

Still, everything looked controllable until Harman's strategic overlay—an inverted map of the city hanging, or so it appeared, in the sky far above the city—began turning red. The neatly carved-up sectors of the city, which had been coloured according to the military-civilian councils that had been keeping peace in each one, were all flipping over to yellow, orange and even red. Suddenly, Harman received a message, "Sergeant, your tactical situation is being re-evaluated through simulation. Make for the safe position indicated on your AR display and wait for new orders." Harman looked around, over the pall of IR blocking purple smoke and through the buildings themselves. Bernardes was already pulling his section out of the neighbourhood, and was on his way to the port lands. There, a single strip of blue indicated the new tactical waypoint: in the warehouse district that nestled under the high concrete walls of the city's vertical farms.

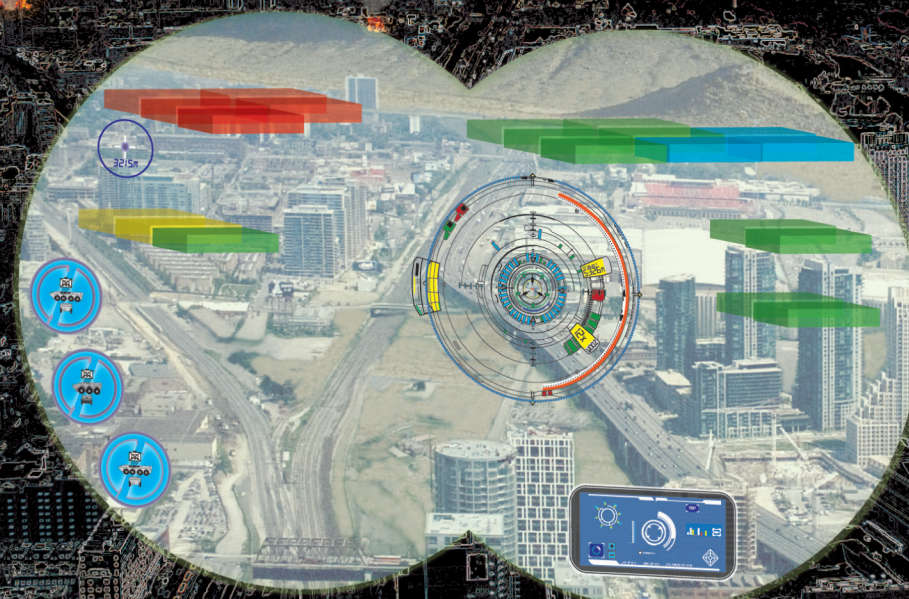
The futuristic scenario elaborated in Crisis in Urlia derives from broader Army work aimed at characterizing the nature and scope of uncertainty facing global societies in general—and Canada in particular—out to the 2040 timeframe. The process involved the development of several alternative futures that Canada's Army could conceivably confront.

The aim of this publication is to stimulate both interest in and debate on the conceptual development of Canada's Army.

CRISIS IN URLIA

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Canadian Army
Land Warfare Centre



National
Defence

Défense
nationale

Canada

CRISIS IN URLIA

National Library of Canada Cataloguing in Publication Data
DND

Crisis in Urlia

Includes bibliographical references and an index.

1. Crisis in Urlia

English

NDID—B-GL-007-000/AF-003

French

IDDN—B-GL-007-000/AF-004

Print—English

GC Catalogue Number—D2-324/2013E

ISBN—978-1-100-22603-3

Print—French

GC Catalogue Number—D2-324/2013F

ISBN—978-0-660-21167-1

Online—English

GC Catalogue Number—D2-324/2013E-PDF

ISBN—978-1-100-22618-7

Online—French

GC Catalogue Number—D2-324/2013F-PDF

ISBN—978-0-660-21182-4

2. Canada. Canadian Armed Forces – Fiction

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DESIGN & LAYOUT

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CRISIS IN URLIA

Canadian Army Land Warfare Centre
DEPARTMENT OF NATIONAL DEFENCE – CHIEF OF STAFF LAND STRATEGY
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The Canadian Army Land Warfare Centre (CALWC) is structured on the former Kingston-based Chief of the Army Staff (C Army) Directorate of Land Concepts and Designs (DLCD), and took effect 17 September 2012 on the authority of the Commander Canadian Army.

The CALWC advises the Commander Canadian Army on the future security environment, the capabilities that will be required to operate in that environment and alternative concepts and technologies to achieve the required capabilities. In meeting its mandate, the directorate examines a wide range of issues covering the global and domestic environments, emerging technologies, the human dimensions of conflict, and allied and foreign force developments. The future army team consists of a small group of military personnel and defence scientists supported by a wide range of contacts, both military and civilian, from within Canada as well as international partners.

ACKNOWLEDGEMENTS

The Canadian Army Land Warfare Centre would like to acknowledge the leadership, guidance and dedication of Dr. Michael Rostek, former Concepts Team Leader, in the development and completion of this project. In addition, the team is grateful for the draft manuscript critique and review comments offered by external reviewers, including Lieutenant-Colonel Ian Hope, Tim Hochban, Cally Warwick, and Dr. Hardeep S. Bhogal.

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ABBREVIATIONS

3D+C	defence, diplomacy, development and commerce
AI	artificial intelligence
AR	augmented reality
ASIC	all source intelligence centre
AugCog	augmented cognition
C Army	Chief of the Army Staff
CALWC	Canadian Army Land Warfare Centre
CBC	Canadian Broadcasting Corporation
CDC	Centres for Disease Control and Prevention
CEFCOM	Canadian Expeditionary Force Command
CF	Canadian Forces
CHERT	Comprehensive Humanitarian / Environmental Response Team
CIMIC	Civil-military cooperation
DART	Disaster Assistance Response Team
DFAIT	Foreign Affairs and International Trade Canada
DIME	diplomatic, informational, military, economic
DLCD	Directorate of Land Concepts and Designs
DND	Department of National Defence
DNIS	Department of National and International Security
DRDC	Defence Research and Development Canada
IM	information management
ISR	intelligence, surveillance and reconnaissance
JIMP	joint, interagency, multinational and public
KLE	key leader engagement
MMORPG	massively multiplayer online role-playing games
NATO	North Atlantic Treaty Organization

OLED	organic light-emitting diode
OPSEC	operational security
PBN	personal body network
PRT	provincial reconstruction team
REF	Rapid Expeditionary Force
RLE	religious leader engagement
ROE	rules of engagement
SDD	structured dialogic design
SMART	Strategic Multi-Departmental Advisory Reconstruction Team
UAV	unmanned aerial vehicle
UN	United Nations
UNRRF	UN Rapid Reaction Force
VF	vertical farm
VR	virtual reality
WHO	World Health Organization
WoW	World of Warcraft™

The future defies prediction. Indeed, uncertainty is a predominant characteristic of the future global security environment, and defence establishments around the world continue to strive to understand and define how their national security policies will fit within this emerging paradigm. State militaries routinely engage in forward planning for a variety of reasons that range from defence procurement to recruitment and retention of personnel, and to assessment of emerging forms of warfare. Typically, however, planners seek to diminish uncertainty rather than learn how to function within it.

In contrast, the Futures Team within the Canadian Army Land Warfare Centre recently undertook the Army's inaugural foresight study aiming to characterize the nature and scope of uncertainty facing global societies in general, and Canada in particular, out to the 2040 timeframe. While the trends, drivers, shocks and uncertainties identified in the study offer a sound basis for generating a common level of understanding of some of the challenges the world may face as it moves into the future, it is difficult to imagine a world shaped by such forces. Here, the development of scenarios based upon initial foresight work can be useful.

The use of scenarios probes imaginatively and generates ideas through creative descriptions.¹ Probing military capability development through the use of scenarios, similarly, brings new ideas to life through compelling narratives that highlight possible risks and opportunities present in an ever-changing security environment. Imagining the future is a powerful tool for managing change.

Crisis in Urlia builds on the Army's strong tradition of looking and thinking ahead. Although this book is set in a fictional location 30 years from now, already we are witnessing the threads linking today's technological solutions to this fictional—yet possible—vision of tomorrow. I invite you to read *Crisis in Urlia*, debate its concepts and participate in building the Future Army.

Jim Simms
Brigadier-General
CHIEF OF STAFF LAND STRATEGY

1. "Design Fiction: A Short Essay on Design, Science, Fact and Fiction," Julian Bleecker, March 2009. See http://drbfw5wflxon.cloudfront.net/writing/DesignFiction_WebEdition.pdf.

The futuristic scenario elaborated in *Crisis in Uralia* derives from broader Army work aimed at characterizing the nature and scope of uncertainty facing global societies in general, and Canada in particular, out to the 2040 timeframe.² Indeed, the process involved the development and elaboration of a number of alternative futures which Canada's Army could conceivably confront.

Futures developed were based on the identification of two global factors—energy sustainability and global environmental change—judged as ranking especially high in terms of impact and uncertainty. In all, four futures (the good, the bad, the not so good, and the not so bad), each representing a potential outcome of the forces under consideration, were constructed, and each was given a name reflective of the key message (or theme) that characterized it.

Four Worlds

A *High Octane Green* world reflects the most optimistic possibility for 2040. Here, decades of steadily increasing resource depletion and environmental crisis lead to growing international awareness of the need for substantial change in policies surrounding energy and the environment. Given rising societal concerns, world leaders from a number of quarters move to take action. The result by 2040 is an international context in which clean/green energy is relatively plentiful and the physical environment is ever-more sustainable and sound.

The *Global Quagmire* offers a stark contrast, as decades of wasteful fossil fuel energy exploitation and mistreatment of the environment lead to a steady decline in energy supplies and increasing environmental ruin. Here, the world is trapped in a vicious “Catch-22” in which the energy resources required to achieve environmental sustainability are absent and yet the lack of environmental sustainability progressively reduces the energy options crucial to future productivity. The result is an unending spiral of economic and social decline.

Other possibilities lie between the two extremes. In the world of *Materialism Gone Mad*, rising concerns over a looming energy crisis and fears of an extended and deepening global recession prompts states and societies to take concerted action on the energy front. Aggressive exploitation of existing sources and exploration of new energy alternatives soon follow. Yet efforts to ensure environmental sustainability are secondary. The result is an “energy-rich” world in which economic growth, development and consumerism are attained at a considerable and steadily growing environmental price—as the waste, pollution and environmental degradation generated becomes widespread and threatening to global security.

2. Details of this foresight study are available in two publications: DRDC CORA TM 2010-264, December 2010; and CLAXTON 14 – *Toward Army 2040: Exploring Key Dimensions of the Global Environment*, 2011.

Meanwhile, in *Recyclable Society*, key dynamics are reversed—decades of wasteful energy consumption leave states and societies little choice but to husband the remaining resources as best they can. As energy deficits work to limit the economic growth and technological innovation needed to address key societal needs and challenges, states and societies recognize that they must do “more with less” if continuous economic decline and disaster are to be averted. The result is a world of radically changed priorities and lifestyles, the nature of which reflect the need for aggressive energy conservation and more proactive approaches to environmental protection and improvement.

The World of Urlia

Determining which of the alternative futures sketched is most likely to arise in the decades ahead is a daunting—if not impossible—task. Nor is it the intention of *Army 2040* to predict the future. Yet when viewed as a whole, the worlds outlined above do offer a plausible, broad window into the future, within which it is reasonable to anticipate that actual events might unfold.

The narrative that follows in fact draws inspiration from all four futures—aiming less at elaborating the characteristics and processes found in any one world than at utilizing elements that can be found in each. The result is a vision of what could occur in the decades ahead that is not only compelling, but increasingly plausible in light of emerging trends in the global security environment.

Richard Dickson

Colonel

Director Canadian Army Land Warfare Centre

There are many ways to illustrate and debate³ concepts for future warfare. Perhaps no simpler or more engaging method exists than the use of scenarios—works of fiction derived from an analysis of key trends, drivers and challenges that are likely to shape the security environment out to 2040. *Crisis in Urlia* was drafted to highlight the potential features, organization and impact of military operations within one possible future global context in which the damaging effects of climate change overwhelm weak state governments and global organized crime is stronger than ever. The approach envisioned—described herein as the comprehensive approach⁴—is derived from private-sector management theory that aims at improving inter-organizational communications and coordination by eliminating the operational silos that reduce the effectiveness of multi-agency operations. The comprehensive approach therefore represents an evolution in function and organizational structure, defined within the context of the Canadian military.⁵ While recent operations in Afghanistan saw Canada move towards a more comprehensive whole-of-government approach, the future envisioned in *Urlia* imagines a much more integrated and tightly-coupled effort.

It is important to recognize that, as the Canadian Forces (CF) evolve, every other entity they may come in contact with will also evolve. In *Crisis in Urlia*, a key lesson is that the comprehensive approach is part of a larger—indeed, a global—trend toward the use of truly multi-dimensional approaches to security. Canada’s comprehensive approach is therefore matched in *Urlia* by a spectrum of similar approaches used by friend and foe alike.

Some of the realigned organizations that appear in *Urlia* include:

- ♦ *Trans-institutions*. Proposed by Jerome C. Glenn⁶ of the Millennium Project (via the American Council for the United Nations University), a trans-institution is an institution that is composed of some income and personnel from governments, corporations,⁷ NGOs, universities and international organizations without the majority from any one category of institution. Such an entity would differ from ordinary NGOs by being legally structured in such a way that it would be required to balance ethical, commercial and educational goals in its operations.

3. *Envisioning emerging technology*: see <http://envisioningtech.com/>.

4. Peter Gizewski and LCol Michael Rostek, “Toward a Comprehensive Approach to CF Operations – The Land Force JIMP Concept,” DRDC CORA TM 2007-60, September 2007.

5. See Michael Rostek and Peter Gizewski, (eds.), *Security Operations in the 21st Century: Canadian Perspectives on the Comprehensive Approach*, 2011.

6. The Millennium Project may become a Trans-Institution: see www.millennium-project.org/millennium/.../AEPI-February23-2011.ppt.

7. *The Rise of State Capitalism*: see <http://www.economist.com/node/21543160>.

- ♦ *Plurinational states*.⁸ In plurinationalism, the idea of nationality is plural, meaning there are many nationalities within an organized community or body of peoples. