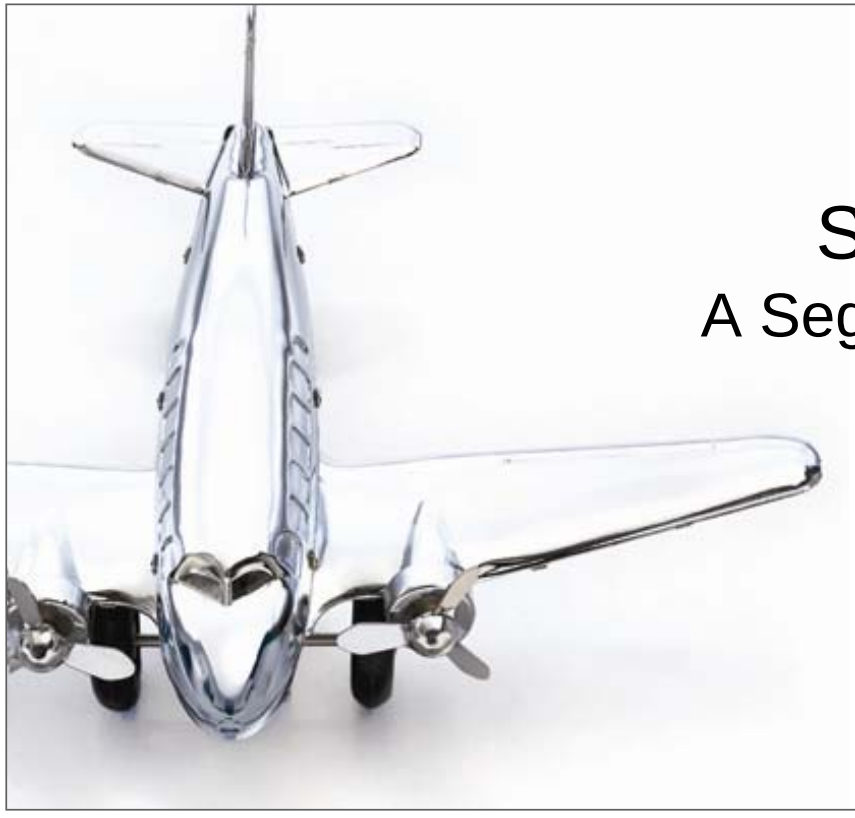

CRA Closer Look

Security and the Commons:
A Segmentation of Assets by Function

July 2010

CRA Charles River Associates

Security and the Commons: Summary

A segmentation of assets by function that provides a framework for business strategy

How should the aerospace and defense industry think strategically about the attention now being focused on securing "the Commons"? The prevailing conceptions of this problem are associated with two distinct customer perspectives, neither of which is well suited to inform strong business strategies. From the perspective of armed forces, the problem is about assuring access through "ungoverned spaces" as they may manifest themselves in the mostly familiar operating domains of sea, air, land, space, and cyberspace. From the perspective of homeland defense, the problem of securing the Commons is primarily about protecting the national infrastructure of industrial production, commercial services, agriculture, healthcare, and public safety thought to be critical to the functioning of the economy. While articulating real and novel challenges, conceptions focused on domain access and the regulation of infrastructure assets have done little for the A&D industry to illuminate new approaches to gaining competitive advantage in this adjacent space. Consequently, neither of these perspectives on securing the Commons has inspired especially coherent business response to the imperatives of securing the Commons.

A more powerful framework for such business strategies focuses on the assets associated with the Commons and takes stock of the particular functions that invest in these assets a "common" value. The interactive graphic featured in this issue of Closer Look presents an illustrative array of these assets organized into a framework of technological functions.[1] Each cell in this matrix characterizes a class of assets that is distinguished by its primary object—matter, energy, or information—and the action it takes with respect to that object—to process, transport, or store. Each combination of object and action suggests a distinctive function which the corresponding assets play in relation to an entire system. And it is the functional significance of these assets that opens a conceptual door to insights about successful business strategies for addressing customer needs to secure the Commons.

