

Systems Analysis: A Tool to Understand and Predict Terrorist Activities

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October 2002

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Objective of the Experiment

- Apply elements of the system engineering process to three terrorist situations to evaluate possible utility to the practice of intelligence analysis

Intelligence Analysis Starts with Data but Needs to Generate Predictions



Intelligence Analysis goal: Get to the top of the pyramid quickly and accurately for the given subject of interest

At the beginning, for the “subject of interest”:

- Boundaries unclear
- Intentions of subject unclear
- Elements/components unclear
- Data comes from multiple sources
- Relevant information must be filtered from large amounts of irrelevant and unrelated data

Technical Approach

- **Successful Intelligence Analysis is about predicting the future – not documenting the past.**
 - But we predict with a model which is assembled from historical information and hypothesis testing.
 - The model is reverse-engineered from multi-source, sampled data.
 - The model provides evidence of how well the target is understood.
- **How do we do this?**
 - Recognize that a target may be viewed as a dynamic system
 - Systems may be analyzed statically or dynamically.
 - Systems need to be represented as separate functional and physical models.
 - System functions change slowly with time while physical elements may change dramatically.
 - Making and testing of hypotheses is a key element of refining and converging the models.
- **Total analysis is never completed.**



Three Illustrations of our Concepts (Source of Material)

①

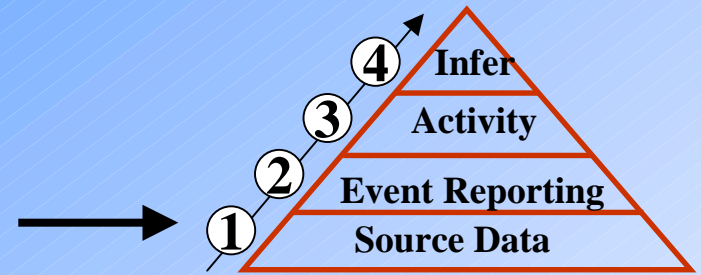
- **Osama bin Laden: Financial Support Networks** (Treasury Department Congressional Testimony)

② → ③

- **Terrorist Pilot Training** (Washington Post)

② → ③

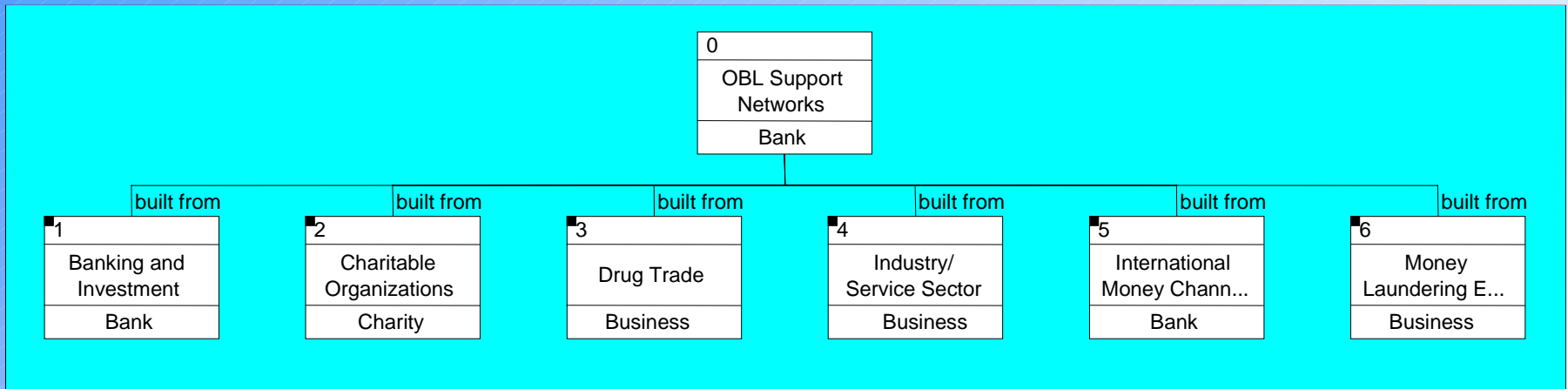
- **WTC Terrorist Cell Activities** (Washington Post)



