

13<sup>th</sup> ICCRTS

“C2 for Complex Endeavours”

The Response to Hurricane Katrina: A Case Study of Changing C2 Maturity

Topics 1, 5, 6

James Moffat

Defence Science and Technology Laboratory

PCS Dept, A3 Building, Dstl, Ively Road, Farnborough, Hampshire GU 14 0LX, UK.

Phone: +44 1252 455374  
Email: [jmoffat@dstl.gov.uk](mailto:jmoffat@dstl.gov.uk)

## **Abstract**

In work with NATO colleagues, I have developed a Maturity Model of NATO Network Enabled Capability (NEC) Command and Control (C2). This model consists of a number of levels of increasing C2 Maturity, ranging from Conflicted C2 to Agile C2, which reflect the NEC journey towards the 'NEC Mature' state, through increasing levels of agility. To validate this Maturity Model, I examined the case study of Hurricane Katrina, based on the following authoritative reports in the public domain. The US House of Representatives created a bipartisan committee to investigate the preparation for and response to Hurricane Katrina. In addition there was an independent report to the President led by the Department for Homeland Security. A report commissioned by the US Government examined the implications for the US Army and National Guard. In terms of our Maturity model, examples were observed of all Maturity Levels, during the build up to and immediate aftermath of the landfall of the hurricane, with the balance towards the Conflicted end. These maturity levels also changed over time in general. The key factors marking out these differing Maturity Levels were identified, where possible, and are consistent with the current NATO NEC C2 Maturity Model.

# 1 Introduction

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## 1.1 The NATO NEC C2 Maturity Model

The aim of this paper is to examine a particular case study, in order to illuminate and, to the extent possible, validate the assumptions and descriptions contained in the NATO NEC Command and Control Maturity Model. The model itself [1] considers the context of a coalition force that is composed of a number of ‘contributing elements’, both military and civilian (inter-agency or whole-of-government) from the various NATO nations. Other contributing elements may include contributions from non-NATO countries and international organizations as well as non-governmental organizations (NGOs) and private voluntary organizations (PVOs). The heterogeneous make-up of the enterprise implies that no single element is ‘in charge’ of the entire endeavour. The interactions among these contributing elements need to be considered in terms of the Physical, Information, Cognitive and Social domains [1].

Industrial Age Command and Control (C2) was well matched to the predominant challenges of the Industrial Age. The low agility of the Command process matched the characteristics of the mission environment; specifically the familiarity of the mission, the linearity of the battlespace, the predictability of actions and effects, and its relatively small rate of change. Hence Industrial Age approaches to Command and Control have proved to be successful in simple, linear (albeit highly complicated) environments where manoeuvre was limited, and the concepts of operation employed were based on massed forces to create attrition-based effects. ‘Industrial’ approaches to Command and Control begin to break down in more complex environments where the interactions that take place are less linear, more dynamic, and less predictable.

## 1.2 Command Agility

These less predictable interactions are characteristic of the nature of the 21<sup>st</sup> Century missions that confront civil-military coalitions. Such complex missions have to be addressed by increased *command agility* [2]. This requires a number of capabilities that include increased information sharing and increased shared awareness, both of which in turn require progressive enrichment of ‘peer to peer’ interactions (e.g. ‘horizontal’ exchanges and interactions with peer contributing force elements and other actors). These peer to peer interactions add to the well established ‘vertical’ interactions present in the command hierarchy.

As the maturity level of C2 increases, one or more characteristics of the approach to Command and Control change. This results in approaches to Command and Control

that correspond to a given level of maturity being located in different parts of the *C2 approach space* [1], shown in Figure 1 below.

