
DEFENCE
R&D
DÉFENSE

A Survey of Military Planning Systems

Dr. A. Boukhtouta†, **Dr. F.** Bouak‡, **J.** Berger†, **A.** Bedrouni, **Dr A.** Guitouni†

†Defence Research and Development Canada-Valcartier, Quebec, Canada

‡ Defence Research and Development Canada-Toronto, Ontario, Canada

9th ICCRTS

Copenhagen, Danemark

Outline of the talk

- Objectives
- Mission planning process
- Emerging concepts for military planning systems
- Planning paradigms used
- Military planning systems
- Challenges
- Conclusion

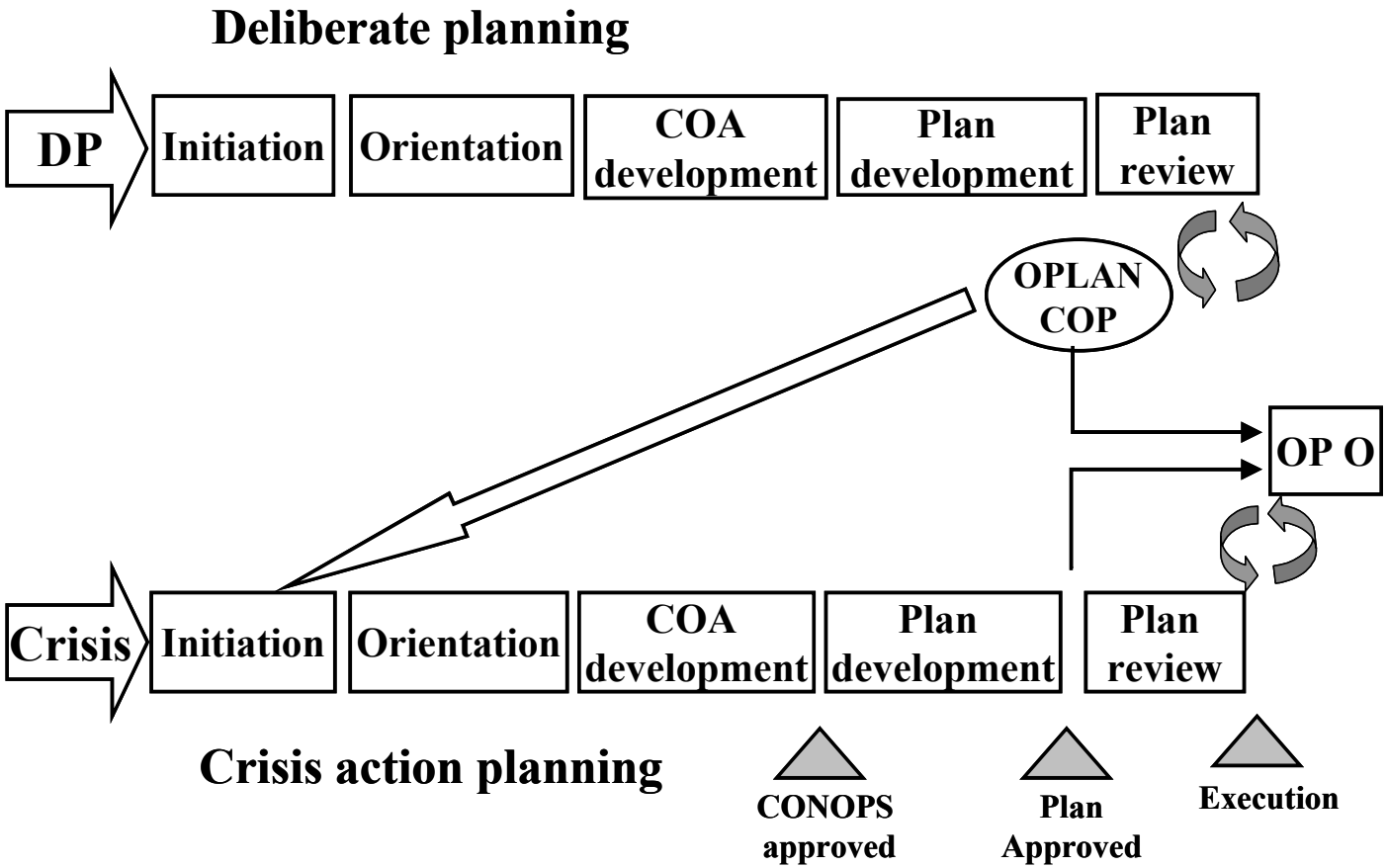
Objectives

- Reviews mission planning and scheduling systems designed to support relevant and specific Air Force and to some extent Joint and Navy forces needs.
- Provides a comprehensive review of functionalities and capabilities of existing military planning systems.
- Provides a brief description of techniques, methods, tools, and procedures used in the existing systems to plan and schedule complex military operations.
- For not having to “reinvent the wheel” the study reviews the military operations that can be handled by existing tools.