Views From Osama bin Laden: Financial Support Networks

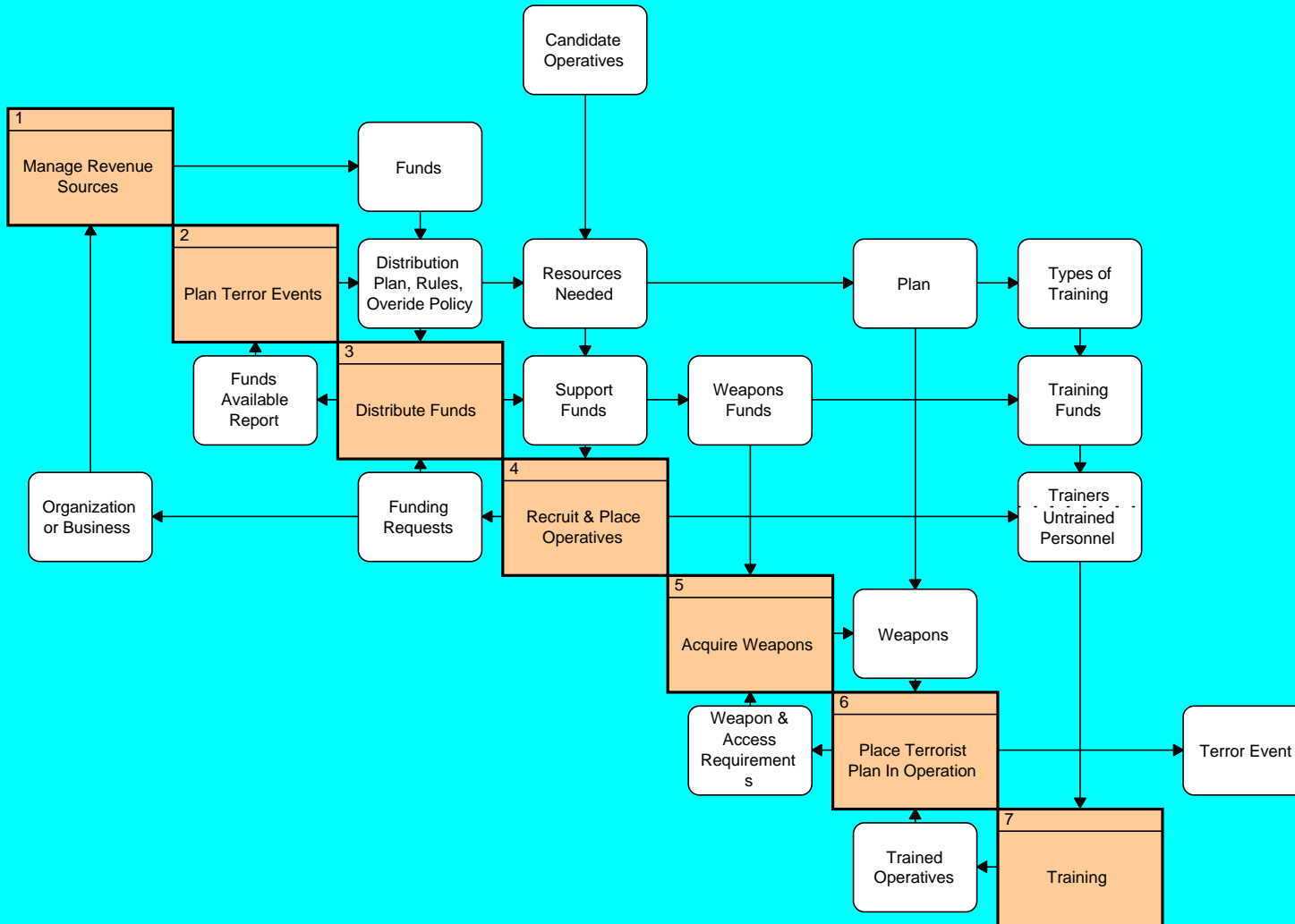
**Source: Mr. Johnathon Winer testimony to US
Senate Banking Committee, September 2001**

Top Level Organization for the OBL Financial Networks

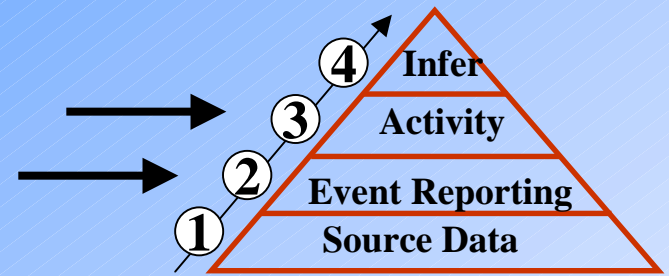


Question: Does this structure and content look familiar?

Postulating the OBL Functional Model puts the Organization in Context



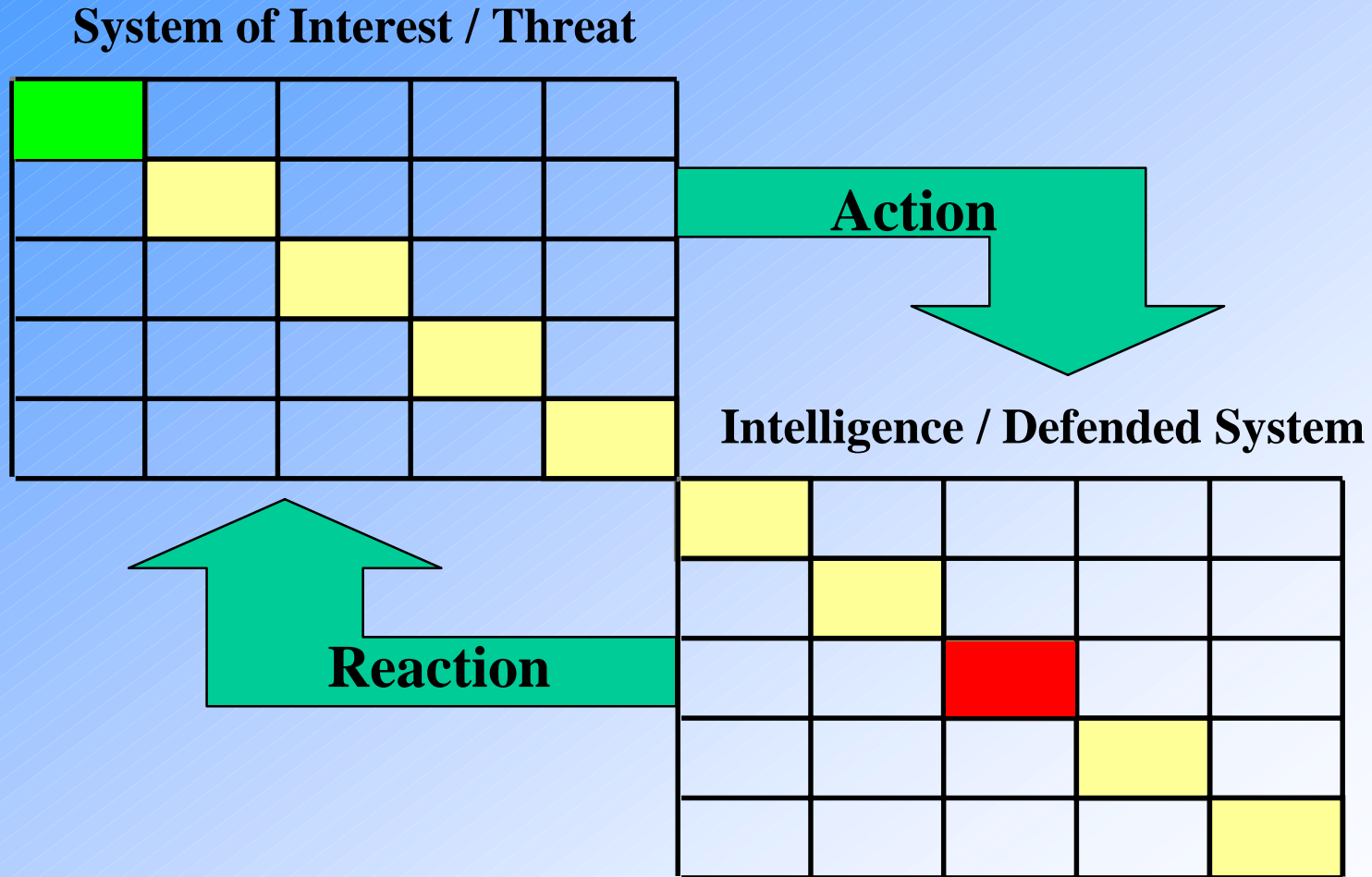
- Initial model lacks functions to provide context for the data.
- Models indicate what information needs to be acquired.



