

## Measures of Effectiveness (MOE) and Effects-Based Operations (EBO) in the Headquarters ARRC

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*Hugh Richardson joined the UK Defence Operational Analysis Establishment in 1971 where he worked on defence planning and operational analysis (OA) studies. In 1984, he was posted to 1(BR) Corps HQ in Germany as the scientific adviser providing OA and conducting field trials. After four years Hugh was posted to MoD UK to advise Requirements Staff on future RISTA/C2 systems. During this time he was seconded to NATO as a specialist adviser to SHAPE to assist in the Conventional Force Europe Reductions Talks analysis in 1990. In 1991 he led the UK scientific team in the Gulf during Op GRANBY providing OA, scientific and technical advice to all UK Land Forces, for which he was awarded the OBE. With UK operations in Bosnia Hugh became the scientific adviser for this operation at HQ Land Command, whilst continuing to develop OA support to senior commanders. In 1993 he was awarded individual merit promotion to Grade 6 (B1) for this work. With the creation of the PJHQ at Northwood in April 96, Hugh was appointed the first scientific adviser. He was responsible for the coordination and conduct of scientific OA studies in support of planning and the conduct of UK joint operations world-wide. After a short spell in Dstl, he joined HQ ARRC in Dec 2002 as Head of the Operational Analysis Branch returning to Front Line Operational Analysis.*

### BACKGROUND

Since the early 1990s and the cessation of hostilities in the Balkans, Operational Analysis (OA) has been successfully employed in support of a number of Peace Support Operations (PSO). Although the application of OA techniques has been varied and widespread, one of the most common and consistent applications of OA has been in the field of campaign monitoring and the assessment of overall campaign success.

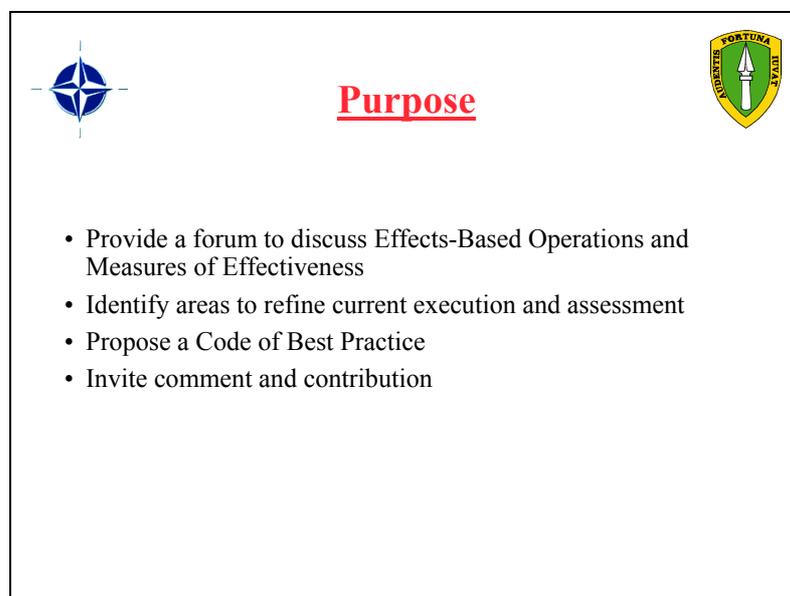
During this time the Operational Analysis Branch (OAB) at HQ ARRC has been prominent in both developing and implementing the tools and techniques required to conduct these tasks both for use within HQ ARRC and across the wider OA community (Figure 1). The aim of the following presentation is to provide a forum to discuss Effects Based operations and measures of effectiveness as currently being developed with HQ ARRC (Figure 2). It is hoped to identify those areas needing further refinement for execution and assessment.

This paper provides a first draft of a Code of Best Practice for the conduct of Campaign Analysis for Peace Support Operations (PSO) using a basic set of Measures of Effectiveness (MOE). It is intended to extend this paper to include Effects-Based Operations and war-fighting operations in later drafts. This current paper is based upon recent operational

experiences but later drafts will include sections on war-fighting, which are likely to be based upon exercises. The paper is written from an OAB, HQ ARRC perspective but also draws on the previous experience and knowledge of the authors. The paper contains no references as all supporting material and reference documents are provided on an accompanying CD-ROM (which is Classified).



*Figure 1: Measures of Effectiveness (MOEs) and Effects-Based Operations (EBO) in the Headquarters ARRC.*



*Figure 2: Providing a first draft of a code of best practice for campaign analysis for peace support operations.*

Why are Measures of Effectiveness needed? I think that the Famous Person Quotation number 1 (Figure 3) says it all, why we need metrics and assessment, because the man at the top wants it. But beware I will end the presentation with another quotation.

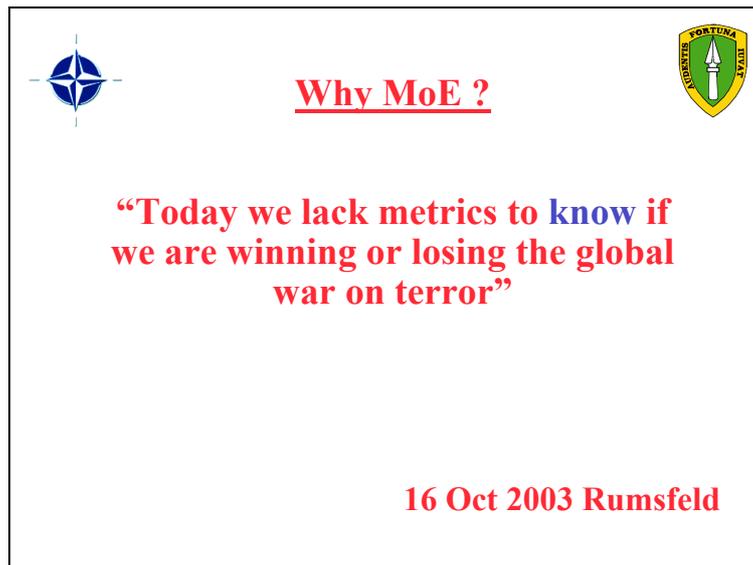


Figure 3: A quotation from a famous person.

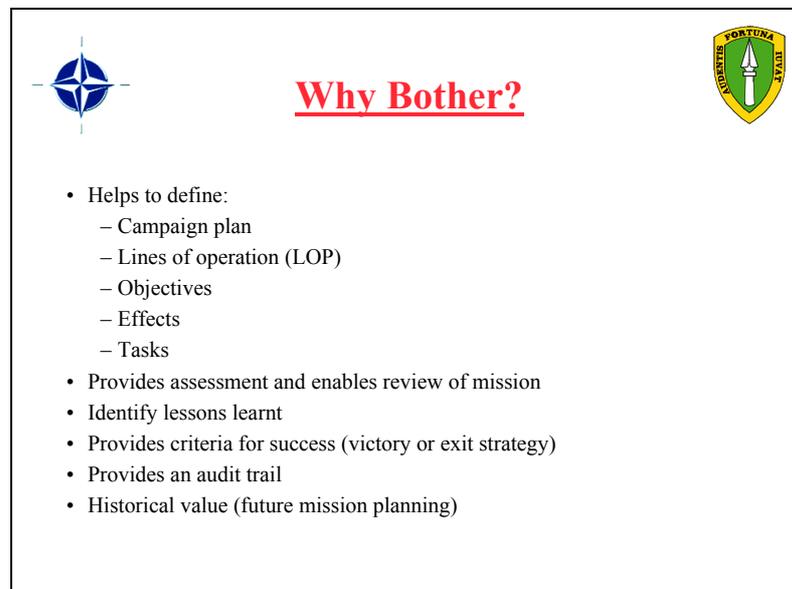


Figure 4: Why bother?

Campaign assessment is a mission critical task that must be considered and integrated throughout all phases of an operation from pre-deployment to exit strategy (Figure 4). Without the ability to measure and assess the success of any given operation we are unable to make best use of the limited resources available and optimise our effort. This is especially so with respect to current PSO where there may be numerous political, financial and resource constraints that will impact on the overall success of the mission. If we are unable to determine what worked and what did not then we are unlikely to be able to learn from previous experiences and are in danger of making the same mistakes time and time again.

OA is a tool to assist in determining the overall level of success and provides useful metrics that can be used in conjunction with the often more subjective assessments made by the military, media and public opinion.

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## INTRODUCTION

Measures of Effectiveness (MOE) is the terminology adopted by the Operational Analysis Branch (OAB), Headquarters ARRC to describe any study relating to the determining, assessment and analysis of factors that may be used in conjunction with other information to help determine the overall level of mission success. This could be applied to a wide range of operations including both war fighting and PSO scenarios.

With the implementation of EBO it has become more apparent to the military for the need to identify suitable metrics in order to determine whether we are achieving the desired effects and hence know whether we are achieving overall mission success. Ultimately this can assist in determining when the mission has been successfully completed and can be used to justify the reallocation or withdrawal of resources. This represents a significant change in approach away from the more traditional task assessments and the focus of “how well we are doing the things we do?” to an effects focus based on “are we doing the right things?”

In addition to providing an objective assessment of overall mission success, the MOE methodology can also:

- Help to define:
  - Campaign plan.
  - Lines of operation (LOP).
  - Objectives.
  - Tasks
- Provide a consistent assessment and enables review of mission.
- Identify lessons learnt.
- Provide an audit trail.
- Generate historical value (future mission planning).

