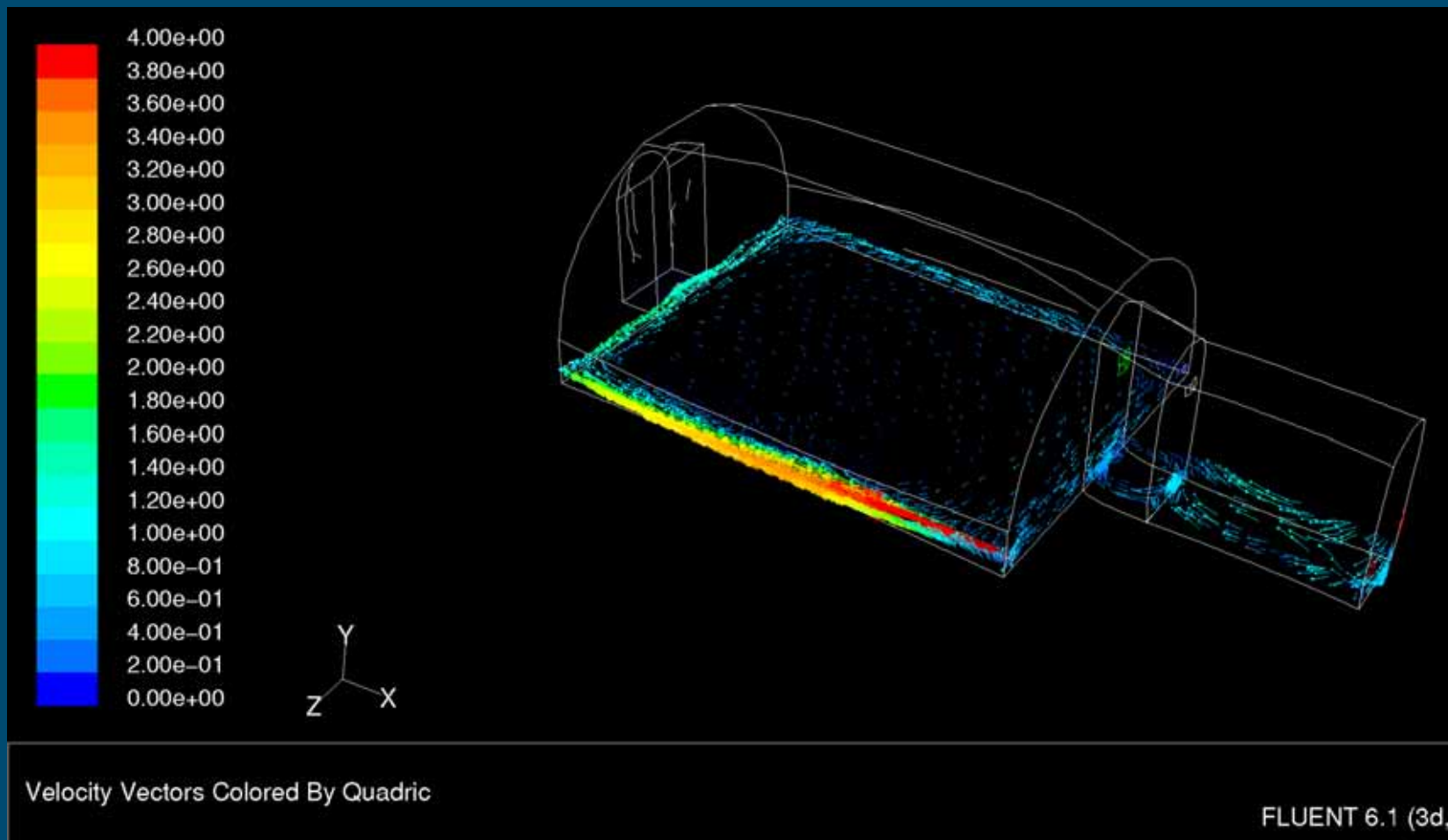
DCPS - Protected Environment

- Refined and structured the mesh
 - Fewer cells means faster computing times
 - Still retaining the detail from previous versions
- Added more detail to model the inlet air flow

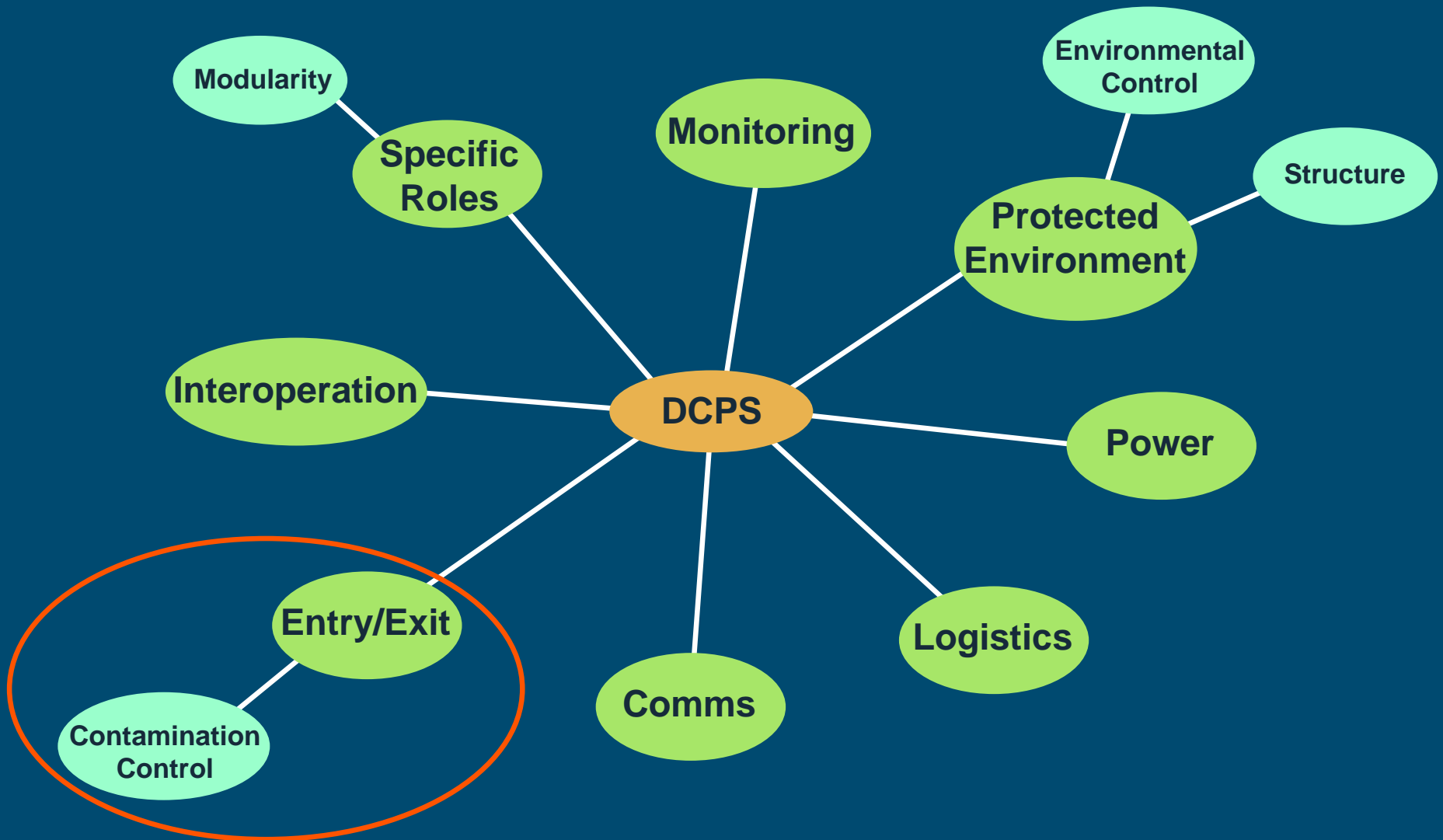


DCPS - Protected Environment

Vectors of velocity magnitude



DCPS System Domain (simplified)



Contamination Control Area (CCA)