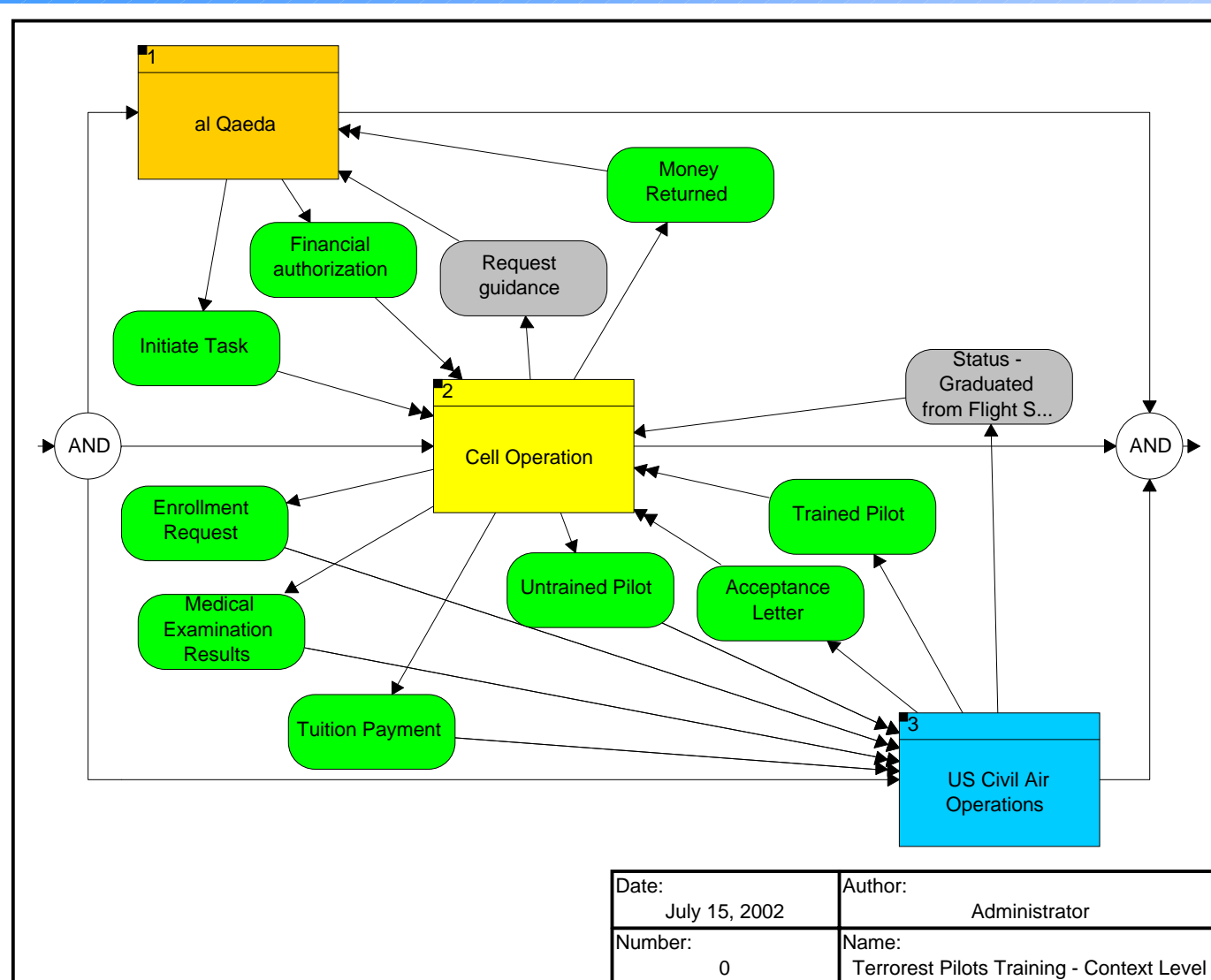
Views From the Terrorist Pilot Training Data