The benefits of using Effects Based Operations and MOEs are listed in Figure 5. These include: improvement in planning, the justification of actions, Focussing on objectives, maximising effects, minimising losses, achieving an economy of force, and providing the winning edge. I think all of these may apply and judging by my current Chief of Staff the last (scoring points with the boss) is the most important. However we must remember that this process is not a solution in itself.

Figure 6 provides an illustration of how HQ ARRC is implementing Effects-Based Operations. Working from the end-state to a set of objectives to a number of effects to achieve those objectives that are implemented through a number of tasks and actions. These tasks or actions are assessed to see if we are doing things right, the effects are assessed to see if we are doing the right things and campaign assessment is conducted to see if we are

achieving the overall mission. Note that this assumes that there is a causal link between actions and effects.

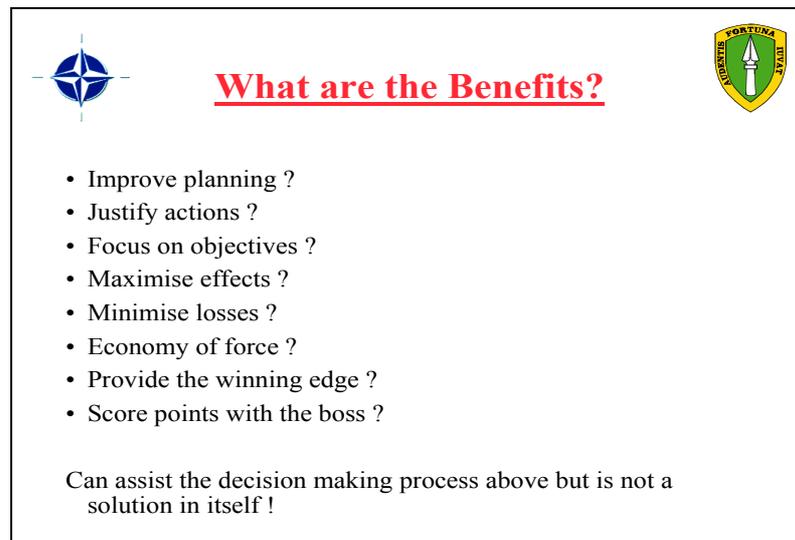


Figure 5: What are the benefits of using Effects-Based Operations and MOEs?

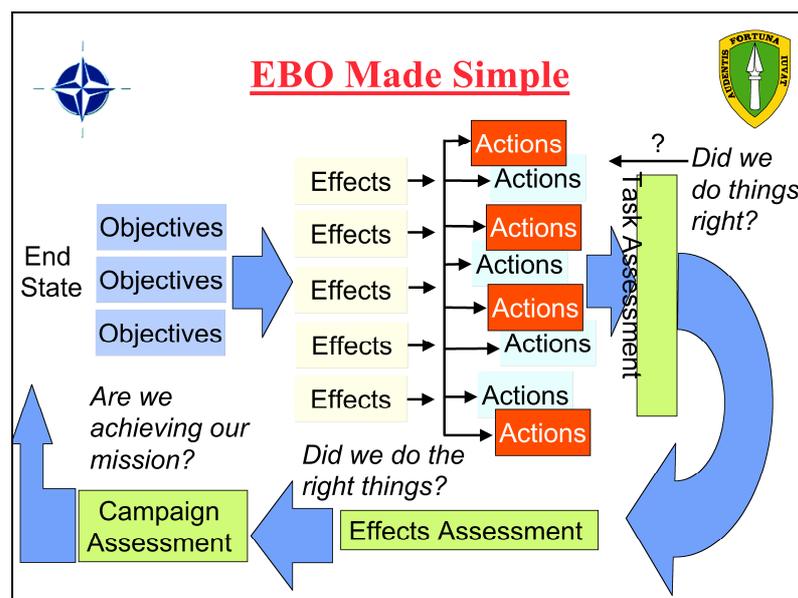


Figure 6: Some of the components of Effects-Based Operations (EBO).

This has been translated into the MOE process within the HQ with a whole set of multidisciplinary working groups including an Effects Working Group, a Joint Coordination Board, an Assessment Working Group, and Campaign Review Meetings (Figure 7). The one good thing about the process is that it provides an excellent audit trail, it is a pity about the time it takes. Remember HQ ARRC is a multinational HQ so you can double the time of which you first thought for activities to be undertaken and goals accomplished.

There is no generic approach that can be adopted for conducting an MOE study as each military operation will have its own specific objectives and priorities. The key is for the process to remain flexible and responsive to changes in either the mission objectives or the

resources available. Some of the basic issues that need to be addressed when developing and implementing a MOE strategy are as described below,

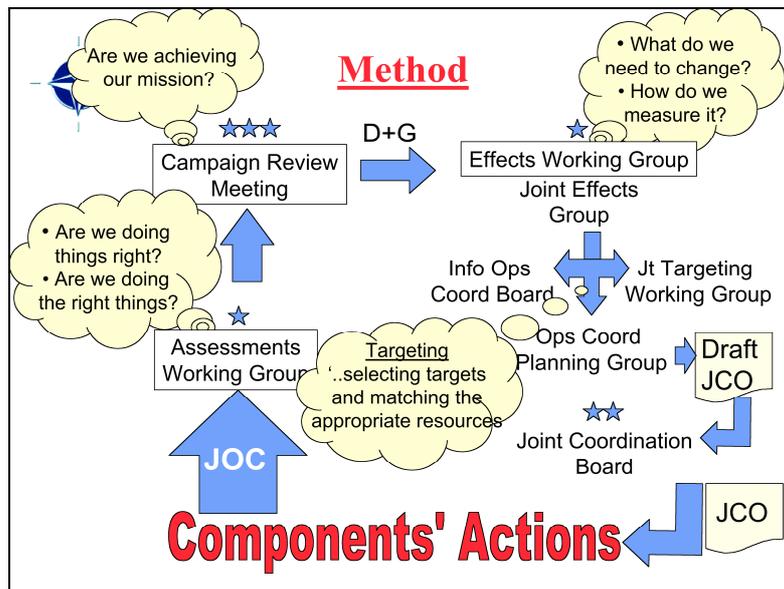


Figure 7: Component actions involved in establishing MOEs.

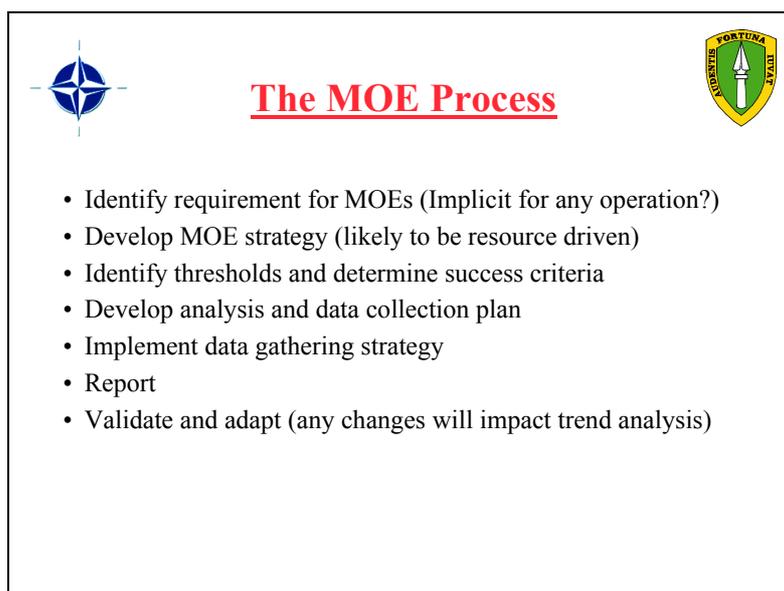


Figure 8: The Measures of Effectiveness Process.

- Identify Requirement: A number of generic reasons for conducting an MOE study for all significant military operation have already been identified (Figure 9). It is essential that the specific mission requirements be also identified, as this is likely to determine the focus of the work and the primary target audience. MOE studies may be used to address specific questions like determining mission end or rationalisation of the force structure or they may be used promote a positive image to selected audience type.



Figure 9: A potential road map for MOE assessments.

- Develop MOE Strategy: The MOE strategy is likely to be resource driven and may often be based around the operational roadmap or campaign plan. Both Top-Down and Bottom-Up approaches can be used in order to construct a hierarchy of Objectives, Effects and Tasks.
- Identify thresholds and determine success criteria
- Develop a data collection and analysis plan.
- Implement the data gathering plan and analysis.
- Report on the analysis findings.
- Be prepared to validate and adapt the analysis.
- Our practical experience suggests that the MOE assessments are:
  - Dependent upon the Mission
  - Need to be scientific, objective, independent, and auditable.
- They depend upon the different phases of the operation:
  - Pre-deployment
  - Operations
  - Compliance
  - Stability
- Normality Indicators (basic needs).
- Higher-level MoEs (governance, economy etc).

- Exit strategy – transfer of tasks to civil authorities.

We need the development of a generic approach to measuring progress during an operation based on these phases.

One of the key issues in documenting the theory of MOEs is that there are a plethora of terms in use but no commonly accepted definitions (Figure 10). This continues to promote confusion when working across multi-disciplinary groups and especially when presenting to the military customer. The NATO Code of Best Practice for Command and Control helps here in defining metrics and MOEs.