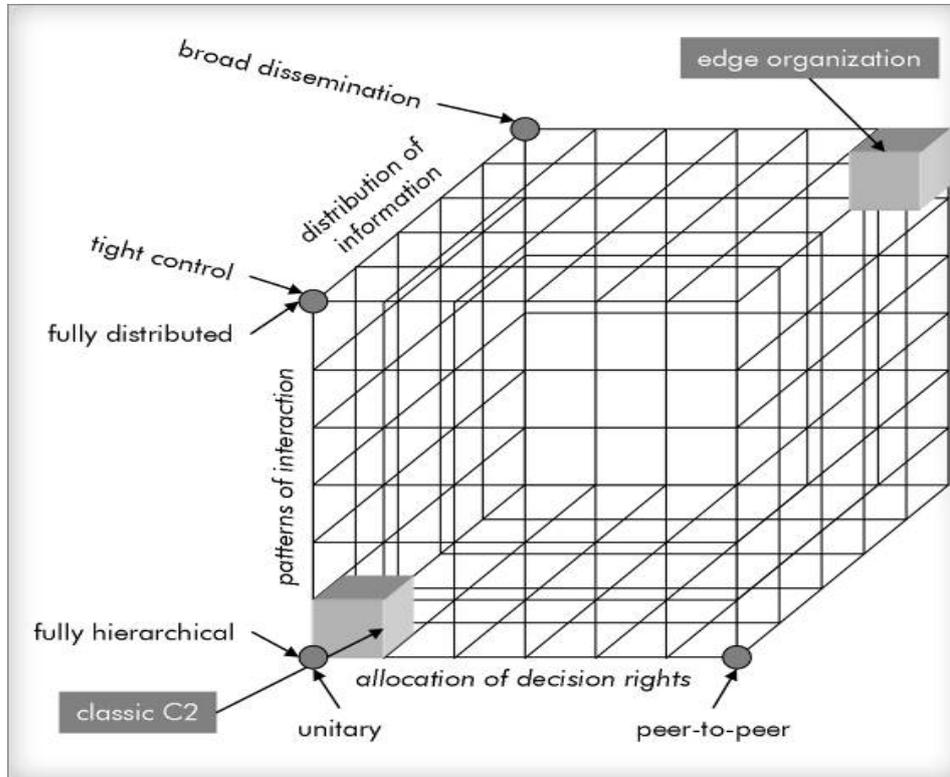


Figure 1; the C2 approach space.

For example, one of the dimensions of the C2 approach space represents the nature of the interactions among participants (in this case the contributing elements and the individuals and groups of individuals including organizations that comprise them). As the maturity of C2 increases, the frequency of interactions among the entities increases and their focus shifts from the Information domain (from sparse to rich exchange of information) to the Cognitive domain (from low to high degrees of shared awareness) and to the Social domain (from low to high sharing of resources). These are the key ‘tipping points’ leading to qualitatively different Network Enabled Capability (NEC) C2 maturity levels. The net result is that entities have the ability to work more closely together as the maturity of C2 increases. Finally, it should be noted that each C2 maturity level incorporates the ability to operate at any one of the maturity levels below it, offering the enterprise a choice.

Figure 2 below shows a mapping of the NATO NEC C2 maturity levels (left hand column) to the maturity levels of NATO NEC (NNEC). These NNEC maturity levels (right hand column) are currently being developed by Allied Command Transformation (ACT). The horizontal arrow implies that the level of C2 is adequate to command all levels of NNEC maturity either at or below the tip of the arrowhead.

Reference [1] describes each of these NNEC C2 maturity levels in more detail<sup>1</sup> as well as the key requirements for transition from one maturity level to the next. This more detailed discussion has also been pulled through into Reference [3], Chapter 7, as part of a wider consideration of planning in Complex Endeavours.