**Material/data extracted from various
Washington Post articles**

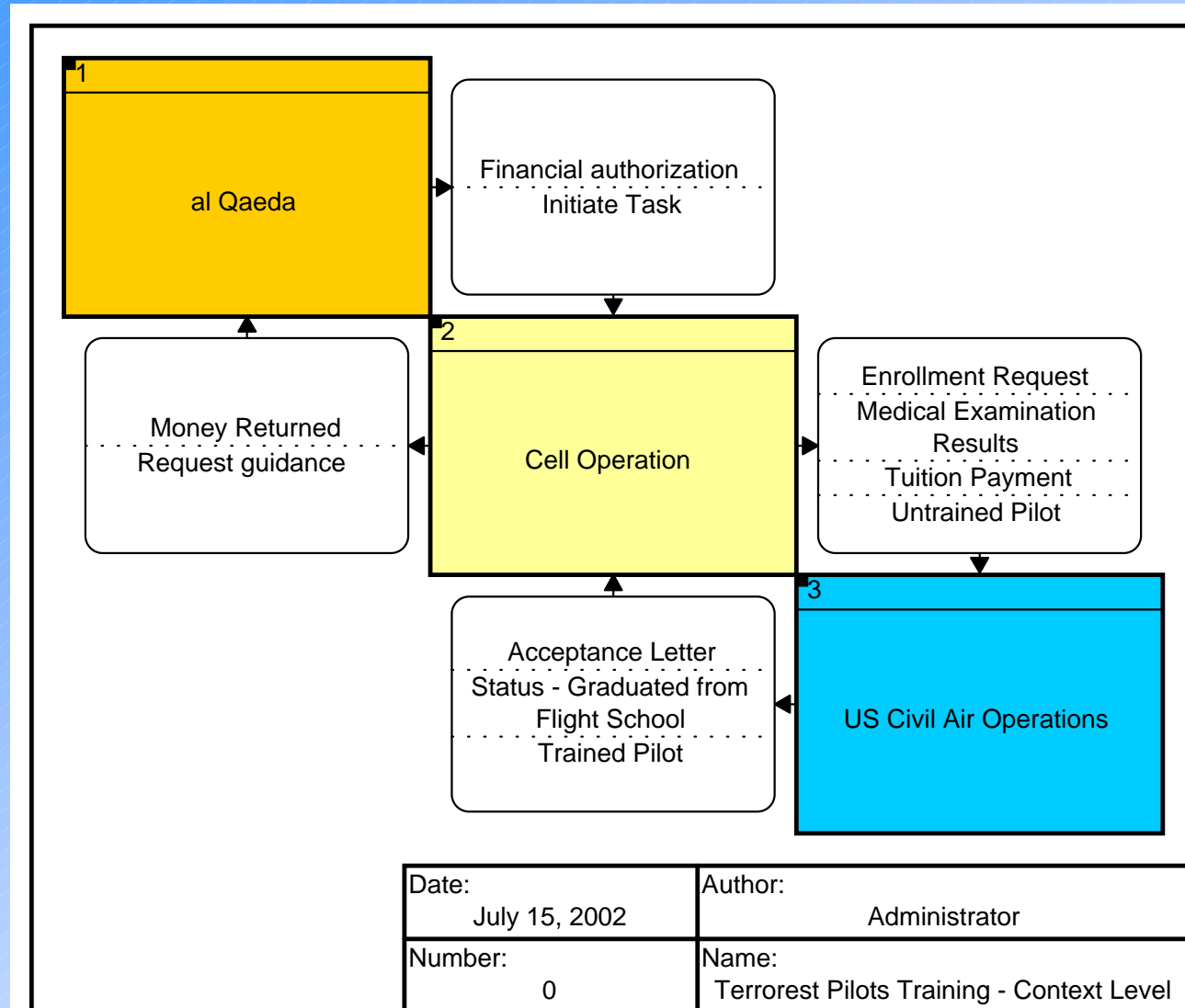
System-On-System Modeling Is Feasible, Straightforward, and Useful



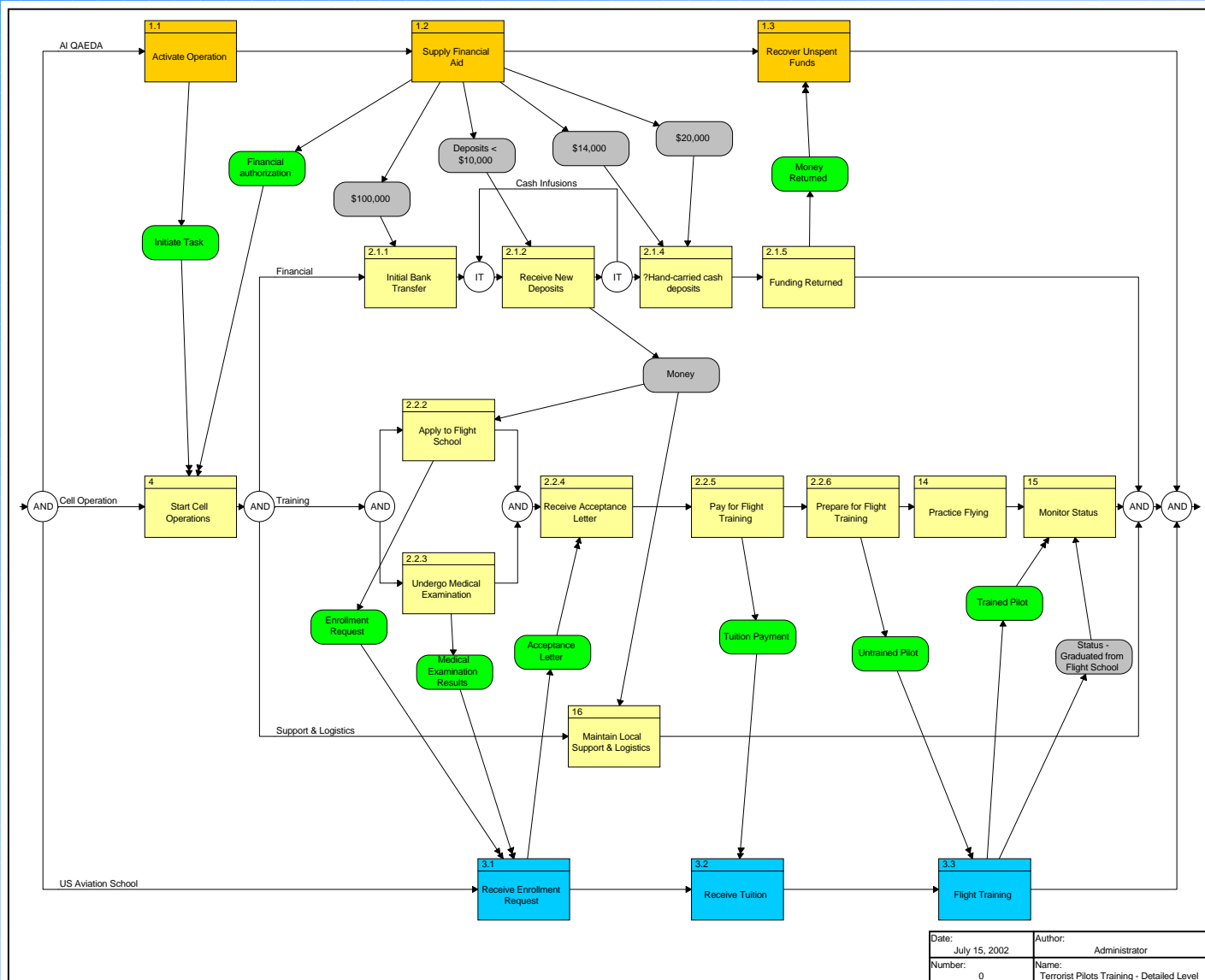
Functions at the Context Level – We Have Three Systems Interacting



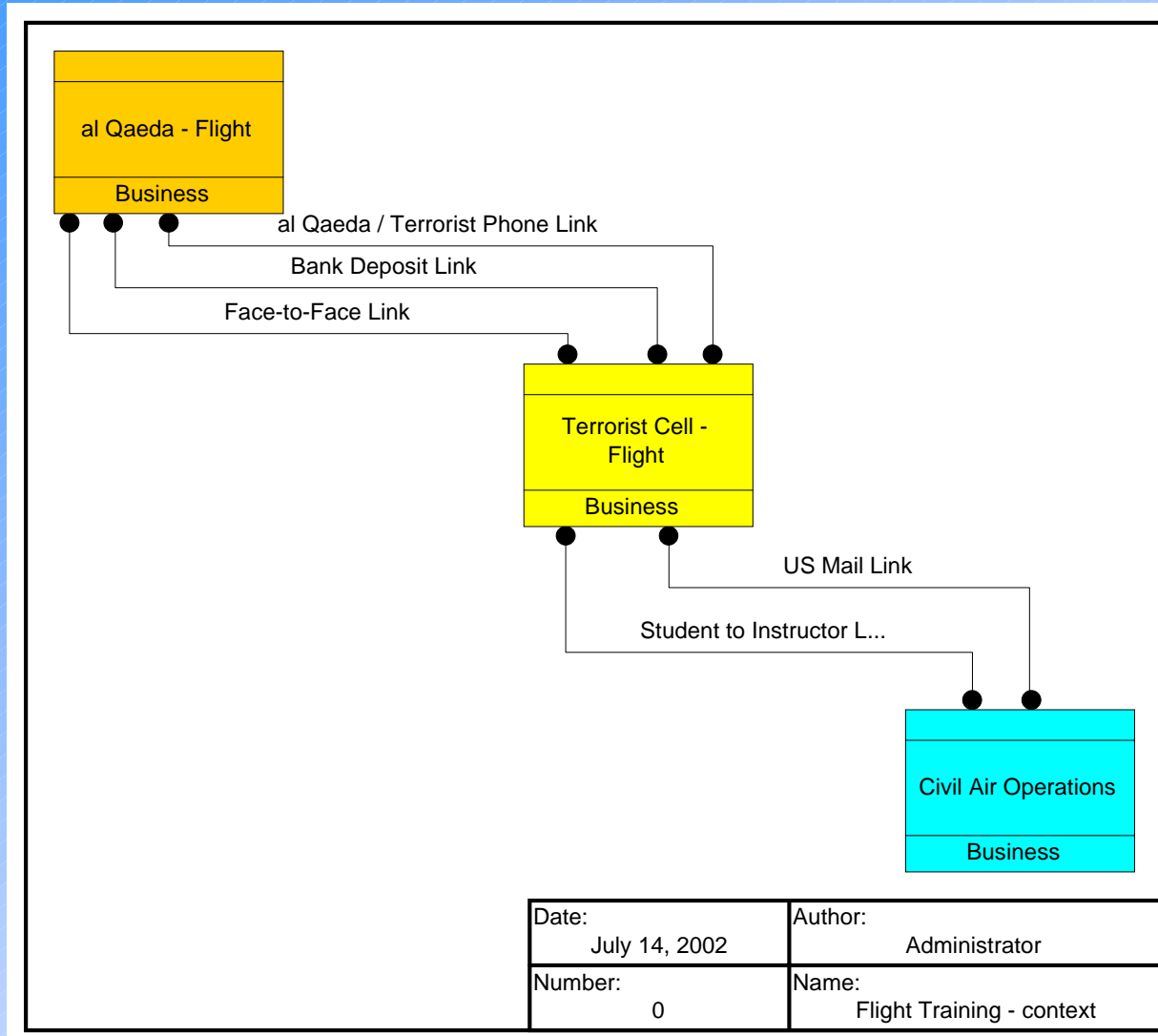
N2 Interface Diagram – Lack of Interaction Between al Qaeda and US School is Easily Visible