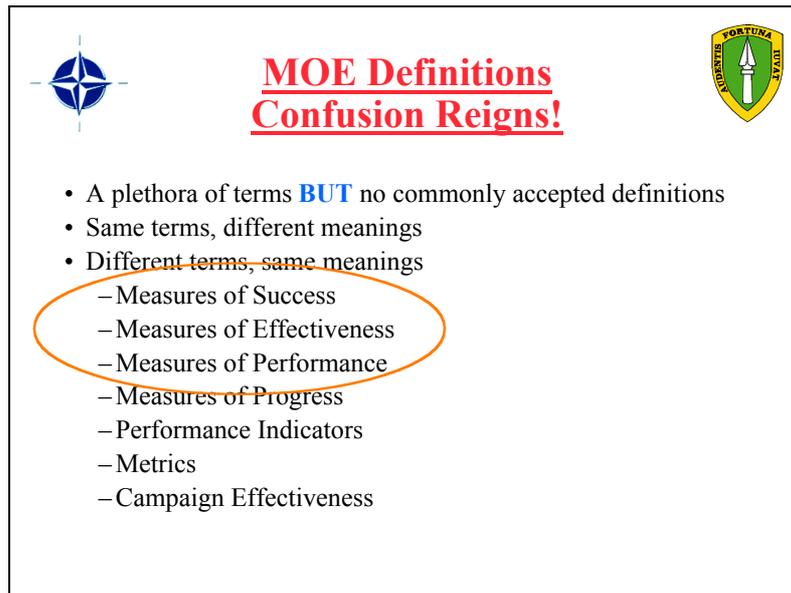


Figure 10: Confusion exists concerning the precise definition of MOEs.

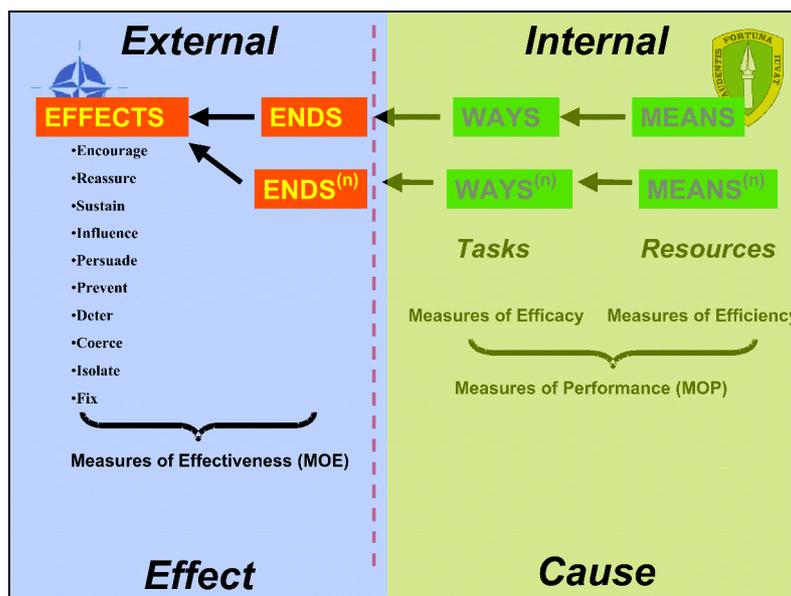


Figure 11: The differences between cause and effect.

We need to recognise the difference between cause and effect. Effects are what we wish to achieve, they are external (Figure 11). We achieve these effects by undertaking tasks and proving resources (the Ways and Means). We try to make them efficient by minimum use of resources and effective in the way they are conducted.

For the purpose of this paper and until an accepted set of definitions has been produced the following definitions will be used throughout this paper (Figure 12).

- **Measure of Success (MOS):** A top-level assessment of overall mission success (campaign assessment). This is primarily a subjective assessment but should be supported where possible with objective metrics.
- **Measure of Effectiveness (MOE):** An objective metric used to assess the level of success achieved for a given desired effect. Numerous measures may exist for any given effect.
- **Measure of Performance (MOP):** A metric used to assess the level of success achieved for a given task. Numerous measures may exist for any given task.

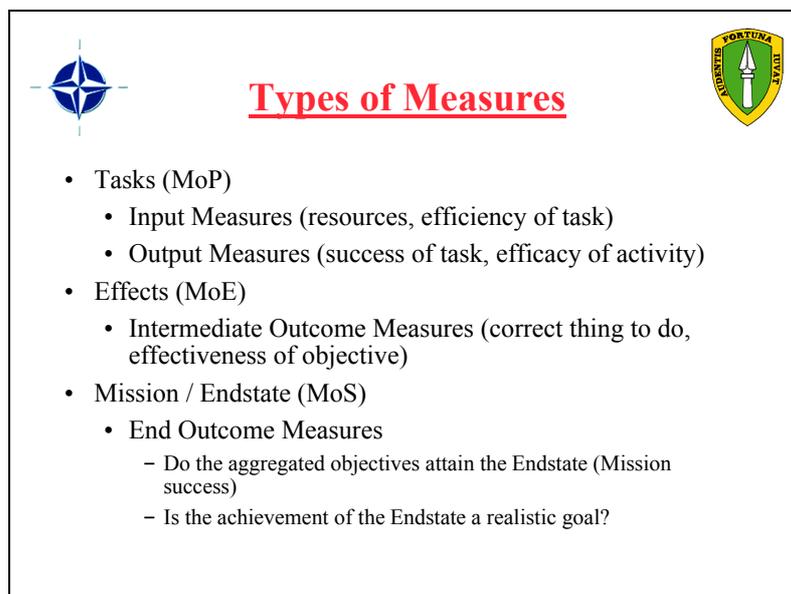


Figure 12: Types of measure.

Every study or project has to have a road map (Figure 13). This illustrates the relationship between the elements of EBO (mission, objectives, effects, tasks, and enabling tasks), campaign tools and Measures. This “Roadmap” approach also helps to determine the overall structure of the campaign plan and therefore which measures will determine level of success for each of the desired effects.

So how have we tried to combine Effects Based Operations and MOE assessments (Figure 14)?

- We first carry out *Task /Action Assessment* (Are we doing things right?).
- Then we conduct *Effects Assessment* (Are we doing the things right?).

- Finally the *Campaign Assessment* (Are we doing the right things; and, are we accomplishing the mission?).

From these assessments we assess what happened; we then decide what we need to do now, continue, reprioritise or redirect. Finally we issue direction to implement what we need to do now.

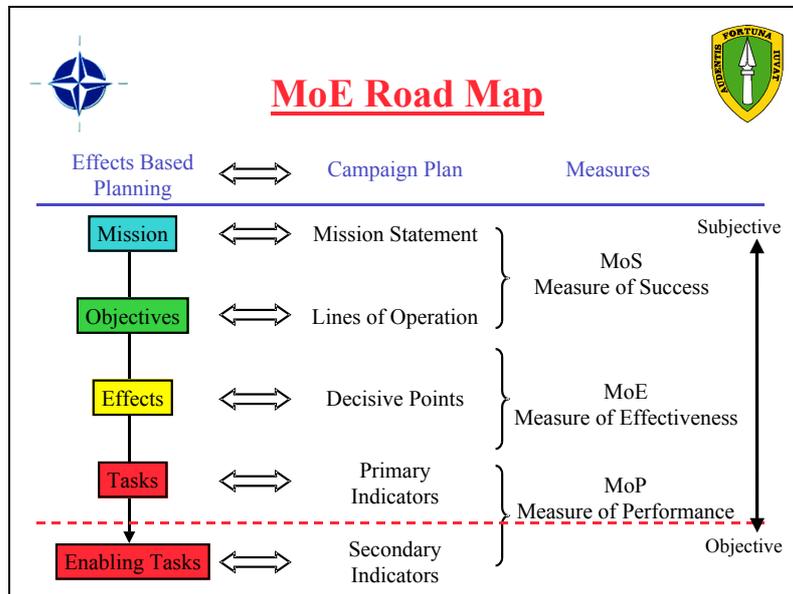


Figure 13: A Measure of Effectiveness road map.

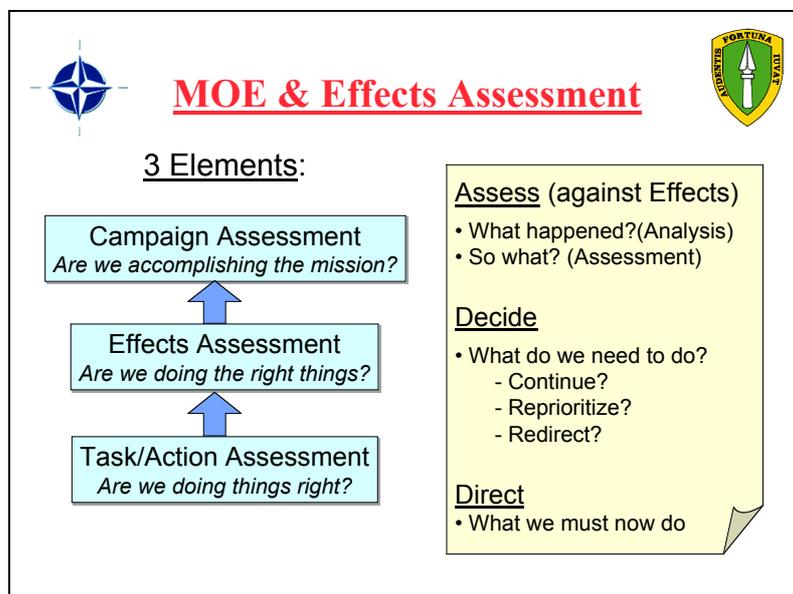


Figure 14: MOE and Effects Assessment.

Task assessment is primarily accomplished by the component and is based on measures of performance (MOP) (Figure 15). The *Task or Combat Assessment* attempts to answer the question: “are we doing Things Right.” You may equate such an assessment to reportable items such as “Time-on-Target” or “Phase 1 BDA.” Or, in other words, “Did we accomplish the task?”

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## Task Assessment

### “Doing Things Right”



Characteristics	Example
<ul style="list-style-type: none"> <li>• Based on Measures of Performance (MOP)               <ul style="list-style-type: none"> <li>• Measures <u>task accomplishment</u></li> <li>• “Combat Assessment”</li> <li>• Normally assessed at the component level</li> <li>• Focus - DIME actions</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Task: OAS on Zagrovian Armd Bde</li> <li>• MOP:               <ul style="list-style-type: none"> <li>• No. sorties flown</li> <li>• Time-on-target</li> <li>• No. of targets engaged</li> <li>• No. of aircraft lost</li> </ul> </li> </ul>

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Figure 15: Task Assessment and “Doing Things Right.”

Measures of effectiveness (MOE) can provide Effects Assessments as information of *Doing the Right Thing* (Figure 16). Such Measures are normally assessed at the operational or strategic level but not exclusively. Normally subjective, but not always. Although they may include some metrics, MOE’s are primarily subjective, and are analyzed through trend analysis or assessed by Subject Matter Experts. For MOP remember objective and measurable, for MOE’s remember subjective and trends and patterns.

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## Effects Assessment

### “Doing The Right Things”



Characteristics	Example
<ul style="list-style-type: none"> <li>• Based on Measures of Effectiveness (MOE)</li> <li>• Measures effects attainment               <ul style="list-style-type: none"> <li>• May be subjective</li> <li>• Trends and patterns</li> <li>• Addresses all PMESII</li> <li>• Outcome of action / applied capability</li> </ul> </li> <li>• Looks across PMESII systems</li> </ul>	<ul style="list-style-type: none"> <li>• Effect: Establish viable utilities &amp; civil systems</li> <li>• MOE:               <ul style="list-style-type: none"> <li>• % of utilities operating in comparison to pre-conflict levels e.g. water, oil, electricity etc.</li> </ul> </li> </ul>

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Figure 16: Effects Assessment and “Doing The Right Things.”

When assessed *in Toto*, assessment of effects must answer the “so what?” question. Such assessments must lead to *Campaign Assessment*: that is an overall assessment of whether our effects based operations are achieving the desired outcomes or end state (Figure 17). *Operational Net Assessment (ONA)* is an important step in process of understanding how systems may adapt requiring current or future operations adjustment. Our initial analysis,

ONA, or plan, may have been flawed again requiring adjustment. We need to identify the “delta” between desired and actual or as the slide says: Effects produced and objectives.



Figure 17: Campaign Assessment “Are We Accomplishing The Mission?”

Figure 18 shows a Schematic Overview of the Campaign Plan against which it was initially envisaged that “Success” would be “Measured. This type of Schematic Overview has been used in several exercises. Figure 19 and Figure 20 illustrate what the Headquarters ended up presenting to the senior staffs during our war-fighting exercise.

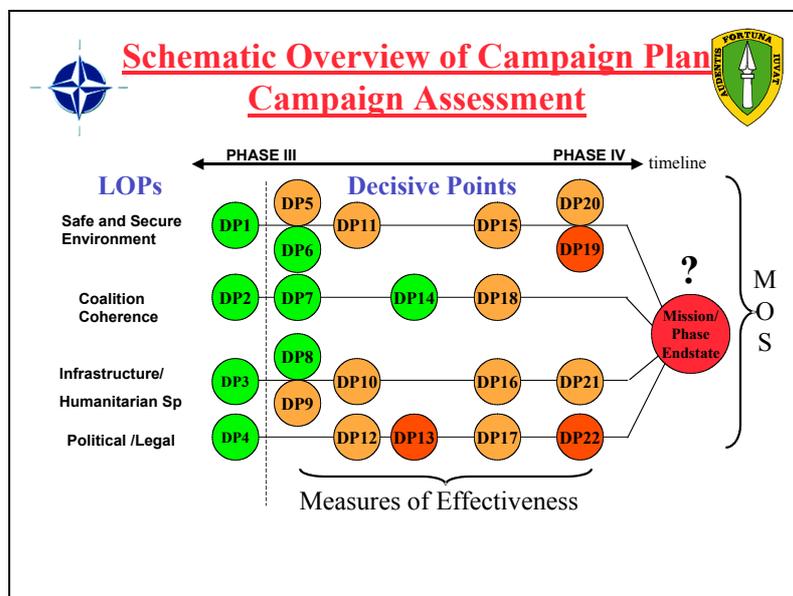


Figure 18: Schematic Overview of Campaign Plan Campaign Assessment.

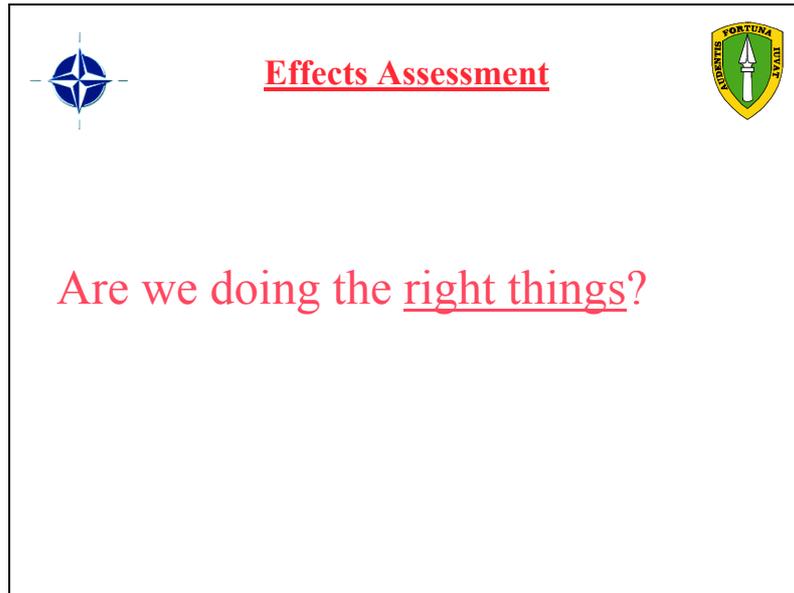


Figure 19: Are we doing the right things?

Figure 20 illustrates how in our first exercise we were attempting to assess and display the assessment for just one of our effects; the defeat of ZNOG forces a conventional war-fighting requirement. Please note how messy it was, overuse of the traffic light methodology and confusion between Combat power and combat effectiveness.

13 Nov		Joint Effects Assessment Matrix		
Target Obj	Action	Quantifiable Measures of Success	Branch	Assessment
<b>LG</b>  Attrit 1AD to min of 45% CP Attrit 6 Div inf Bdes & sp arty to min 80% CP Disrupt 6 ID mvr & fires on L ZAB-sing sites Disrupt 7th MDe ability to mutually sp 6 MD w/ mvr & fires Disrupt 8 ID ability to mutually sp 6 MD w/ mvr & fires Disrupt Army Level Arty assets from affecting LCC ME Disrupt 62 AH Br ability to mutually sp 1 AD def. Disrupt ZNOG tac C2 Deny WAC ability to employ WMD. Disrupt 6 ID fm effective def IVO TIZ	<b>Defeat ZNOG Forces : 20% (50%)</b>		Branch	ISTAR
	Reduce CP / CE	CE AMBER - 11ID 76% CE RED - 8 ID 55% (80%) CE BLACK - 6MD 20% (25%), 21 Armd Bde 0% (70%)	G2	
	Destroy Manoeuvre Bdes	CE GREEN - 81 IBde 85%	G2	
	Dest/ disrupt C2	GREEN - ZNOG Main HQ 80% CE RED - 7MD HQ 55%, 19 Msl Div HQ 45% CE BLACK - 6 MD Main HQ 30%, 21 Armd Bde HQ destroyed TBC - 8ID; 11ID	G2	
	Dest arty ammo & systems	CE GREEN - (11ID Arty 90%+ 211/4 SP Regt 90%); RED - (8ID + 211/1 SP Regt 45% + 211/2 SP Regt 25% + 212/1 MBRL Regt 50% + 212/2 MBRL Regt 50% (60%)) CE BLACK - (6ID + 212/2 MBRL 20% (30%))	G2	
	Dest / disrupt avn	CE GREEN - 11ID Avn 90%; 8ID Avn 95%; AMBER - 61 Army Avn 65% RED - 62 Army Avn 45% CE BLACK - 7MtnD Avn 15%; 1AD Avn 15%; 6MD Avn 10%(15%)	G2	
	Dest UAVs / Div Recce	CE GREEN - 11ID Recce 85% (90%), 8ID Recce 85% CE BLACK - 6MD Recce 30%, 7 Div 0%	G2	
	Dest WMD capable SS21s	CE RED - 193 Msl Bde 40% (55%) CE BLACK - 191 Msl Bde 0% (25%); 192 Msl Bde 10% (25%);	G2	
	Dest WMD storage		G2	
	Dest long range ADA	CE BLACK - 213 AD Bde 40% (70%);	G2	
Undermine confidence & cohesion	Morale - 1AD surrendered, elms 7MtnD, 6MD & 8ID surrendering, countering hostile IO.	Psyops		

Effect Achieved     Some Effect Noted     No Effect Noted  
 Full BDA coverage     Partial BDA avail     No BDA avail     Not ISTAR task

Figure 20: The Joint Effects Assessment Matrix.