Seen in this framework, the customer needs associated with securing the Commons are more tractable to analysis of customer demand and the formulation of supplier responses. For example, in the context of how these assets create common value, the size and pace of customer demand can begin to be appraised by evaluating the risks and consequences of events that may impair the security of these assets—events of the sort that animate the interactive graphic. Moreover, the organization of Commons assets by this scheme also suggests patterns of customer needs that may form the foundation for a coherent business strategy. For example, a competitive strategy could be organized around the assets associated with a single function, like securing energy-storage assets, or some other combination of functions that may be amenable either to a common operational approach (e.g., protecting fixed assets, arteries, information) or to a distinct technological solution (e.g., biometrics, remote sensing, data processing).

[1] Van Wyk, Rias J. *Technology - A Unifying Code.* Cape Town: Stage Media Group, 2004.

Security and the Commons

Each object-action pair indicates a function that invests its assets with “common” value

This interactive graphic organizes an illustrative array of Commons assets into a framework of technological functions.[1] It also animates the nature of threats to these assets by reference to a selection of historical events.

Each cell in this matrix characterizes a class of assets distinguished by its primary object and the action it takes with respect to that object. Each combination of object and action suggests a distinctive function that the corresponding assets play to provide “common” value to the entire system.

Identifying the functional significance of the assets associated with the Commons opens a conceptual door to insights about successful business strategies. Seen from the perspective presented in this array, the customer needs associated with securing the Commons are more tractable to analysis of demand and the formulation of supplier responses.

Roll over table for details

Actions

Objects	Process	Transport	Store
Matter	Postal facility Wastewater treatment facility Estuary Pharmaceutical plant	Sea lane Arterial roadway Chlorine rail tanker car Flight corridor	Drinking water reservoir Vaccine warehouse Forest Mineral deposit
People	Hospital Airport Shopping mall Cruise ship	Aircraft Subway car Roadway bridge Ferry	Sports venue Landmark office building High-rise condominium International Space Station
Energy	Power plant Oil well Coal mine Electrical substation	Liquefied natural gas tanker Electricity transmission grid Oil pipeline Wind farm collector substation	Hydroelectric reservoir Petroleum storage tank Nuclear waste repository Geothermal wells
Information	Refinery process control Air traffic control data processing Navigation satellite World Wide Web	Telecommunication network Radio spectrum Undersea communications cable Mail distribution system	Library National archive Seed vault Stock exchange data backup

[1] Van Wyk, Rias J. *Technology - A Unifying Code.* Cape Town: Stage Media Group, 2004.

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Security and the Commons: Action Segments

Illustrative Process Assets and Threats

Melamine / milk scandal
China (2008)

Drinking water contamination
Milwaukee, WI (1993)

PEPCON Explosion
Henderson, NV (1988)

Tylenol poisonings
Chicago, IL (1982)

DC Sniper attacks
Washington, DC (2002-2003)

Swine flu pandemic
Worldwide (2009)

Deepwater Horizon disaster
Gulf of Mexico (2010)

Chernobyl disaster
Ukraine (1986)

Upper Big Branch Mine disaster
Montcoal, WV (2010)

9-11 financial market closure
New York, NY (2001)

BlackBerry service outage
North America (2007)

South Ossetia war cyber attacks
Russia & Georgia (2008)

Actions

Objects		Process	Transport	Store
Matter		Postal facility Wastewater treatment facility Estuary Pharmaceutical plant		nking water reservoir ccine warehouse est eral deposit
	People	Hospital Airport Shopping mall Cruise ship		orts venue dmark office building h-rise condominium rnational Space Station
Energy		Power plant Oil well Coal mine Electrical substation		droelectric reservoir roleum storage tank clear waste repository othermal wells
Information		Refinery process control Air traffic control data processing Navigation satellite World Wide Web	Mail distribution system	ary ional archive ed vault Stock exchange data backup

Process assets are objects that receive inputs of one kind and transform them into outputs of another kind, or where transactions take place. Process assets include factories, places of commerce, and shopping centers.

The security characteristics of process assets relate to the impairment of operation. Therefore, threats to the security of process assets tend to focus on their vulnerability to sabotage or corruption.