## NNEC C2 Maturity → NNEC Maturity

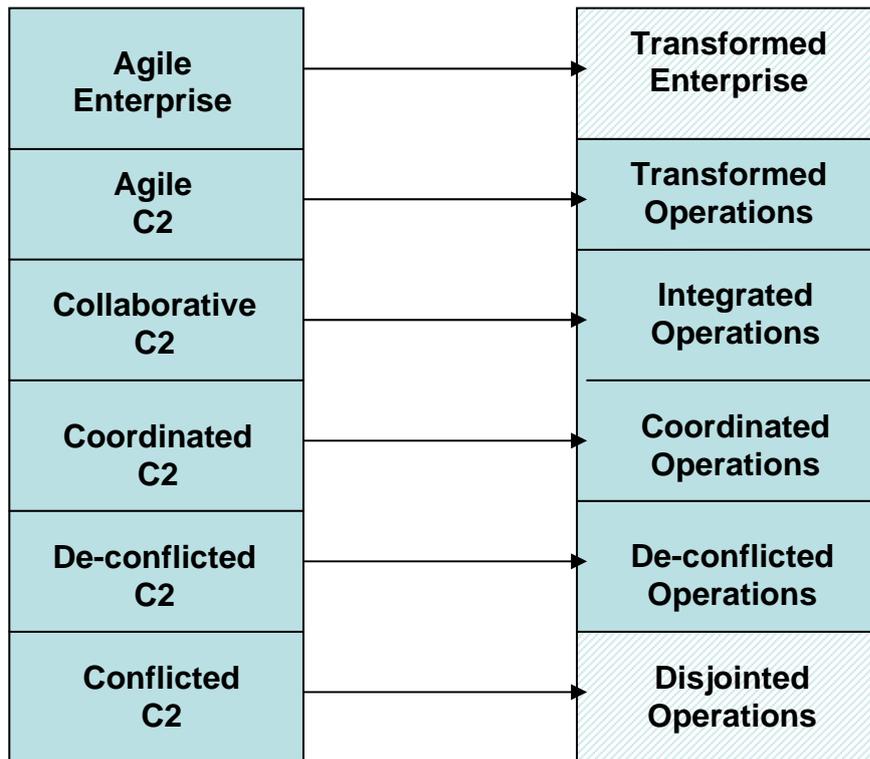


Figure 2; The relation between NATO NEC C2 Maturity and NATO NEC Maturity.

<sup>1</sup> Excluding the 'Agile Enterprise' level since our focus here is the operational employment of the force.

## 2 The US Emergency Planning Process

Having now described the Maturity Model in some detail, we turn in this section to the Hurricane Katrina Case Study, in order to test its validity. This study draws from a set of three authoritative reports on the events surrounding Hurricane Katrina, which are available in the public domain [4, 5, 6].

The US National Response Plan (NRP), resulting from Department of Homeland Security (DHS) Presidential Directive No. 5 in 2004, recognizes that planning, preparing for and responding to natural and other disasters are primarily responsibilities of the individual States. This reflects the US constitutional perspective, and results in a *pull* response assumption, with local authorities having the lead at the start, escalating to State level and then to Federal level, if necessary and if requested.

The ‘Stafford Act’ reiterates the philosophy that, in a disaster, local resources should be used first, then State and finally Federal resources. The Stafford Act also outlines the process by which State governors can request assistance from the Federal government when the event becomes one of ‘National Significance’. The US President then has to decide whether this merits designation as an ‘Emergency’ (releasing limited resources to the States), a ‘Major Disaster’ (releasing much greater resource to the States) or a ‘Catastrophe’. The first two of these result in a ‘pull’ response; the States requesting and drawing down from these Federal resources as they see the event unfolding. The third category of ‘Catastrophe’ was only being formulated at the time of Katrina, and had not been fully implemented. If called for by the President, it would have resulted in a proactive ‘push’ of resources to the region, States and local level, irrespective of the States’ requests. (Note: The USA is divided into ‘regions’ consisting of several individual States. Below the State level there are also local authorities).

Under the NRP, a comprehensive framework of response to major incidents is set up. At the Federal level, the Homeland Security Operations Centre, the FEMA (Federal Emergency Management Agency) National Response Centre and the Interagency Incident Management Group jointly coordinate the response across Government Departments. The Federal Coordinating Officer (FCO), a representative of the Secretary for Homeland Security, is authorized to lead a Joint Field Office (JFO). This is a temporary Federal facility established locally at the time of a disaster to coordinate the local, State and Federal response. It consists of senior representatives from all of the agencies and responders involved, and develops objectives, strategies, plans and priorities. The membership of this office is envisaged as growing and adapting over time as the incident escalates or diminishes.

Figure 3 shows how these various agencies interact, and indicates the place of the US Dept of Defense (DoD) Joint Task Force (JTF) Katrina within this context. The icons in the Figure indicate key committees or agencies.