We even borrowed from the US a display mechanism used during the 2nd Gulf war for use on our Exercise (Figure 21). This shows the 5 effects with slider bars to depict the current assessment of progress. As you can see there is a lot of terminology and abbreviation on this slide, which, makes it not as clear, as one would like. It took us a lot of effort to get the military to agree to put some definitions of the transition points between red-amber and amber green.

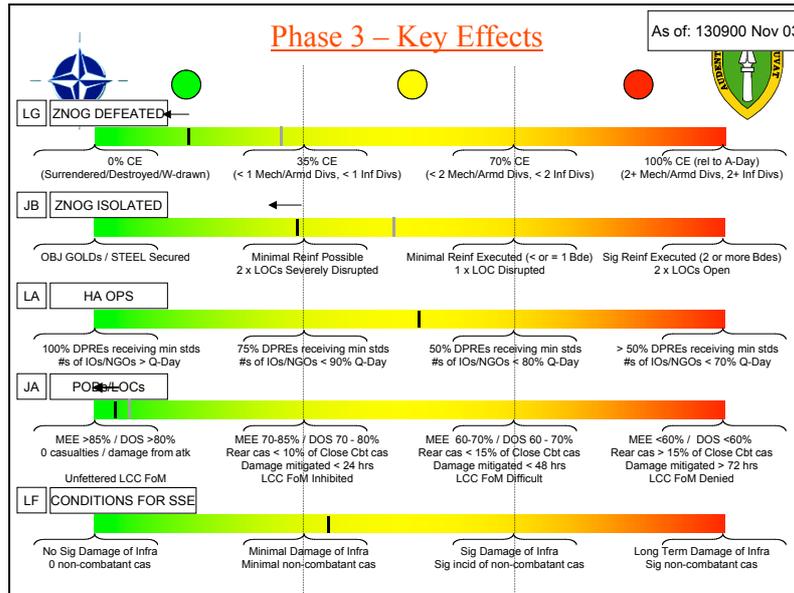


Figure 21: Phase 3 Key Effects.

We ended with even more fun when we went to the peace support exercise. Assessments were now being made by the J2 Intel staffs, metrics provide by OAB (we were making up the data based upon Kosovo, ISAF and Iraq) and finally on own forces assessment (Figure 22). At least they agreed not to produce an average.

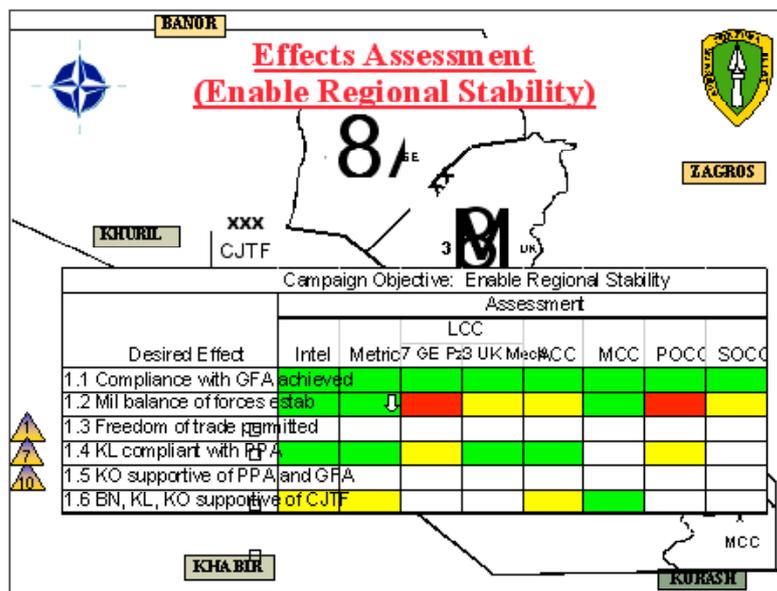


Figure 22: Effects Assessment for Enable Regional Stability.

- **LCC:** From CIMIC: There are several problems related to infrastructure, such as water supply, electricity supply in Bagdad, railroad Mosul - Bagdad still closed restricting the FOM for population and IO/NGO (alternative evacuation route).
- **MCC:** Harbour operations at Umm Qasr returns to normal. Local Police are increasing their presence inside the harbour and its surroundings in order to

increase security. Local authorities at Umm Qasr harbour have agreed to get three merchant vessels inside the port despite the missing de-rating certificates. They show their willingness to cooperate with MCC.

- ACC: Too early to return control of CL airspace to CL authorities due to NATO requirements, lack of trained manpower (Air Traffic Controllers), outdated equipment and old infrastructure (eg. radars). (Effect: Assist in restoration of CL Aviation Authorities to pre-conflict levels)
- POCC: Not fully established, but systems are working! AMBER.

Figure 23 shows Effects Assessment for Support to CL Govt./Restore Infrastructure. J2 use their inputs to provide a subjective assessment but do consider and assess the impact and likelihood of the threat (Figure 24). This is then summarised in a traditional traffic light notation. Please do not ask me how they do it, I suspect its divine intervention.

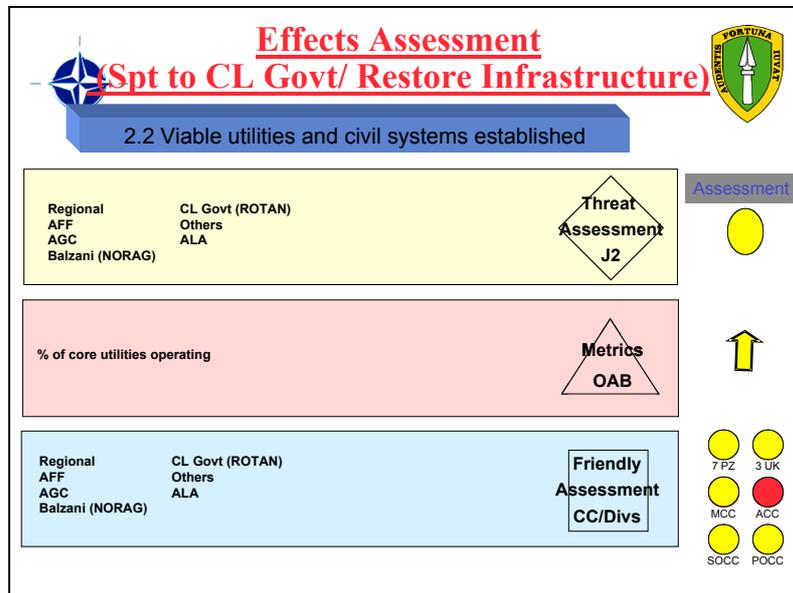


Figure 23: Effects Assessment for Support to CL Govt./Restore Infrastructure.

Here is an alternative presentation from J2 of all effects subdivide into sub-effects with an assessment and an outlook (Figure 25). I presume they used their crystal ball or else they had seen the main events list and knew what was coming next.

The next Figure, I am not proud to say, shows the votes from the OAB jury (Figure 26). A display indicating our confidence in the indicators and the data sources and finally an assessment also indicating the trend. It was of course all made up as it is not possible to provide all the data required for our exercises especially when it is still being written a month before we deploy. We could certainly do with an exercise MOE generator.

This method of display illustrates the importance of thresholds and uses a traditional traffic light display of green, amber, red, and black (Figure 27). A much more traditional display but what does it really mean, what is normal in Calaban (Figure 28)?

OBJECTIVE 2 - VIABLE GOVERNANCE			
EFFECT 2.2 - VIABLE UTILITIES AND CIVIL SYSTEMS ESTABLISHED			
THREAT	IMPACT	LIKELIHOOD	ASSESSMENT
<b>Regional</b> Different powers support different ethnic groups who turn to them rather than the CL Government	LOW	LOW	Green
<b>AFF</b> Will employ significant conventional and asymmetric capabilities against utilities/civil systems, in non-Azbeki areas, in order to destabilise the Govt (e.g. Oil industry & Ports, Water supply).	MEDIUM	V HIGH	Red
<b>AGC</b> AGC control utilities/civil systems in own area.	V LOW	HIGH	Green
<b>BALZANI (NORAG)</b> Wants NORAG autonomy, so limits access of non NORAG workers to AOR.	V LOW	HIGH	Green
<b>ALA</b> Info Ops campaign highlighting inability of Govt to provide services to DPRES	LOW	MEDIUM	Green
<b>CL GOVT (ROTAN)</b> CL Govt has little authority outside BAGHDAD and is unable to implement countrywide services.	LOW	V HIGH	Yellow
<b>Others</b> NATO Unable to meet expectations to provide security of utilities	MEDIUM	MEDIUM	Yellow
<b>OVERALL THREAT ASSESSMENT - MEDIUM</b>			

Figure 24: Threat Assessment: Objective 2 Viable Governance.

J2 THREAT SUMMARY as at 040312		
EFFECT	ASSESSMENT	OUTLOOK
1.4 - KL Compliant with the terms of the PPA	LOW	↑
1.6 BN, KL, KO, KH, AB, ZG Govts and public supportive of CJTF M2/MSFOR	MEDIUM	↑
1.2 - Military Balance of Forces in Region Established	LOW	→
1.1 - Compliance with GFA Achieved	LOW	→
2.3 Existence of public countenance for a system of central governance	VERY HIGH	↑
2.6 - Anti-CL Govt Threats Minimised	HIGH	→
2.2 - Viable Utilities and Civil Systems Established	MEDIUM	↑
2.4 - Credible & effective rule of law established	HIGH	↑
2.7 - CL Govt Re-establish Control of N CL	HIGH	↑
2.1 - CL Government Stabilised	MEDIUM	↑
3.1 - Borders Secured	HIGH	↑
3.2 - Freedom of Manoeuvr Permitted	MEDIUM	↑
3.3 - Provision of Viable Humanitarian Assistance Enabled	MEDIUM	↑
3.4 - Inter/Intra Factional Fighting Minimised	HIGH	↑

Figure 25: J2 Threat Summary.

### ISSUES RAISED FROM THESE ACTIVITIES

Let me now discuss a number of issues and the way ahead we are proposing. It will be in the best tradition of Front Line OA, in bite sized chunks, a little at a time. There are two commonly accepted approaches to developing a MOE strategy, Top-Down and Bottom-Up (Figure 29). There are strengths and weaknesses to both approaches and in practice it is often advantageous to try and conduct both approaches simultaneously. The Top-Down approach is good for deconstructing the top-level mission objectives and effects in order to identify the metrics for data gathering and analysis. This “Roadmap” approach helps to determine the

overall structure of the campaign plan and therefore which measures will determine level of success for each of the desired effects.

**Metrics Review**  
**(Sp to CL Govt/ Restore Infrastructure)**

EFFECTS	MoE	INDICATORS (Primary)	PRIMARY DATA SOURCES	Jan-04	Feb-04
<b>2 Viable Governance</b>					
2.1 CL Govt Stabilised	Duration in post of government ministers	Ave. duration in ministerial posts	J2 Intsum. CL Govt. POLAD	↓	↓
		No. of ministerial meetings	J2 Intsum. CL Govt. POLAD	↓	↓
		No. of NSB meetings	J2 Intsum. CL Govt. POLAD	↓	↓
		Ethnic representation in Govt.	J2 Intsum. CL Govt. POLAD	↓	↓
2.2 Viable utilities & civil systems established	% of utilities and infrastructure operating	Utilities	CL govt. Engr. CIMIC	↑	↑
		Transport system	CL govt. Engr. CIMIC	↑	↑
		Police force	CL govt. Engr. CIMIC	↑	↑
		Hospitals	CL govt. Engr. CIMIC	↑	↑
2.3 Existence of public courtenance for a system of law established	Level of public support	TAA opinion polls	TAA, Info Ops, P Info	↓	↓
		No. of demonstrations against CL govt.	P Info, J3	↓	↓
2.4 Credible and effective rule of law established	% of reported crimes leading to successful conviction	No. and ethnic breakdown of cases	Legal	↔	↔
		No. and ethnic breakdown of	Legal	↔	↔
		Duration of sentence	Legal	↔	↔
		No. of successful appeals.	Legal	↔	↔
2.5 Free & fair elections undertaken	% of public voting	No. of votes	UN		
		No. of polling stations	UN		
		Ethnic breakdown of candidates	UN		
2.6 Anti-CL Govt threats minimised	Level of threat against CL govt	No. of hostile acts againts CL	J2, J3 Incident Database	↓	↓
		TAA opinion polls	TAA, Info Ops, P Info	↓	↓
2.7 CL Govt control of N CL re-established	No. of incidents	Level of taxes collected by CL govt.	J8, CL Govt. POLAD	↓	↓
		No. of demonstrations against CL govt.	J2, J3 Incident Database	↓	↓
		No. of hostile acts againts CL	J2, J3 Incident Database	↓	↓

Figure 26: Metrics Review (Sp to CL Govt/Restore Infrastructure).

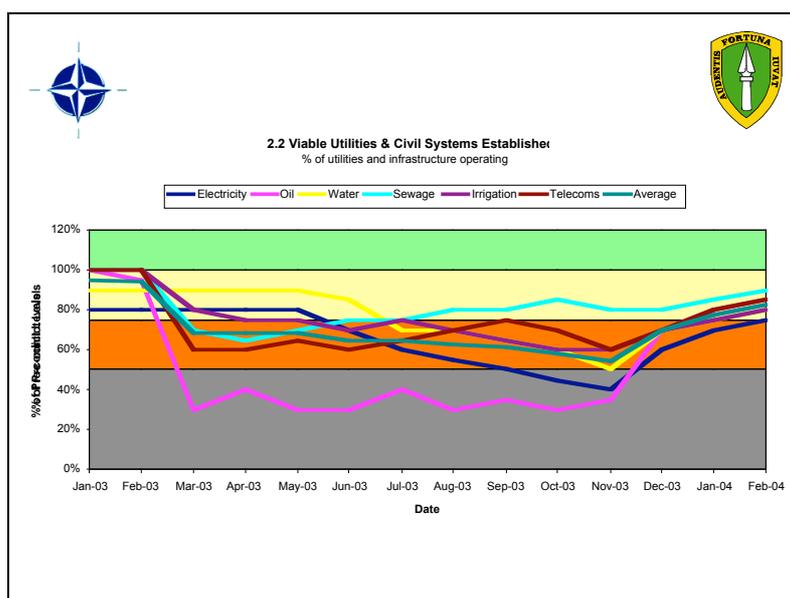


Figure 27: Assessment of 2.2 Viable Utilities and Civil Systems Estimates, % of Utilities and Infrastructure Operating.

MOEs can be collected at all levels within a military operation, however difficulties may arise when lower level (tactical) MOEs are amalgamated to produce higher level (operational/strategic) MOEs. In order to achieve this a weighting system may be employed in order to combine multiple MOEs for any given effect. This can provide a mechanism for amalgamating MOEs from bottom level task assessments up to high-level effects assessments. Unfortunately in practice this is often hard to achieve, as it is difficult to develop and validate a weighting system that represents the varying impact any given MOE may have on a given effect. Other problems include issues such as:

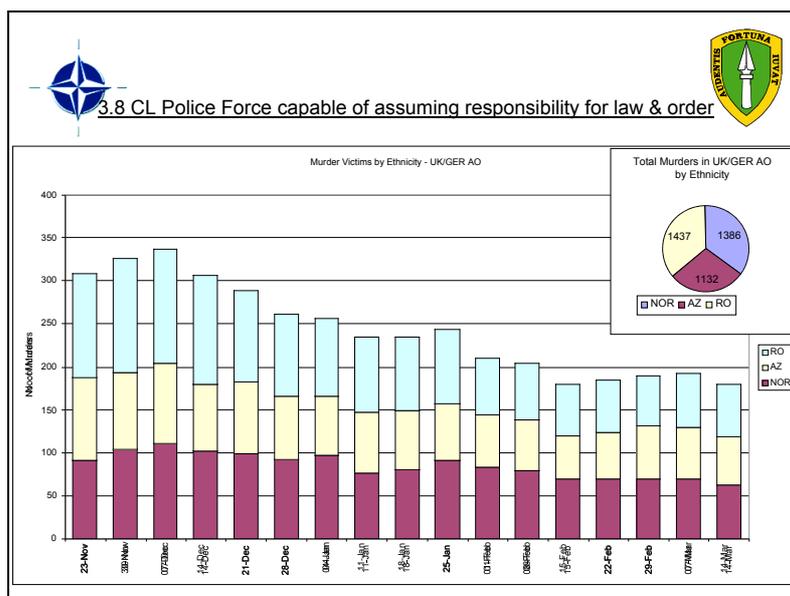


Figure 28: Assessment of 3.8 CL Police Force capable of assuming responsibility for law and order.

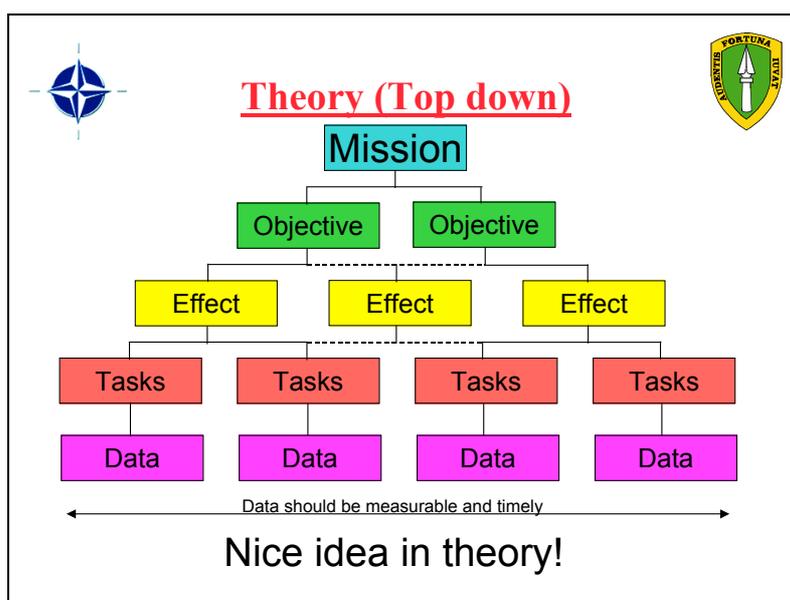


Figure 29: Theory (Top-Down).