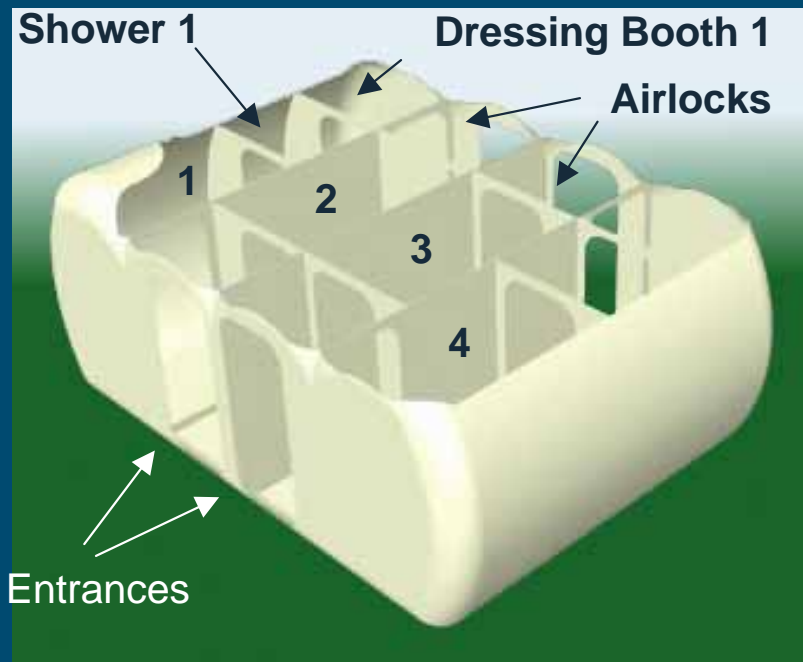
- The CCA is a critical area
- Ineffective decontamination could render system useless
- Presently gives entry bottleneck in system
- Needs to:
 - Accelerate entry of personnel
 - Provide effective decontamination
- Solutions:
 - Ability to identify dirty and clean personnel
 - Fast track entry for clean
 - Accelerated access for dirty personnel (persons/hour)
 - Introduce more effective decontamination procedures



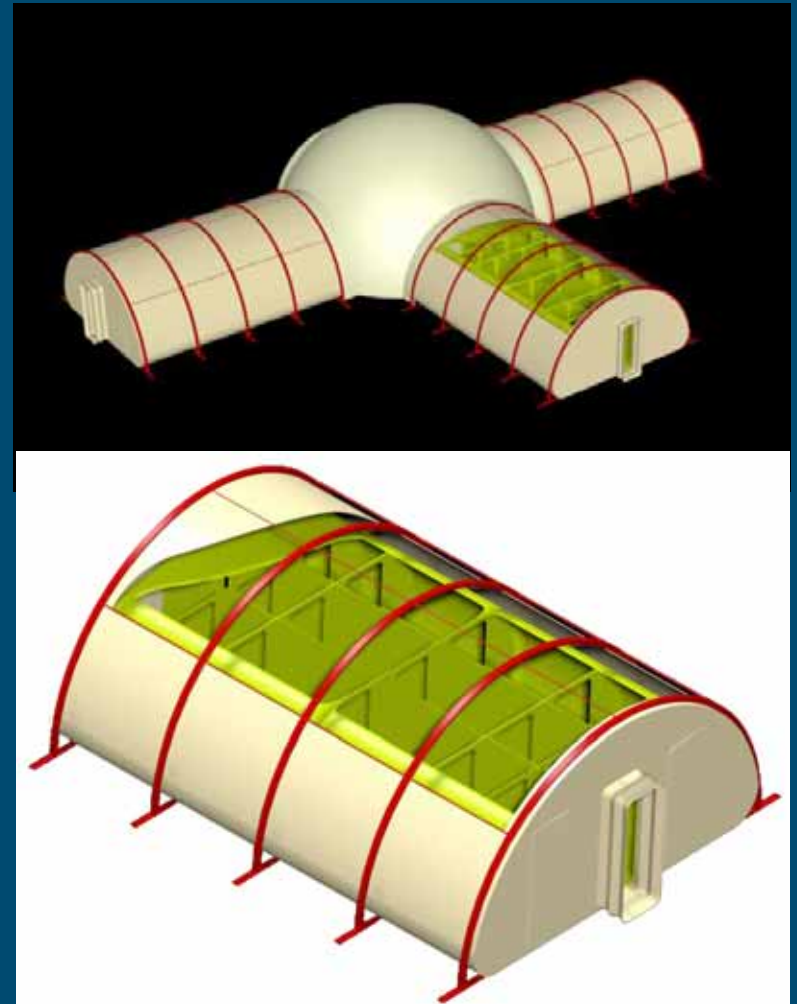
DCPS - Entry/Exit

- Clip-in CCA liner potential benefits
 - More undressing lanes, therefore faster entry rates
 - All contamination is trapped in a disposable liner
 - Shower booths for B&R decontamination
 - Extra CCAs can be easily added to a facility