Mission Planning Process

- The development of planning systems is usually based on a military doctrinal process
- Military planning doctrinal process is a structured formal process
- Address
  - different levels of planning: Strategic, Operational, and Tactical
  - planning environment: deliberate planning vs. Crisis action planning

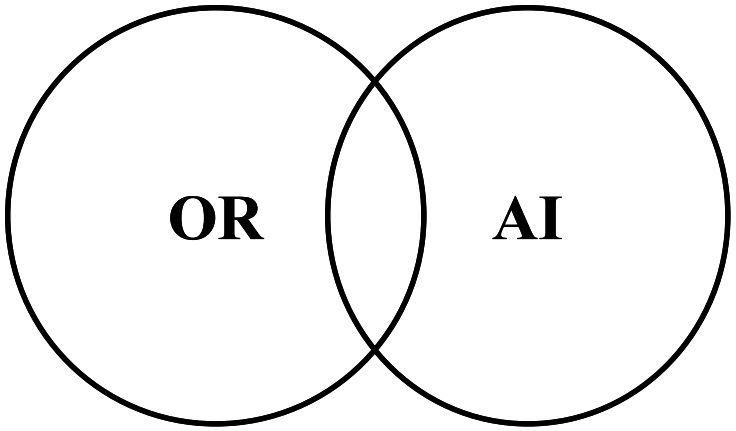
Canadian Operational Planning Process



Emerging concepts for military planning systems

- Distributed continual planning (collaborative planning)
- Network-Centric operations (or Warfare)
  - Relies on computer processing and networked communications technology
- Collaborative planning concept
- Various technologies are used in developing military planning systems.

Paradigms used for planning



- OR: Decision theory & decision theoretic planning
  - probability theory, mathematical programming, game theory, different heuristics,....
- AI: constraint programming, multi-agent systems, data mining, knowledge management, rules, heuristics,....

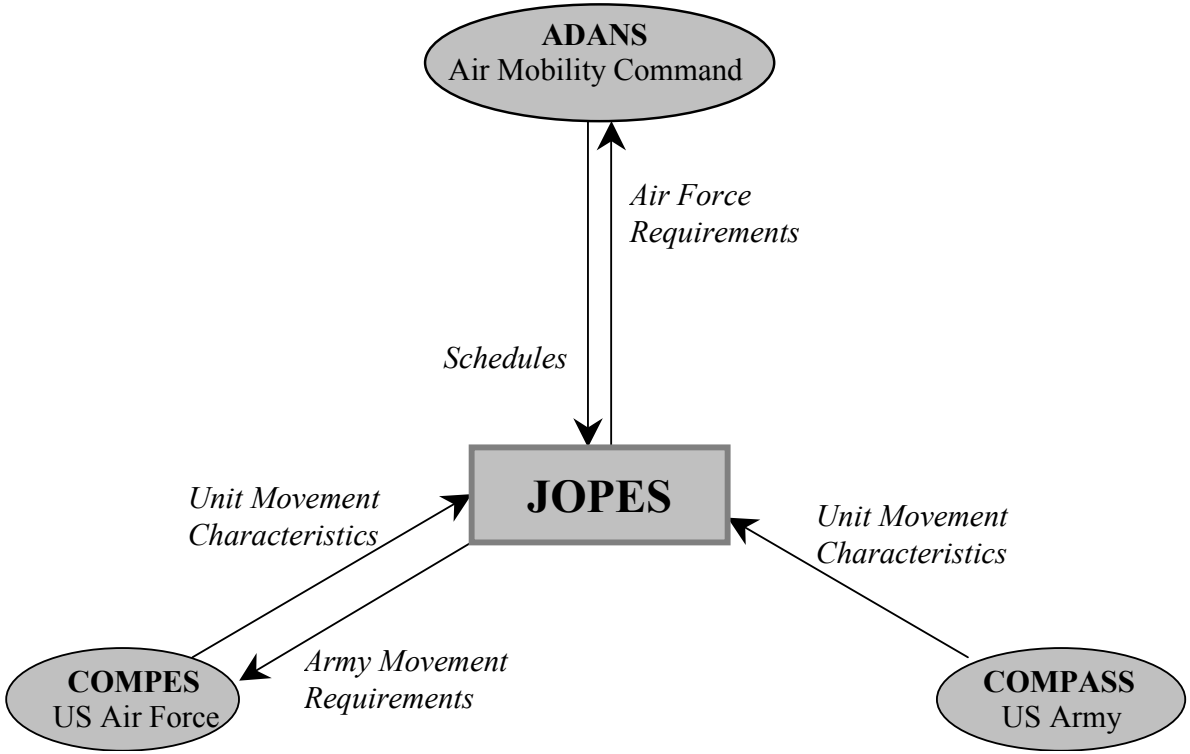
Deployment and Battle Operations systems

	System	**Op**erational or **P**rototype	Artifiical **I**ntelligence, **O**peration **R**esearch or **O**ther	Fully **A**utomated or **S**emi-Automatic	**A**ir Force, **A**rmy, **N**avy, **M**arine **C**orps, **S**pecial **F**orces, **J**oint, (CF, **FRA, NLD, US** or International)	Operations Type: **A**ir, **J**oint, **L**and, **M**aritime or **N**avy	Operational Level	Strategic Level	Tactical Level	Deliberate Planning	Crisis Action Planning	**C**ommercial, **G**overnement or …	**Additional Informations :** **T**ransportation, **L**ogistics, **M**obilization, **D**eployment, **B**attle, **E**mployment, **S**ustainment, **R**edeployment
1	**FOX - Genetic Algorithm (FOX-GA)**	**P**	**AI**	**A**	**USArmy**	**L**			✓		✓	**G**	**B**
2	**Contingency Theater Automated Planning System (CTAPS)**	**Op**	**AI**	**S**	**J**	**A**					✓	**G**	**T, D, B**
3	**Joint Assistant for Deployement and Execution (JADE)**	**P**	**AI**	**S**	**USArmy**	**J**	✓				✓	**G**	**D, B**
4	**Dynamic Analysis and Re-planning Tool (DART)**	**Op**	**AI**	**S**	**J**	**J**		✓		✓	✓	**G**	**T, D, B**
5	**Anticipated Planning Support System (APSS)**	**P**	**AI**	**A**	**USArmy**	**L**			✓		✓	**G**	**B**
6	**Time-Phased Force Deployment Data Editor (TPEDIT)**	**Op**	**OR**	**S**		**J**			✓		✓	**G**	**T, D**
7	**Collaborative Operational Planning System (COPlans)**	**P**	**AI OR**		**Can Air Force**	**A J**	✓					**G**	**L**