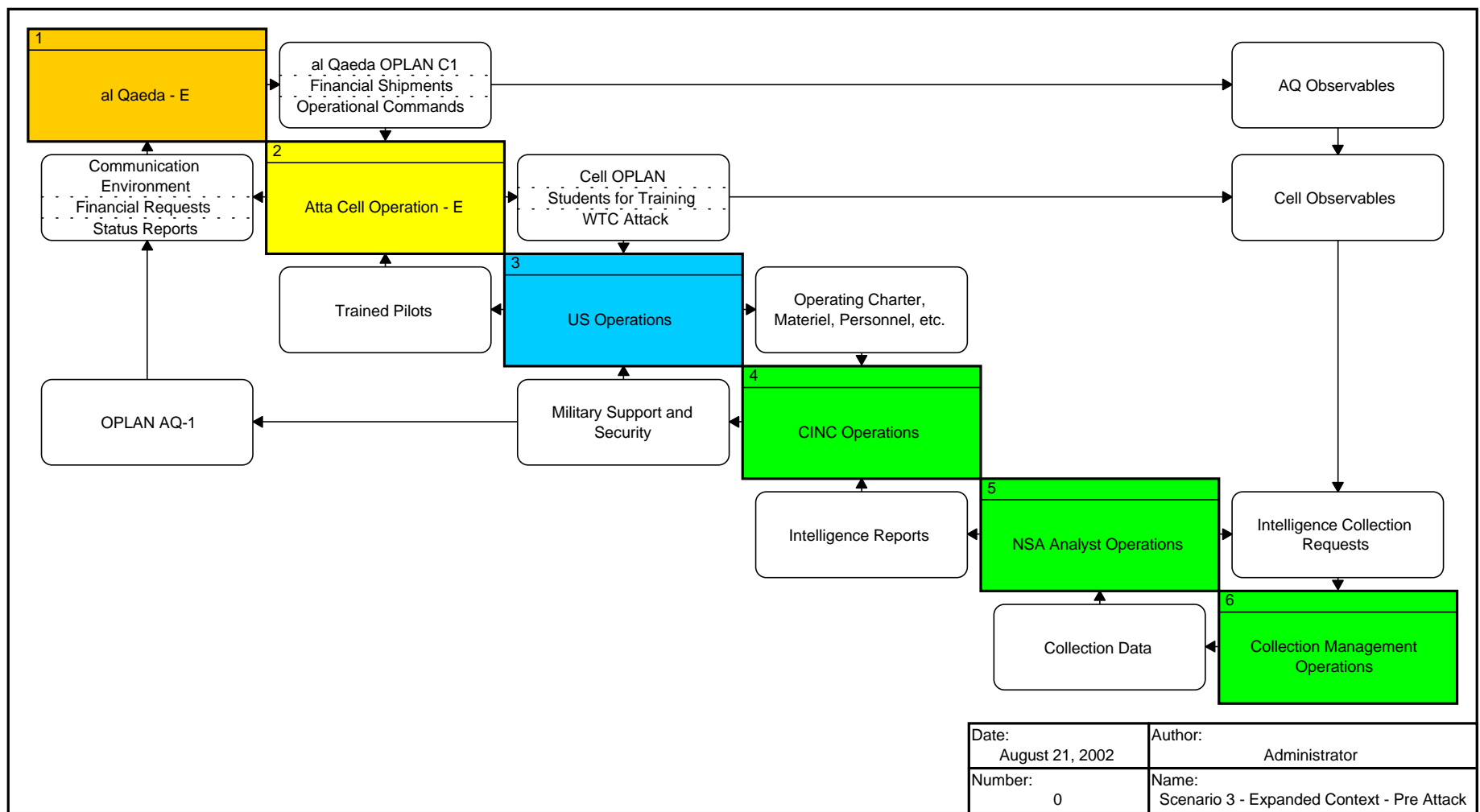
Functional Architecture at the Next Level Shows Sequencing and Partitioning of Roles