VHA
lanes
1- 4

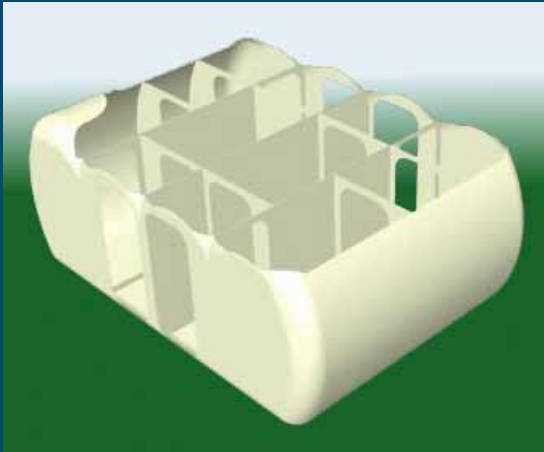


Entry rate 30 per hour, current 7.5 per hour

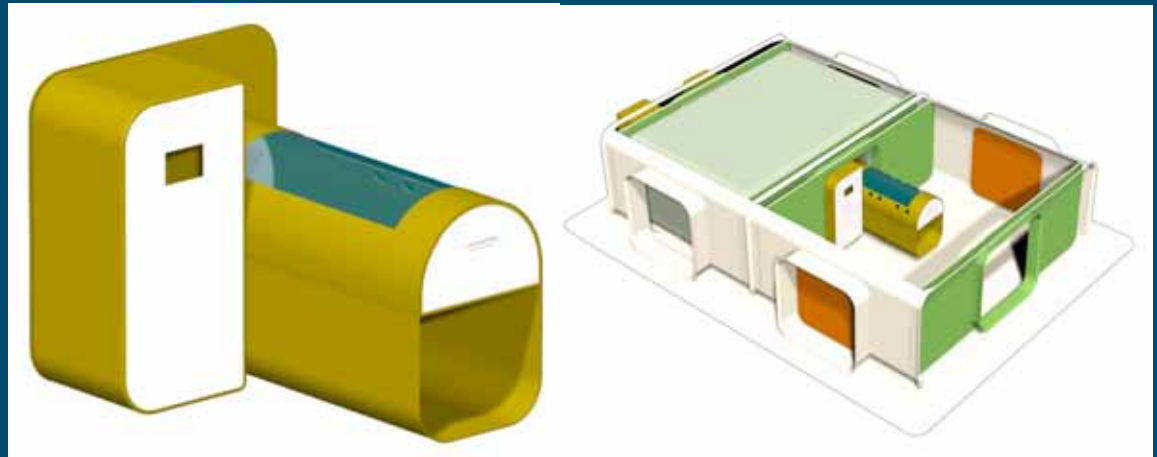


DCPS - Entry/Exit

CCA variants for specific user groups



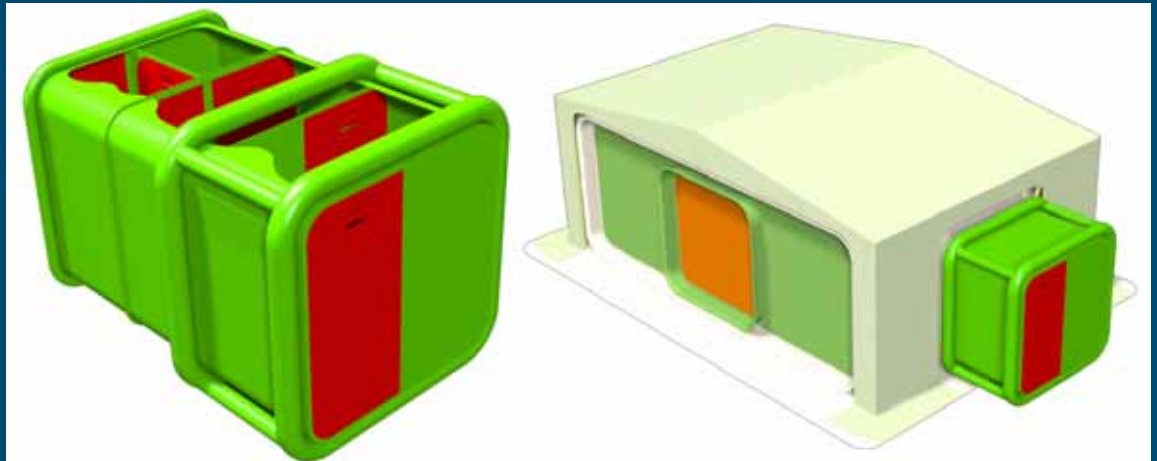
Land users 4-lane CCA



Casualty users-stretcher airlock and CCA liner

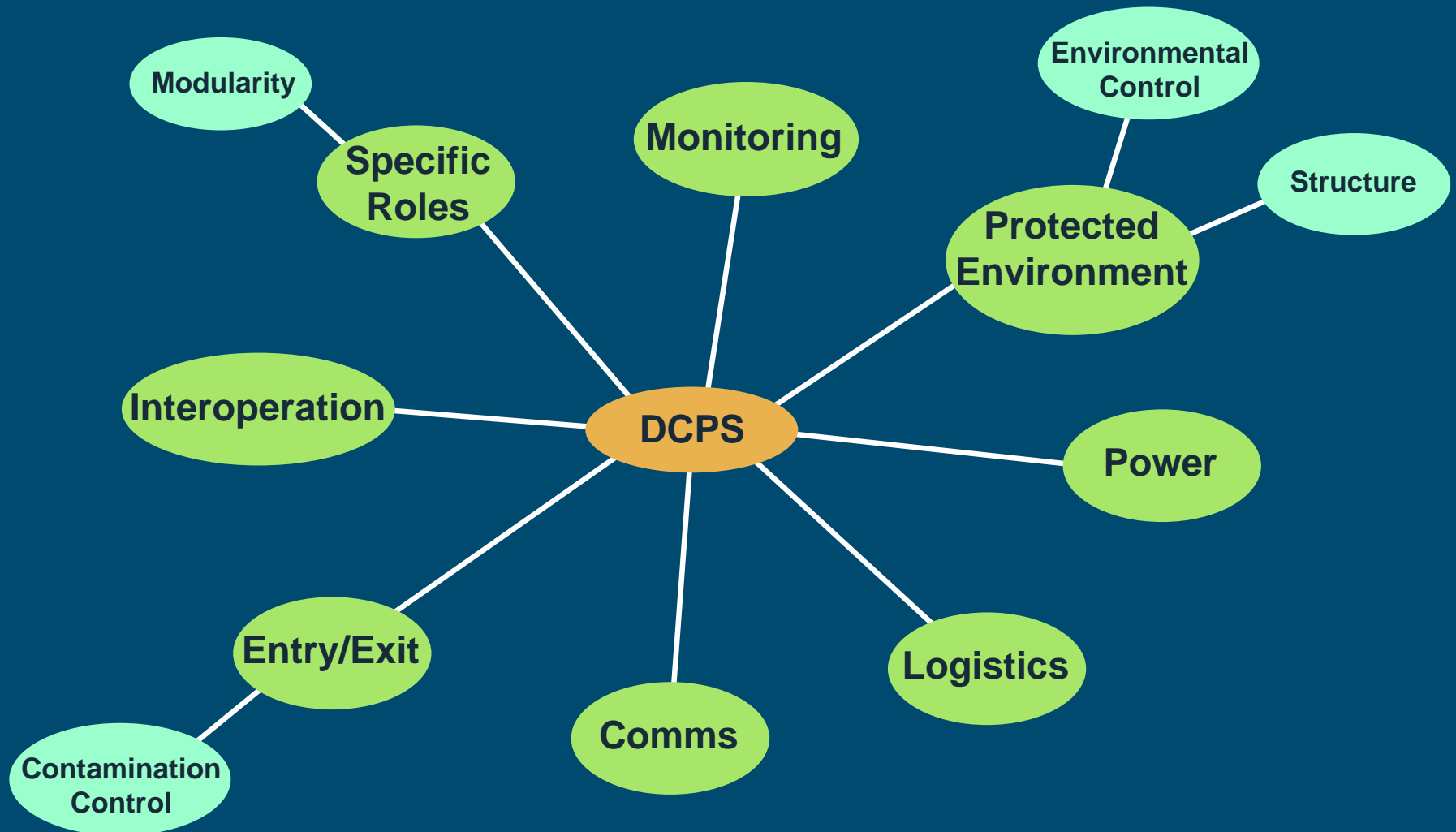


Aircrew users 5-station



Maritime users - minimal size CCA

DCPS System Domain (simplified)



Conclusions

- Range of structural options have been assessed
- Computational Fluid Dynamics (CFD) model has been developed and validated in order to provide an indication of the performance of COLPRO systems
- A range of Contamination Control Area (CCA) system concepts have been developed and assessed

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