- Some measures being used more than once for different effects.
- Each task being described by a different number of measures.
- Each Line of Operation being described by a different number of tasks.
- Some measures being obviously more important than others in reaching the end state.

In short it is often to preferable to avoid the complications of developing a weighting system and try to stick to a few or even one primary and a number of secondary measures for

each effect (Figure 30). The problem is that this often leads to a massive data collection exercise that may not lead to a greater understanding. The Bottom-Up approach introduces an element of reality and practicality to the process by helping to identify what data is readily available for collection. By examining the data sets being routinely collected by the HQ it is often possible to map these directly on to the theoretical “roadmap” and hence optimise the resources available for data collection. The difficulty in using these combined techniques is in trying to ensure that both approaches merge and do not become dislocated.

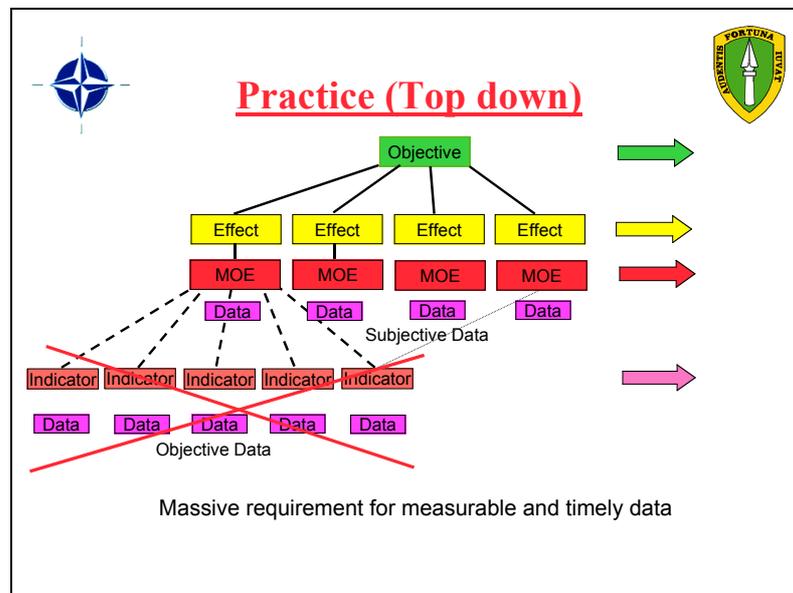


Figure 30: Practice (Top-Down).

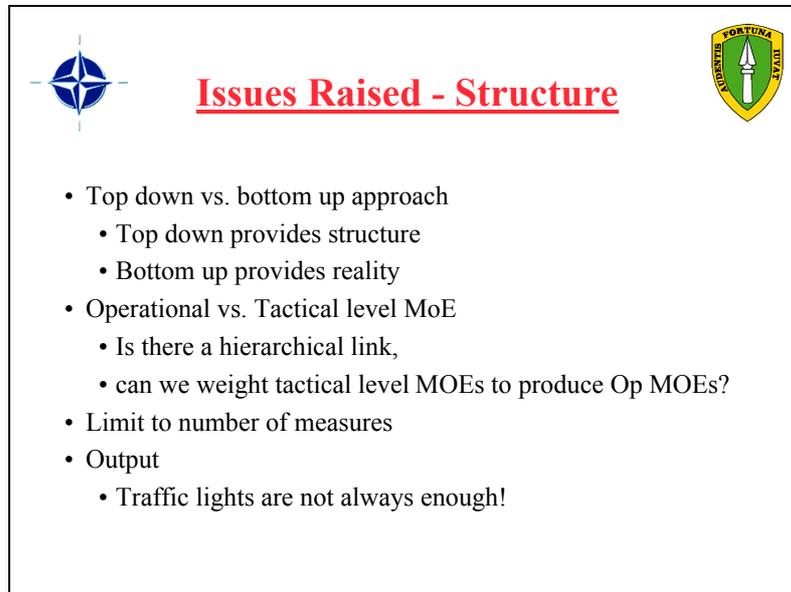
In summary, there are two commonly accepted approaches to developing a MOE strategy (Figure 31), Top-Down and Bottom-Up. There are strengths and weaknesses to both approaches and in practice it is often advantageous to try and conduct both approaches simultaneously.

- The Top-Down Approach is good for deconstructing the top-level mission objectives and effects in order to identify the metrics for data gathering and analysis. This “Roadmap” approach helps to determine the overall structure of the campaign plan and therefore which measures will determine level of success for each of the desired effects.
- The Bottom-Up Approach introduces an element of reality and practicality to the process by helping to identify what data is readily available for collection. By examining the data sets being routinely collected by the HQ it is often possible to map these directly on to the theoretical “roadmap” and hence optimise the resources available for data collection.

The difficulty in using these combined techniques is in trying to ensure that both approaches merge and do not become dislocated.

The specific Measures of Effectiveness (MOEs) selected will differ between operations although it is often possible to identify common themes, categories or Lines of Operation (LOP) (Figure 32). One of the primary tasks in the MOE process is the selection of suitable

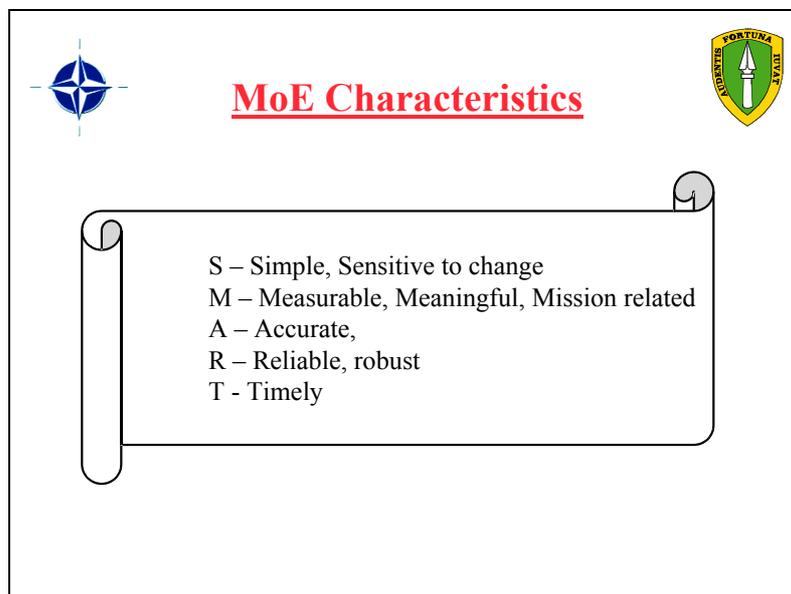
MOEs for each of the desired effects. Limited resources and availability of reliable data sources often hamper this process and often numerous MOEs may need to be initially selected. Only after a period of data gathering can the more useful metrics be identified and selected for further analysis. MOEs must always be mission-specific and in addition should be as specified below.



**Issues Raised - Structure**

- Top down vs. bottom up approach
  - Top down provides structure
  - Bottom up provides reality
- Operational vs. Tactical level MoE
  - Is there a hierarchical link,
  - can we weight tactical level MOEs to produce Op MOEs?
- Limit to number of measures
- Output
  - Traffic lights are not always enough!

*Figure 31:* Structural issues raised.



**MoE Characteristics**

S – Simple, Sensitive to change  
 M – Measurable, Meaningful, Mission related  
 A – Accurate,  
 R – Reliable, robust  
 T - Timely

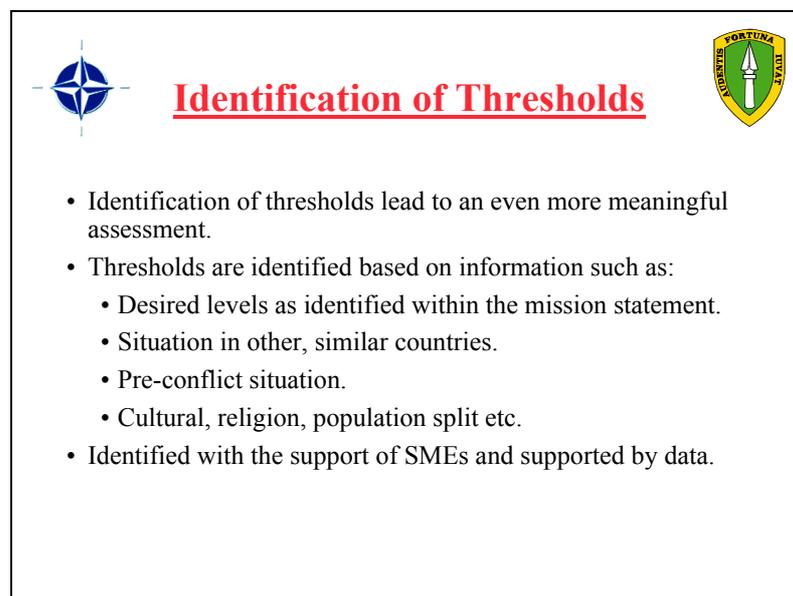
*Figure 32:* MOE characteristics.