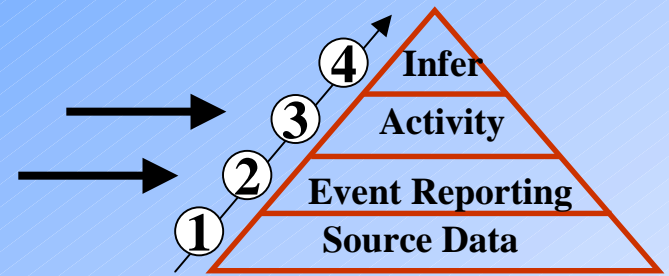


Physical Links Indicate Mechanisms of Communication



More Correct and Complete System-on-System Model for Terrorist Pilot Training

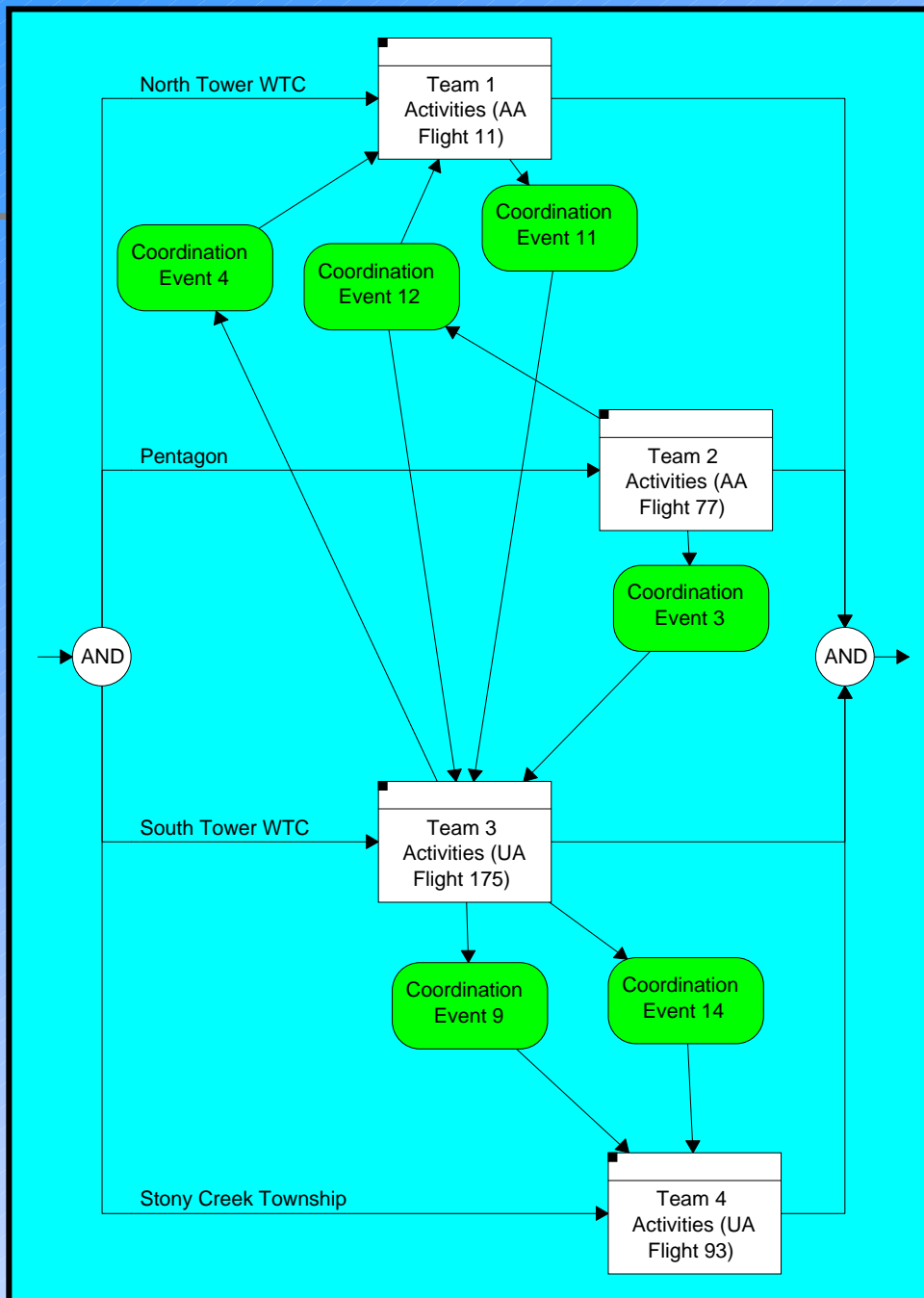




Views/Scenarios From the World Trade Center Terrorist Attack

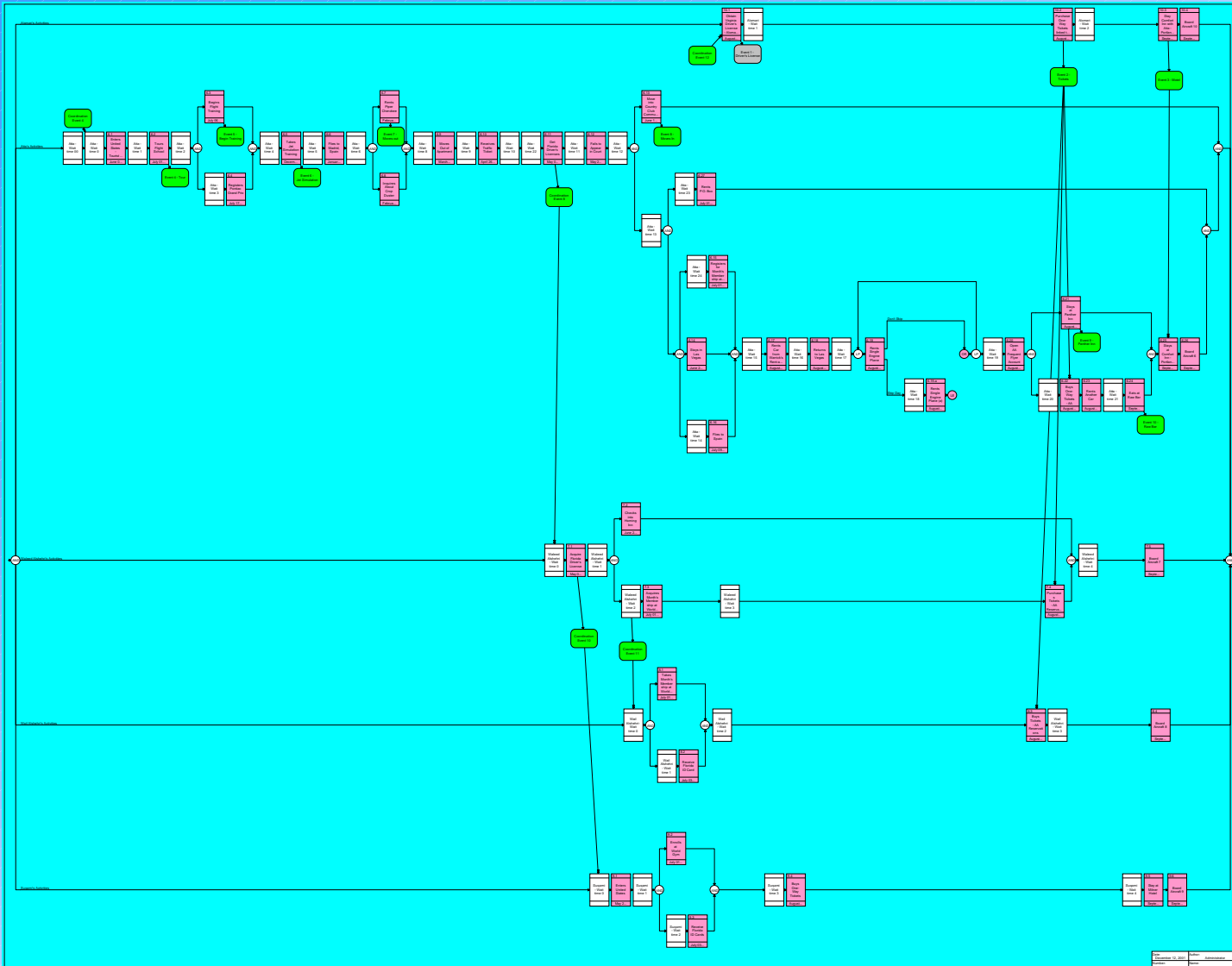
**Material/data extracted from various
Washington Post articles**