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Security and the Commons: Action Segments

Illustrative Transport Assets and Threats

I-35 bridge collapse
Minneapolis, MN (2007)

Suez Canal closure
Egypt (1967-1975)

9-11 national airspace closure
US (2001)

Madrid train bombings
Spain (2004)

Shoe bomb plot
US (2001)

Estonia disaster
Baltic Sea (1994)

Exxon Valdez oil spill
Prince William Sound, AK (1989)

Natural gas pipeline explosion
Carlsbad, NM (2000)

Northeast blackout
US & Canada (2003)

SQL Slammer worm disruption
Worldwide (2003)

Galaxy 15 satellite failure
North America (2010)

Cyber intrusion of electric grid
US (2009)

Actions

Objects	Process	Transport	Store
Matter	Postal facility Wastewater treatment facility Estuary Pharmaceutical plant	Sea lane Arterial roadway Chlorine rail tanker car Flight corridor	
People	Hospital Airport Shopping mall Cruise ship	Aircraft Subway car Roadway bridge Ferry	
Energy	Power plant Oil well Coal mine Electrical substation	Liquefied natural gas tanker Electricity transmission grid Oil pipeline Wind farm collector substation	
Information	Refinery process control Air traffic control data processing Navigation satellite World Wide Web	Telecommunication network Radio spectrum Undersea communications cable Mail distribution system	

Transport assets receive inputs and move them before releasing them. Most forms of transport resemble arteries: vast interconnections of continuous pathways (such as pipelines, power grids, and communications networks) that connect to nodes, or concentrations of objects (ships, aircraft, trucks, and information 'packets') travelling between nodes.

Transportation assets, by their nature, are highly vulnerable because they tend to be distributed and exposed, so approaches to security must focus on intelligence, surveillance, and response over perimeter protection and physical robustness.

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Security and the Commons: Action Segments

Illustrative Storage Assets and Threats

Actions

Objects	Process	Transport	Store
Matter	Postal facility Wastewater treatment facility Estuary Pharmaceutical plant		Drinking water reservoir Vaccine warehouse Forest Mineral deposit
Matter – People	Hospital Airport Shopping mall Cruise ship		Sports venue Landmark office building High-rise condominium International Space Station
Energy	Power plant Oil well Coal mine Electrical substation		Hydroelectric reservoir Petroleum storage tank Nuclear waste repository Geothermal wells
Information	Refinery process control Air traffic control data processin Navigation satellite World Wide Web	Mail distribution system	Library National archive Seed vault Stock exchange data backup

Storage assets receive inputs and hold them until they are required. Storage encompasses a wide range of assets, including warehouses, storage tanks, homes, schools, and mineral resources.

The security characteristics of storage assets relate to the protection of contents from loss or physical damage. Threats to the security of storage assets tend to involve breaches of containment, or destruction of the content.

Bhopal disaster
India (1984)

Love Canal
Niagara Falls, NY (1976-1978)

Mountain Pine Beetle outbreak
CO, WY, (2006-present)

Hurricane Katrina
US Gulf Coast (2005)

Centennial Olympic Park bombing
Atlanta, GA (1996)

Beslan school massacre
North Ossetia (2004)

Terak coal field fire
Xinjiang, China (1957-2007)

East Ohio Gas Explosion
Cleveland, OH (1944)

Sunrise propane incident
Toronto, ON (2008)

Lovebug worm infection
Worldwide (2000)

National Personnel Records fire
St. Louis, MO (1973)

Sidekick smartphone data loss
US (2009)

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Security and the Commons: Object Segments

Illustrative Matter Assets and Threats

I-35 bridge collapse
Minneapolis, MN (2007)

Suez Canal closure
Egypt (1967-1975)

9-11 national airspace closure
US (2001)

Melamine / milk scandal
China (2008)

Drinking water contamination
Milwaukee, WI (1993)

PEPCON Explosion
Henderson, NV (1988)

Bhopal disaster
India (1984)

Love Canal
Niagara Falls, NY (1976-1978)

Mountain Pine Beetle outbreak
CO, WY, (2006-present)

Actions

Objects

	Process	Transport	Store
Matter	Postal facility Wastewater treatment facility Estuary Pharmaceutical plant	Sea lane Arterial roadway Chlorine rail tanker car Flight corridor	Drinking water reservoir Vaccine warehouse Forest Mineral deposit
People	Hospital Airport Shopping mall Cruise ship	Aircraft Subway car Roadway bridge Ferry	Sports venue Landmark office building High-rise condominium International Space Station
Energy	P O C E		
Information	R A Navigation satellite World Wide Web	Undersea communications cable Mail distribution system	Seed vault Stock exchange data backup

Matter assets are comprised of physical objects that have substance, encompassing a wide range of asset types such as infrastructure, real estate, all manner of goods, and natural resources.

The security characteristics of matter tend to relate to its value, hazard, or substitutability. Threats to the security of matter assets involve attempts to steal or destroy high value assets, compromise hazardous assets, or impair assets that are difficult to replace.

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Security and the Commons: Object Segments

Illustrative People Assets and Threats

Madrid train bombings
Spain (2004)

Shoe bomb plot
US (2001)

Estonia disaster
Baltic Sea (1994)

Tylenol poisonings
Chicago, IL (1982)

DC Sniper attacks
Washington, DC (2002-2003)

Swine flu pandemic
Worldwide (2009)

Hurricane Katrina
US Gulf Coast (2005)

Centennial Olympic Park bombing
Atlanta, GA (1996)

Beslan school massacre
North Ossetia (2004)

Actions

Objects

	Process	Transport	Store
Matter	Postal facility Wastewater treatment facility Estuary Pharmaceutical plant	Sea lane Arterial roadway Chlorine rail tanker car Flight corridor	Drinking water reservoir Vaccine warehouse Forest Mineral deposit
People	Hospital Airport Shopping mall Cruise ship	Aircraft Subway car Roadway bridge Ferry	Sports venue Landmark office building High-rise condominium International Space Station
Energy	P O C El		
Information	R Air traffic control data processing Navigation satellite World Wide Web	Radio spectrum Undersea communications cable Mail distribution system	National archive Seed vault Stock exchange data backup

People are a special case of matter in that they are living physical objects.

The security characteristics of people relate to the fact that human beings are very high-value assets, but are also relatively fragile, and that many threats to people come from other people. The significance of these characteristics is a focus on preventing injury or death, rather than on material loss, as well as denying 'bad actors' the means to carry out attacks.

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Security and the Commons: Object Segments

Illustrative Energy Assets and Threats

Actions

Objects	Process	Transport	Store
Matter	Po Wa Est Ph		
People			
Energy	Power plant Oil well Coal mine Electrical substation	Liquefied natural gas tanker Electricity transmission grid Oil pipeline Wind farm collector substation	Hydroelectric reservoir Petroleum storage tank Nuclear waste repository Geothermal wells
Information	Refinery process control Air traffic control data processing Navigation satellite World Wide Web	Telecommunication network Radio spectrum Undersea communications cable Mail distribution system	Library National archive Seed vault Stock exchange data backup

Energy assets are related to the creation, distribution, and storage of a variety of forms of energy, such as electrical, mechanical, chemical, thermal, and nuclear. Much of modern society is dependent on an oil-based energy infrastructure for transportation, or the infrastructure that converts fuels (e.g., oil, coal, water reservoir, nuclear) into electricity for distribution and use.

The security characteristics of energy assets relate to the hazardous nature of the fuel, the value of the energy stored, or to the fact that some energy assets such as electrical are in a sense perishable because creation and consumption is balanced in real-time, with limited capacity for storage. Threats to the security of energy assets tend to involve impairment of conversion or transportation assets.