- Mission Related.
- Meaningful.
- Measurable.

- Sensitive to changes.
- Culturally and Locally Relevant.
- Comprehensive (cover all LOPs).
- Timely.
- Cost/Time Effective (in terms of manpower).

In order to determine the success criteria, for example meeting specific objectives or completion of the mission, it is essential to identify MOE thresholds prior to any data gathering activities (Figure 33). Thresholds are identified based on information such as:

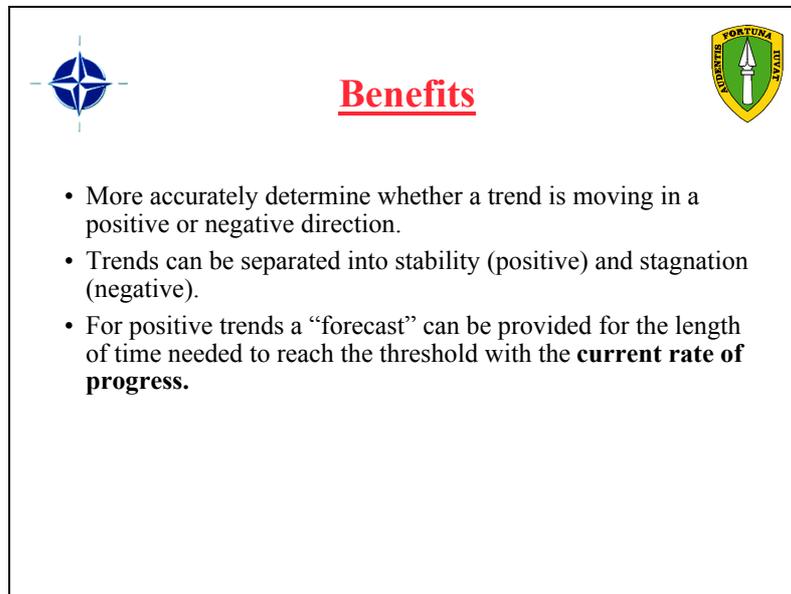
- Desired levels as identified within the mission statement.
- Situation in other, similar countries.
- Pre-conflict situation.
- Cultural, religion, population split etc.
- Identified with the support of Subject Matter Experts and supported by data.



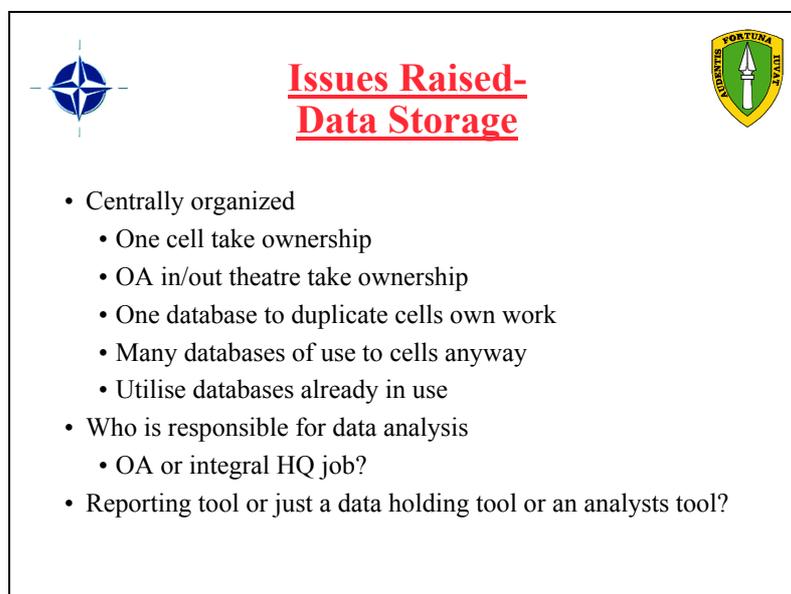
*Figure 33: Identification of thresholds.*

Identification of thresholds and trend analysis leads to a more meaningful assessment and helps to define end states and success criteria during the initial stages of the operation (Figure 34). That does not mean to say that these thresholds do not need to undergo constant review and are likely to change with and alteration to the mission objective of changes to the force structure.

Implementation of a data gathering strategy (Figure 35) will involve the following activities: Assessing the achievability and feasibility of data collection, undertaking a survey of the data currently collected, and the identification of data entry points and source. Other matters of concern would involve data formats, the current use of data in headquarters, the realities of data transmission, the importance of information, and an evaluation of the user requirements for data.



*Figure 34: Bernefits.*



*Figure 35: Issues raised with respect to data storage.*

Issues Raised with respect to data collection and use involve the following: The question of whether data storage should be centrally organized. Should one cell take ownership of data? Should OA in and/or out of theatre take ownership of data? Should one database to duplicate cells' own work How many databases would be of use to cells anyway? How should existing databases already in use be used? Who is responsible for data analysis?

Should the activities be undertaken by OA personnel or should they be an integral HQ job?  
Should a reporting tool, or just data holding tool be provided?

## THE WAY FORWARD

So what is the way forward (Figure 36)? We certainly need a common understanding and approach within NATO, To achieve this we have proposed and are developing a code of best practice: This Code will identify a common set of measures from recent operations and propose a set of commonly used measures for each.

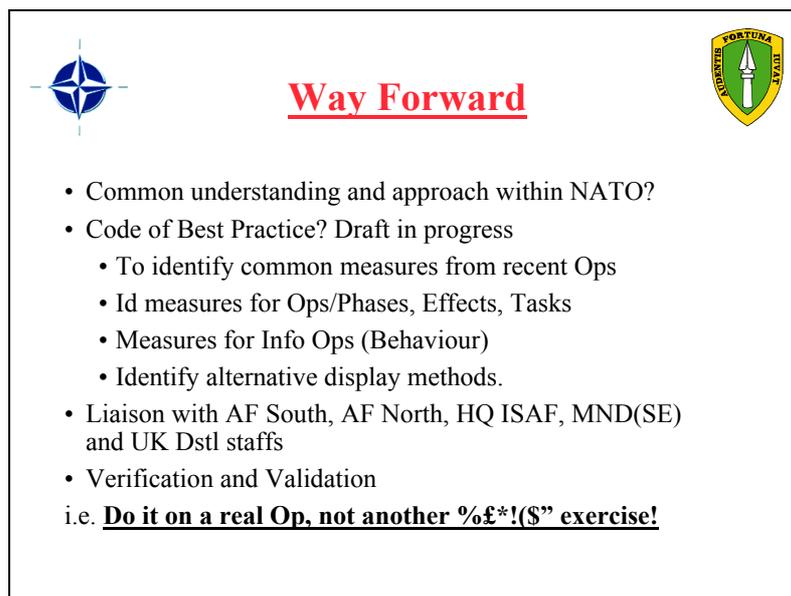


Figure 36: The Way Forward.

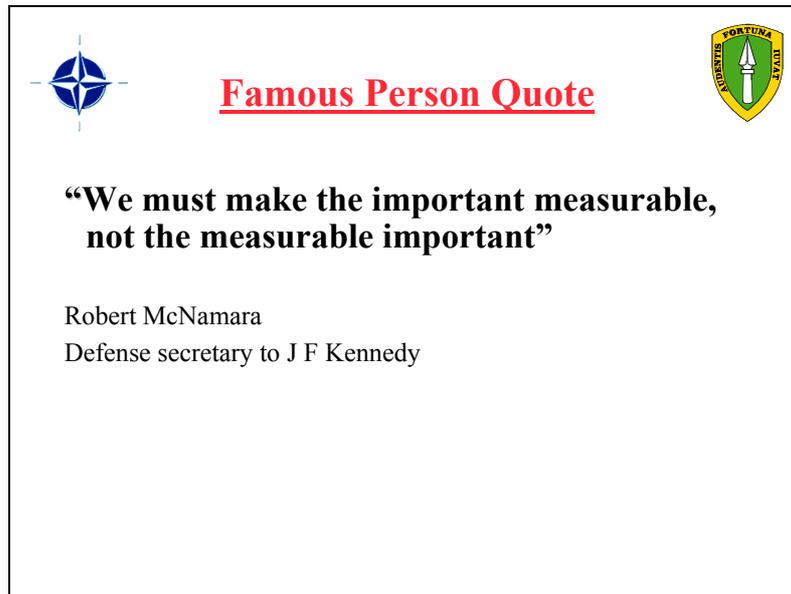
- Type of operation,
- The phases of an operation,
- Those commonly defined effects
- The tasks used to implement the effects required.

We will pay special attention to the measures associated with Information Operations as they need to reflect the behaviour of the groups we are seeking to influence.

There is a need to identify commonly used display methods. To achieve this we are in liaison with AF South AF North, HQ ISAF, MND(SE) in Iraq and I am implementing a research programme with Dstl.

Furthermore, as DG(S&A) staffs are here I thought I should as an after thought the requirement for verification and validation. Of course the real test is to implement it on an operation. OAB may not have that long to date if our Commander gets his way!

Finally I promised you a final quote and I do believe this is very important (Figure 37). I have no wish to produce the equivalent of league tables just to satisfy a politician.



*Figure 37:* Second quotation from a famous person.

*Editor's Note:* This paper was compiled by the Senior Editor from notes and Powerpoint™ slides provided by Mr. Richardson. The Senior Editor hopes that the paper does justice to the provided materials.