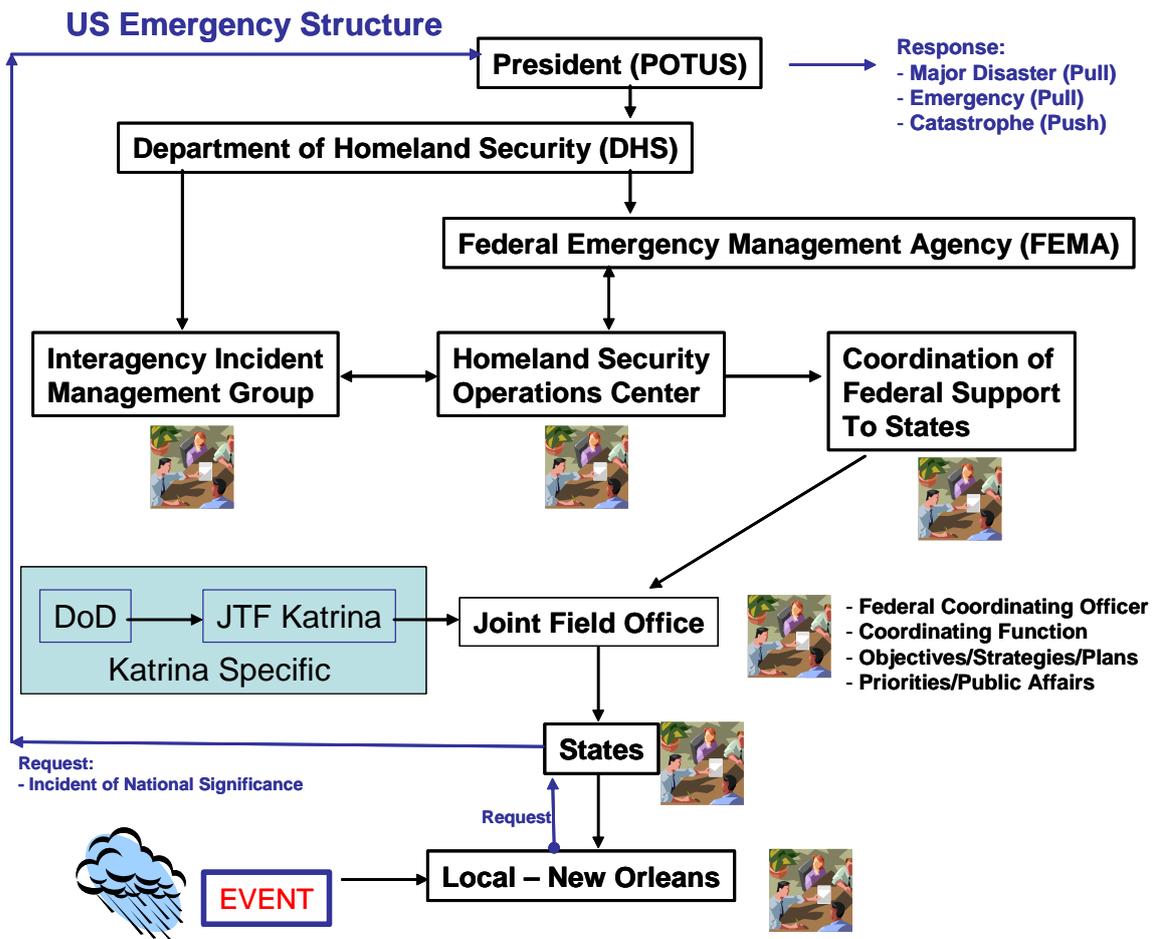


Figure 3; The US Emergency Structure: How the various agencies should interact, and the place of JTF Katrina in this context.

### **3 The Timeline and Response to Hurricane Katrina**

This section draws out key features of the events surrounding landfall of the hurricane. In Annex A we describe in more detail the timeline of events leading up to the landfall, and the events afterwards in terms of the evacuation of New Orleans.