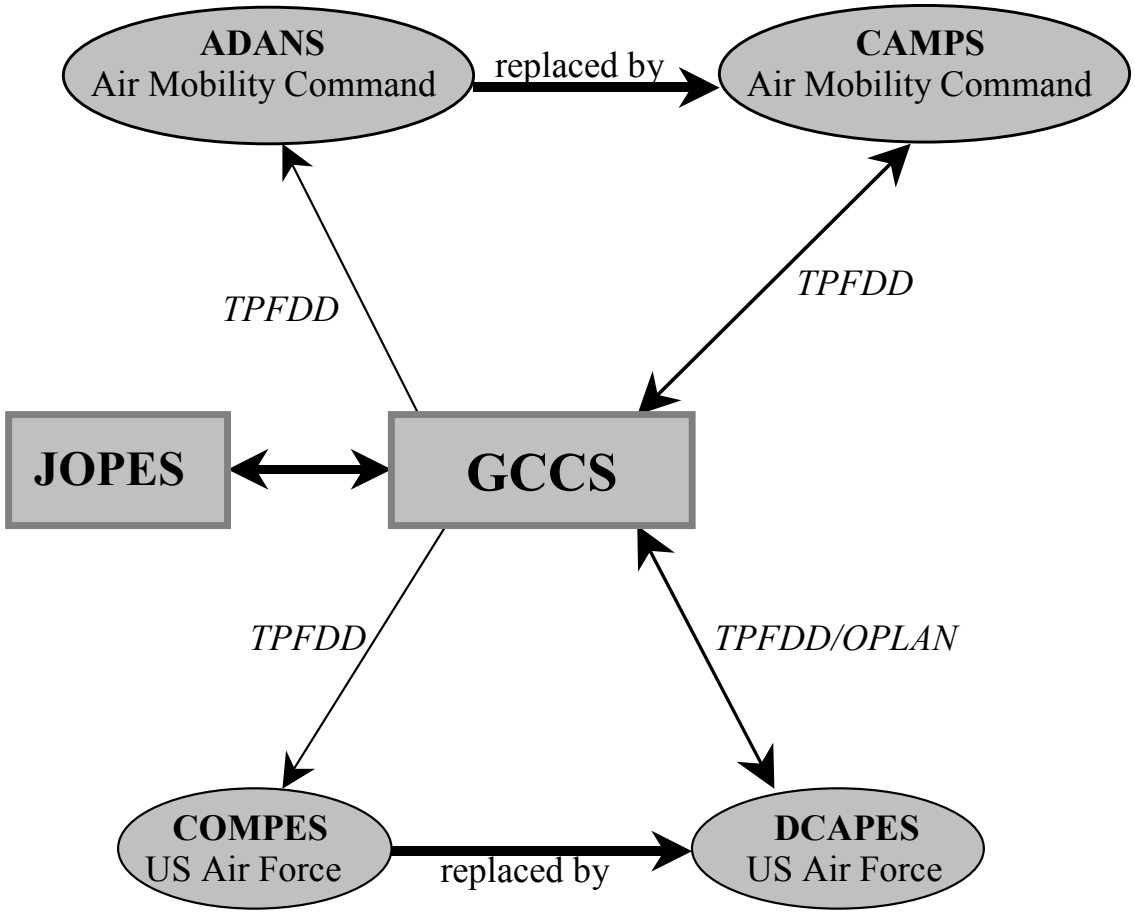
Airlift resource allocation and transportation systems

	System	**O**perational or **P**rototype	**A**rtifiical **I**ntelligence, **O**peration **R**esearch or **O**ther	Fully **A**utomated or **S**emi-Automatic	Air **F**orce, **A**rmy, **N**avy, **M**arine Corps, **S**pecial **F**orces, **J**oint, (CF, **FRA, NLD, US** or International)	Operations Type: **A**ir, **J**oint, **L**and, **M**aritime or **N**avy	Operational Level	Strategic Level	Tactical Level	Deliberate Planning	Crisis Action Planning	**C**ommercial, **G**overnement or …	**Additional Informations :** **T**ransportation, **L**ogistics, **M**obilization, **D**eployment, **B**attle, **E**mployment, **S**ustainment, **R**edeployment
1	**Joint Operation Planning and Execution System (JOPES)**	**Op**	**AI OR**	**S**	**J**	**J**	✓	✓	✓	✓	✓	**G**	**T, L, M, D, E, S, R**
2	**System for Operation Crisis Action Planning (or SIPE-II Operational Crisis Action Planner) (SOCAP)**	**P**	**AI**	**S**	**J**	**J**		✓	✓	✓	✓	**G**	**T**
3	**Airlift Deployment Analysis System (ADANS)**	**Op**	**OR**	**A**	**(AMC)**	**A**	✓	✓		✓	✓	**G**	**T**
4	**Consolidated (Combined) Air Mobility Planning System (CAMPS)**	**Op**	**AI**	**S**	**(AMC)**	**A**	✓	✓		✓	✓	**G**	**T, D**
5	**Contingency Operations Mobility Planning and Execution System (COMPES)**	**Op**		**A**	**(USAF)**	**A**	✓		✓	✓	✓	**G**	**L, M**
6	**Deliberate Crisis Action Planning and Execution System (DCAPES)**	**Op**			**(USAF)**	**A**	✓		✓	✓	✓	**G**	**L, M, D, E, S, R**
7	**Knowledge-based Adaptive Resource Management Agent (KARMA)**	**P**	**AI**	**A**		**A**	✓		✓			**G**	**T**
8	**Decision Scheduling System (DSS)**	**Op**	**OR**		**Can Air Force**	**A**	✓	✓	✓			**G**	**T**

ADANS interfacing with JOPES



DCAPES and CAMPS interfacing with GCCS and JOPES.



Flight planning or route planning systems

	System	**Op**erational or **P**rototype	Fully **A**utomated or **S**emi-Automatic	**A**ir Force, **A**rmy, **N**avy, **M**arine **C**orps, **S**pecial Forces, **J**oint, (CF, **FRA, NLD, US** or International)	Operations Type: **A**ir, **J**oint, **L**and, **M**aritime or **N**avy	Operational Level	Strategic Level	Tactical Level	Deliberate Planning	Crisis Action Planning	**C**ommercial, **G**overnement or …	**Additional Informations :** **T**ransportation, **L**ogistics, **M**obilization, **D**eployment, **B**attle, **E**mployment, **S**ustainment, **R**edeployment
1	**Real-Time In-Flight Planner (IFP)**	**P**	**A**	**USAF**	**A**			✓		✓	**G**	**B, SAR**
2	**Joint Mission Planning System (JMPS)**	**Op**	**A**	**USAF USN USMC**	**A**			✓	✓	✓	**G**	**B**
3	**Navy-Portable Flight Planning Software (N-PFPS)**	**Op**	**A**	**USN USMC**	**A**			✓			**G**	
4	**Tactical Automated (or Aircraft) Mission Planning System (TAMPS)**	**Op**	**A**	**USN USMC**	**A**			✓			**G**	
5	**Air Force Mission Support System / Mission Planning System (AFMSS)**	**Op**	**A**	**AF (US, I), USSF**	**A**			✓	✓	✓	**G**	**D**
6	**Mission Support System Campal (MSS/C)**	**Op**	**A**	**RNLAF (NLD)**	**A**			✓	✓	✓		**B**
7	**SAIC Mission Planning System (SAIC//MPS)**	**Op**	**A**	**J (USA or I)**	**A**			✓			**C**	**T, L**
8	**MATRA Mission Planning System (CINNA 4)**	**Op**	**A**	**AF (FRA)**	**A**			✓				**B**

Other specific military planning systems

	System	Operational or Prototype	Artifiical Intelligence, Operation Research or Other	Fully Automated or Semi-Automatic	Air Force, Army, Navy, Marine Corps, Special Forces, Joint, (CF, FRA, NLD, US or International)	Operations Type: Air, Joint, Land, Maritime or Navy	Operational Level	Strategic Level	Tactical Level	Deliberate Planning	Crisis Action Planning	Commercial, Govermement or …	**Additional Informations :** Transportation, Logistics, Mobilization, Deployment, Battle, Employment, Sustainment, Redeployment
1	The Rochester Interactive Planning System (TRIPS)	P	AI	S		J					✓		T, L
2	Joint Maritime Crisis Action Planning (JMCAP)	P	AI	S	USN USMC	M			✓		✓		B
3	Joint Strategic Planning System (JSPS)	Op			J	J		✓		✓	✓	G	S, Asset manag.
4	Open Planning Architecture (O-PLAN 2)	Op	AI	S		A	✓	✓	✓		✓	G	
5	Joint Stand Off Weapon Mission Planning Module (JSOW MPM)	P		A	N	A			✓			G	Missile's route,..

Challenges

- Common standards (among coalition members)
- Transition from:
  - » vertical organizational structure (decisions)
  - » vertical-horizontal organizational structure (decisions)-NCO framework
- Improve information sharing →
  - » Enhances the quality of information and shared situational awareness
- Develop synchronized, distributed, coherent, and interconnected databases (sources of information)
- Conduct complex military operations over long distances
- Contingency planning (exogenous events)
- Distributed continual planning

Conclusions

- Mission planning and execution capabilities are key and undoubtedly vital to future operational effectiveness of modern armed forces
- Innovative concepts, doctrine, and technologies are highly required to support the emergence of new planning and execution systems
- The new planning systems should be more flexible, adaptive, interoperable, and responsive to changing and uncertain environment.
- Shared information and systems interoperability through the use of common advanced standards (to include into doctrinal process) should be considered