Deepwater Horizon disaster
Gulf of Mexico (2010)

Chernobyl disaster
Ukraine (1986)

Upper Big Branch Mine disaster
Montcoal, WV (2010)

Terak coal field fire
Xinjiang, China (1957-2007)

East Ohio Gas Explosion
Cleveland, OH (1944)

Sunrise propane incident
Toronto, ON (2008)

Exxon Valdez oil spill
Prince William Sound, AK (1989)

Natural gas pipeline explosion
Carlsbad, NM (2000)

Northeast blackout
US & Canada (2003)

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Security and the Commons: Object Segments

Illustrative Information Assets and Threats

Actions

Objects	Process	Transport	Store
Matter	Postal facility Wastewater treatment facility Estuary Pharmaceutical plant	Sea lane Arterial roadway Chlorine rail tanker car Flight corridor	Drinking water reservoir Vaccine warehouse Forest Mineral deposit
People	Hospital Airport	Aircraft Subway car	Sports venue Landmark office building
Energy	Po Oil Co Ele		
Information	Refinery process control Air traffic control data processing Navigation satellite World Wide Web	Telecommunication network Radio spectrum Undersea communications cable Mail distribution system	Library National archive Seed vault Stock exchange data backup

Information assets convey meaning, and typically depend on physical assets to make them tangible (e.g., displays, audio, newspapers) and durable (e.g., books, DVDs, computer memory).

Security of information assets is characterized by an emphasis on protecting the integrity of content by preventing unauthorized access, duplicating assets to prevent loss of information and function, maintaining transaction integrity, and detecting intrusion or loss.

9-11 financial market closure
New York, NY (2001)

BlackBerry service outage
North America (2007)

South Ossetia war cyber attacks
Russia & Georgia (2008)

SQL Slammer worm disruption
Worldwide (2003)

Galaxy 15 satellite failure
North America (2010)

Cyber intrusion of electric grid
US (2009)

Lovebug worm infection
Worldwide (2000)

National Personnel Records fire
St. Louis, MO (1973)

Sidekick smartphone data loss
US (2009)

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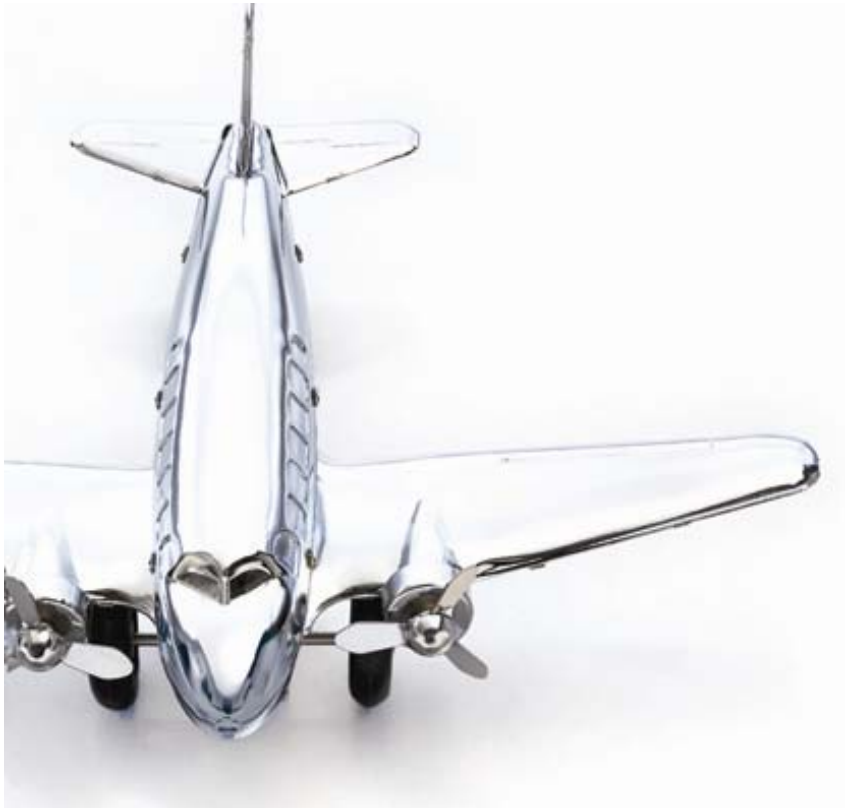

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