#### **3.1 Key Points Concerning the National Guard Response**

- The National Guard response was unprecedented both in size and speed. However;
- There was a perceived overall slowness of response, and;
- There was a lack of coordination.
- The National Guard Board director was provided with daily briefings about what each State was sending in terms of units and personnel and their missions. The briefings also contained projections of forces that would be arriving over each of the following days. (This started at landfall of the hurricane (29<sup>th</sup> August) and continued daily with more accuracy).
- Initially, there was no attempt to use the process known as “troops to task analysis”. Most National Guard troops dispatched to Louisiana did not know what their mission would be. (Troop dispatch started on 31<sup>st</sup> August and continued for the following 3-4 days).

#### **3.2 Events post the landing of Katrina (29<sup>th</sup> Aug. 2005) and the Military Response**

On 30<sup>th</sup> August the Joint Task Force (JTF) Katrina was established.

States forwarded their requests for assistance to Federal civilian officials; the requests then moved through a series of military channels. Inherent in this process was the need for time to assess the capabilities required by each request and to design an appropriate military response.

There was an incorrect situational awareness and understanding at Department of Defense (DoD) level. Civilian and military decision makers throughout the government apparently judged that the projected flow of National Guard units would be sufficient. (Only on the 30<sup>th</sup> of August did the Deputy Secretary of Defense give the Commander a “blank cheque” for any DoD resources and on 31<sup>st</sup> August Gen. Honore still “did not believe that Federal ground forces were needed”).

- Federal military forces lacked awareness of what National Guard units were in the area and how they were operating. The C2 of the National Guard units and the Federal level could not exchange information.
- No unified C2 system was put in place during the search and rescue, evacuation and supply delivery missions. The effect was that of having multiple rescue teams operating in the same area while other areas were left

uncovered. This is an example of *Conflicted C2*, and occurred over the first week from 29<sup>th</sup> August to approximately 4<sup>th</sup> September.

- At the initial stage then, *Conflicted C2* was in place. Only after some time were National Guards and active-duty units deliberately deployed into different geographic areas in which to carry out various relief and rescue missions using separate C2 structures (*De-conflicted C2*).
- Only by the end of the first week post landfall did a complex and multifaceted C2 structure emerge given that *Coordinated C2* arrangements had to be made among States, between civilians and military organizations at both State and Federal levels, and among multiple military organizations and staffs. At this more mature stage:
  - a. NORTHCOM commanded most active-duty forces through JTF Katrina. JTF Katrina in turn commanded the majority of its active-duty forces through separate task forces: a joint Logistic task force and one for each service (Air, Navy and Marine Corps). (In place by 4<sup>th</sup> September).
  - b. A Planning Group from the US 5<sup>th</sup> Army under JTF Katrina assisted FEMA in identifying what DoD assistance was needed. It also helped the PFO (Principal Federal Officer) with the task of coordinating active-duty and National Guard forces. (In place by 4<sup>th</sup> September).

The timing and effectiveness of operations were driven by when the forces arrived. As an example, although the Superdome evacuation (see Annex A) could have been accomplished more quickly if an operational and tactical level C2 structure had been put in place and a single person put in charge, evacuation delays were nevertheless more due to lack of transportation assets and personnel, including specifically law-enforcement and security personnel.

### **3.3 Migration of the Maturity Levels over time**

During the initial response phase National Guard and active-duty forces operated independently of one another within the same operational area, and were *Conflicted*. Over time, within the first week post-landfall, they began to move up the maturity scale, and *De-conflicted* their efforts through liaison arrangements. With the creation of JTF Katrina, these liaison arrangements became more formalised. There was friction in this process however; for example, 24 hours were needed to agree within the Federal government and by Federal officials and the governor of Louisiana, on a structure of separate active-duty and National Guard task forces. The final agreement was not reached until 5 days later (i.e. six days after landfall of the hurricane).

More generally, there were some examples of *Coordinated C2*.

- Firstly the evacuation of the general populations (i.e. without medical or special needs) went relatively well in all three States.

- Once activated, the Emergency Management Assistance Compact enabled an unprecedented level of aid assistance to reach the disaster area in a timely and effective manner.

A law enforcement coordination centre was established in New Orleans on 6<sup>th</sup> September. It provided a unified command consisting of New Orleans police, Louisiana State police, National Guard and all Federal law enforcement personnel. This is an example of transition from *Conflicted C2* through *De-conflicted* to *Coordinated C2* and had an immediate positive impact.

The only possible example of *Agile C2* observed was an isolated single case. This was the response of an individual pharmacist to the crisis in medical supplies in New Orleans. He raided the flooded pharmacies and repositioned these supplies in local downtown hotels.

## **4 Factors identifying each Maturity Level**

### **4.1 Conflicted C2**

#### **4.1.1 Understanding Objectives: ‘Disjointed’ Decision Making**

- New Orleans Police Department was ill-prepared at the start for continuity of operations and lost almost all effectiveness.
- Deployment of medical personnel was reactive, not proactive.
- Deployment confusion, uncertainty about mission assignments, and government red tape delayed medical care.

#### **4.1.2 Conflict Identification and Resolution: Lack of Coordination**

- DoD, FEMA, and the State of Louisiana had difficulty coordinating with each other, which slowed the response.
- DoD-DHS coordination was not effective during Hurricane Katrina.
- Government did not effectively coordinate private air transport capabilities for the evacuation of medical patients.
- Lack of coordination led to delays in recovering dead bodies.

#### **4.1.3 Information Quality**

- “Information gaps” – problems with information-related implications, or failures to act decisively because information was sketchy at best.

#### **4.1.4 Awareness Quality: ‘Foggy’ Situational Awareness**

- FEMA management lacked situational awareness of existing requirements and of resources in the supply chain.

#### **4.1.5 Information Exchange related to Plans**

- Some local and State responders prepared for communications losses but still experienced problems, while others were caught unprepared.
- DoD lacked an information sharing protocol that would have enhanced joint situational awareness and communications between military components.

#### **4.2 De-Conflicted C2**

- National Guard and active duty units were deployed to different geographical areas.

#### **4.3 Coordinated C2**

- Evacuation of the general populations of the States of Louisiana and Mississippi went relatively well, as described in the timeline at Annex A. This escalated over time from the De-conflicted to the Coordinated level.
- Once activated, the Emergency Management Assistance Compact enabled an unprecedented level of aid assistance to reach the disaster area in a timely and effective manner.

#### **4.4 Collaborative C2**

- This level was not reached during the immediate aftermath of the hurricane. However, the subsequent rebuilding of the New Orleans Hurricane Protection System was an example of such a Collaborative level.

#### **4.5 Agile C2**

- The creation of ad-hoc clinics in downtown hotels was an agile and self-organized response to an awareness of the situation, and the need to adapt to that situation.

#### **4.6 Factors Inconsistent with the NNEC C2 Maturity Model**

There were no key factors observed which are not currently captured by the Maturity Model.

## 5 Conclusions

The NATO NEC Command and Control Maturity Model describes the journey towards the NEC Mature state, through levels of increasing maturity, corresponding to levels of increasing Command Agility.

In this case study of Hurricane Katrina which I have examined in order to support the validation of these maturity levels, examples were observed of maturity levels ranging from *Conflicted C2* to *Agile C2*, during the build up to and immediate aftermath of the landfall of the hurricane, with the balance towards the *Conflicted* end. These maturity levels also changed over time in general, as described in more detail in Annex A.

The key factors which, in combination, mark out these differing maturity levels have been identified, where possible, and are consistent with the current NATO NEC C2 Maturity Model.

## **6 Acknowledgements and Peer Review**

A number of the members of the NATO RTO SAS-065 working group have contributed to, and peer reviewed, initial versions of this paper. They are listed here in alphabetical order.

Julius Barath (Slovakia), Alain Burton (Belgium), Nancy Houston (USA), Agatino Mursia (Italy), Paul Phister (USA), Bill Piersol (USA).

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3. D ALBERTS, R HAYES 'Planning: Complex Endeavours' US DoD Command and Control Research Program, Washington DC, 2007.
4. 'A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina' US House of Representatives, Feb 2006.
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6. L DAVIS et al. 'Hurricane Katrina: Lessons Learned for Army Planning and Operations' RAND Arroyo Centre, Santa Monica, CA, USA, 2007.

## Annex A - Timeline of Events and Change of Maturity Levels

### A.1 Glossary

Note: a 'region' is a formally defined set of individual States, and thus lies above the individual State level. Beneath the individual State level is the 'local' level.