Activities of WTC Highjackers-Top Level



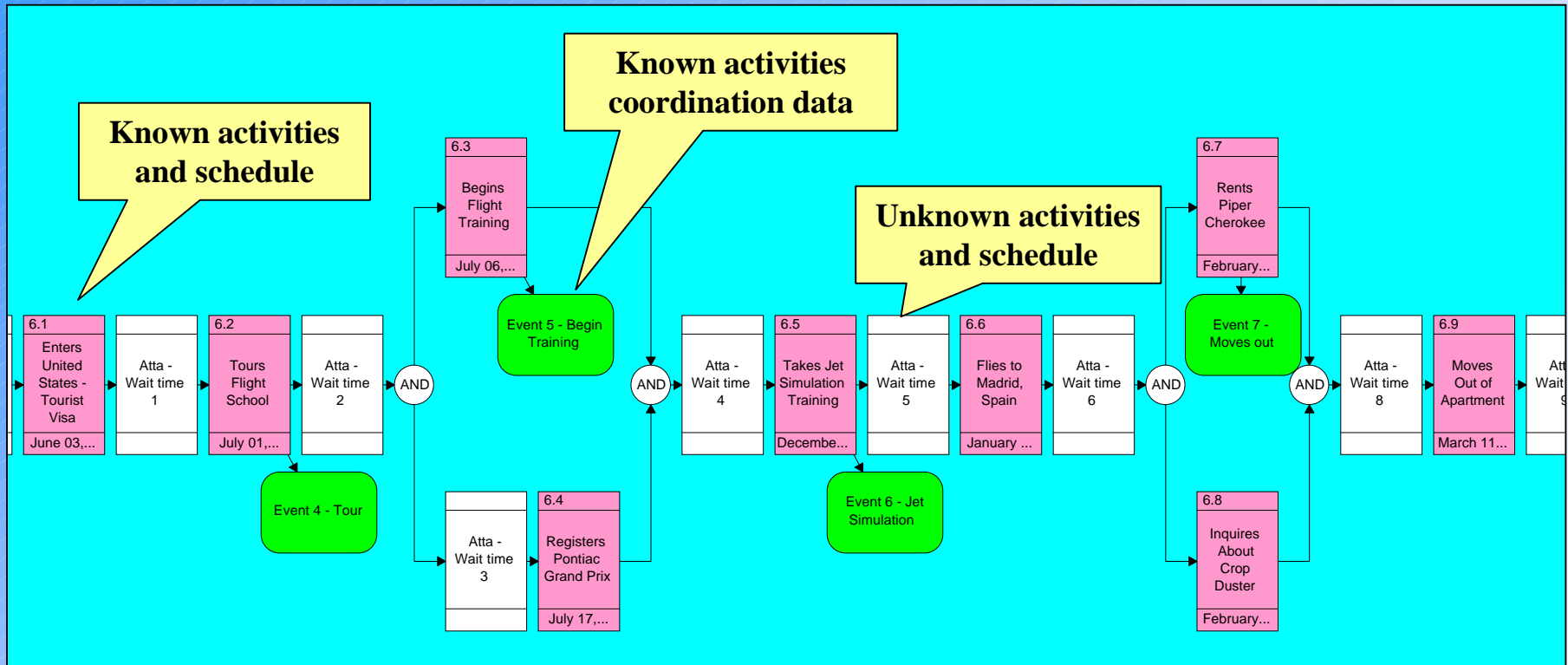
- Behavior and N2 Modeling included hierarchies down to the individual terrorist level (see COREsim simulator output for Atta)
- The cell is made up of 19 terrorists organized in 4 coordinated teams
- The total timeline from first terrorist entry into US until the attack on the WTC and Pentagon involved about 33 months

Activities of Team 1 (AA Flight 11) – At the Next Level of Detail



- Each main branch represents the activities of one terrorist (5 on this plane)
- Linked activities between terrorists indicated by interfacing items

Details of a Segment of ATTA's Timeline



NOTE:

- Behavior diagrams and scenarios are represented in a graphical language that is executable, allowing automatic simulation of the graphical model

Details of ATTA's Activities are in the Repository

Class: Activity

12/18/2001

Folders: Atta, Alomari, Waleed Alshehri, Wail Alshehri, Suqami

Number & Name	When	Description
6 Atta's Activities		
6.1 Enters United States - Tourist Visa	6/3/2000	June 3, 2000 Atta enters United States at Newark on a tourist visa.
6.2 Tours Flight School	7/1/2000	July 2000 Atta and Al-Shehhi tour Aiman Flight School in Norman, Oklahoma, but don't enroll.
6.3 Begins Flight Training	7/6/2000	July 6, 2000 Atta and Al-Shehhi start pilot training at Huffman Aviation, Venice, Florida.
6.4 Registers Pontiac Grand Prix	7/17/2000	July 17, 2000 Atta registers a red Pontiac Grand Prix, at 4890 Pompano Road, Venice, Florida.
6.5 Takes Jet Simulation Training	12/29/2000	December 29-30 2000 Atta and Al-Shehhi pay for two three-hour jet simulator lessons in Miami.
6.6 Flies to Madrid, Spain	1/4/2001	January 4, 2001 Atta leaves the United States, flying from Miami to Madrid, Spain.
6.7 Rents Piper Cherokee	2/1/2001	February 2001 Early February Atta and Al-Shehhi visit Atlanta, rent a Piper Cherokee plane.
6.8 Inquires About Crop Duster	2/1/2001	Early February 2001 Atta inquires about crop-dusters at Belle Glade State Municipal Airport in Belle Glade, Florida.
6.9 Moves Out of Apartment	3/11/2001	March 11, 2001 Atta and Al-Shehhi move out of their Hamburg apartment.
6.10 Receives Traffic Ticket	4/26/2001	April 26, 2001 Atta receives a traffic ticket in Tamarac, Florida, for driving without a license.
6.11 Get Florida Driver's Licenses	5/2/2001	May 2, 2001 Atta and Jarrah get Florida driver's licenses. Atta lists address at 10001 N. Atlantic Boulevard, Coral Springs, Florida.

Multiple Views Provide Insight of the Model

- We use reverse engineering to build the model since the system exists but its features are not completely known to us.
- The N2 chart is a natural view for reverse engineering a system with only partial or missing data
 - N2 is an interface chart
 - N2 does not represent time sequences
 - Patterns of interface relationships emerge from incomplete data
 - Interface information is continuously added. Density of interface instances yields model insight
- Predictions are most easily made from the timelines, likely triggered by inference from an event in context
 - Scenarios capture time and sequencing of activities
 - Allocation of activities to physical elements combine the physical and functional models
 - Stimulus-response patterns are deducible from the allocated scenarios and provide a basis for predictions

Requirements for Inference

- For inference, we need to identify events relating to some combination of:
 - Target
 - Weapon,
 - Schedule,
 - Team, and
 - Postulated scenarios
- Inference requirements are interdependent. Once some are satisfied, others become constrained
- Observables need to be placed in context
- Functional scenarios/models must have realizable physical allocations