AL – State of Alabama; DoD – Dept of Defense; DoT – Dept of Transportation; DHS – Department of Homeland Security; FCO – Federal Coordinating Officer; FEMA – Federal Emergency Management Agency; GA – Georgia Region; JTF – Joint Task Force; LA – State of Louisiana; MS – State of Mississippi; NO – New Orleans; NORTHCOM – Northern Command; NWS – National Weather Service; TX – Texas Region.

### A.2 Timeline and Change of Maturity Levels

<b>Date Year: 2005</b>	<b>Activities</b>	<b>NNEC C2 Maturity Level</b>
Wed 24 Aug	<ul style="list-style-type: none"> <li>• FEMA activates Hurricane Liaison Team – FEMA, National Weather Service, State, local</li> <li>• DoD NORTHCOM issues Warning Order for supporting commands to prepare</li> <li>• Planning Perception – “Adequate and Exemplary”</li> </ul>	<p><b>De-Conflicted</b> Between FEMA, National Weather Service and National Hurricane Centre</p>
Thurs 25 Aug	<ul style="list-style-type: none"> <li>• Local emergency preliminary responses within each State</li> <li>• First FEMA teleconference – Federal/State/local</li> <li>• Plans for evacuation and shelter</li> <li>• FEMA initial pre-positioning</li> <li>• Rapid needs and emergency response teams on alert</li> <li>• Local private sector entities respond</li> </ul>	<p><b>Conflicted</b> Separate responses at local level. <b>De-Conflicted</b> At Federal/State level.</p>
Fri 26 Aug	<ul style="list-style-type: none"> <li>• LA and MS Governors declare states of emergency</li> <li>• AL, LA and MS Emergency Operational Centres expanded to highest readiness levels</li> <li>• LA Joint OP Centre activated</li> <li>• LA, MS National Guard mobilised</li> <li>• FEMA daily video conferencing – Regions, Nat Hurricane Centre, Federal Agencies and Depts. – Exchange information; reconcile responses</li> </ul>	<p><b>De-Conflicted by function</b> At Federal/State level. Limited interactions in the information domain.</p>
Sat 27 Aug	<ul style="list-style-type: none"> <li>• Phase 1 of LA Emergency Evacuation Plan – Implemented and MS informed</li> <li>• LA and MS Departments of transportation linked – Evacuation transportation plans coordinated</li> </ul>	<p><b>Coordinated</b> At Federal/State level. Limited linking of plans and actions.</p>

	<ul style="list-style-type: none"> <li>• FEMA activates National Disaster Medical Systems teams</li> <li>• FEMA and FEMA regional HQs in TX and GA go to level 1</li> <li>• FEMA Mobile Emergency Response Support Detachment deploys to LA from TX</li> <li>• FCO appointed (heads Joint Field Office)</li> <li>• LA and MS implement contra-flow traffic plans</li> <li>• LA and MS deploy personnel and pre-position resources</li> <li>• Federal emergency declared by President after request from Governor LA</li> <li>• Governor AL offers assistance to LA and MS</li> </ul>	
Sun 28 Aug	<ul style="list-style-type: none"> <li>• President calls LA Governor <ul style="list-style-type: none"> <li>- Urges mandatory evacuation of New Orleans</li> </ul> </li> <li>• FEMA video conference <ul style="list-style-type: none"> <li>- President</li> <li>- DHS Secretary</li> <li>- FEMA</li> <li>- National Hurricane Centre</li> <li>- State Representatives</li> </ul> </li> <li>• Regular briefings to President</li> <li>• “DoD fully engaged” (FEMA quote from report)</li> <li>• NWS issues accurate warning of severity of impact (to all parties)</li> </ul>	<p><b>De-conflicted</b> At President/State level</p> <p><b>Coordinated</b> At the local/State level</p>
Mon 29 Aug	<ul style="list-style-type: none"> <li>• <b>Storm hits</b> <ul style="list-style-type: none"> <li>- Huge damage to power, communications</li> <li>- Damage to infrastructure, transport, healthcare</li> <li>- Mayor of New Orleans could not communicate for 48-hrs</li> </ul> </li> <li>• LA and MS request National Guard assets from other States</li> <li>• Conflicting reports to local/State/Fed level <ul style="list-style-type: none"> <li>- Inaccurate and incomplete information</li> </ul> </li> <li>• Lack of situation awareness and Common Operational Picture (COP) <ul style="list-style-type: none"> <li>- Breaching of levees unclear</li> </ul> </li> <li>• Impossible to establish functioning incident command centres</li> <li>• Some emergency responders did not respond</li> <li>• Search and Rescue begins</li> <li>• Command structure broke down for local emergency response</li> </ul>	<p><b>Conflicted</b> Search and Rescue</p>
Tues 30 Aug	<ul style="list-style-type: none"> <li>• DoD Joint Task Force Katrina established</li> <li>• State and local officials begin to organize mass evacuation of New Orleans</li> <li>• FEMA organizes bus transportation <ul style="list-style-type: none"> <li>- Buses arrived eve of 31 Aug.</li> </ul> </li> </ul>	<p><b>Conflicted</b> Search and Rescue</p> <p><b>De-Conflicted</b> For FEMA/State</p>

	<ul style="list-style-type: none"> <li>• Search and Rescue fully committed</li> </ul>	<ul style="list-style-type: none"> <li>• Some plans and actions starting to be linked</li> <li>• Low level of coordination being established</li> </ul>
Wed 31 Aug	<ul style="list-style-type: none"> <li>• LA and Fed working together to plan evacuation to other States</li> <li>• DoD, DoT, State <ul style="list-style-type: none"> <li>– Local delivery of food, water</li> <li>– Plan further evacuation activities from New Orleans</li> </ul> </li> <li>• No Federal active duty forces in the area <ul style="list-style-type: none"> <li>– Due to incorrect situational awareness</li> </ul> </li> <li>• Large crowds at Convention Centre <ul style="list-style-type: none"> <li>– No food or water</li> </ul> </li> <li>• Search and Rescue <ul style="list-style-type: none"> <li>– Evacuees deposited on high ground with no coordination or unified command structure</li> </ul> </li> </ul>	<p><b>Conflicted</b> At local level and with DoD</p> <p><b>Conflicted</b> For Search and Rescue</p> <p><b>Coordinated</b> Planning in parts of Federal/State levels</p>
Fri 2 Sept	<ul style="list-style-type: none"> <li>• Superdome evacuation continues <ul style="list-style-type: none"> <li>– 15,000 evacuated</li> <li>– 5,500 remaining</li> </ul> </li> </ul>	<p><b>Conflicted</b> For National Guard and Active Duty Force</p> <p><b>De-Confliction</b> Using local liaison officers</p> <p><b>Coordinated</b> Planning in parts of Federal/State levels</p>
Sat 3 Sept	<ul style="list-style-type: none"> <li>• Evacuation of Convention Centre starts <ul style="list-style-type: none"> <li>– Food, water and medicine now available</li> <li>– 25,000 to be evacuated</li> </ul> </li> <li>• Superdome evacuation continuing</li> </ul>	<p><b>De-Conflicted</b> For evacuations Between National Guard and Active Duty Forces via JTF Katrina</p>
Sun 4 Sept	<ul style="list-style-type: none"> <li>• Evacuation mostly complete <ul style="list-style-type: none"> <li>– Superdome and Convention Center</li> </ul> </li> </ul>	<p><b>Coordinated</b> Between National Guard and Active Duty Force via JTF Katrina</p>
Mon 5 Sept	<ul style="list-style-type: none"> <li>• Vice Admiral Allen (Coast Guard) <ul style="list-style-type: none"> <li>– Designated Deputy Primary Federal Officer</li> </ul> </li> </ul>	<p><b>Coordinated</b> Higher levels emerging</p>
Tue 6 Sept	<ul style="list-style-type: none"> <li>• Establishment of Law Enforcement Coordination Centre <ul style="list-style-type: none"> <li>– Unified Command for Law Enforcement</li> <li>– NO Police, LA State Police, National Guard, Federal Law Enforcement</li> </ul> </li> </ul>	<p><b>Collaborative</b> Emerging</p>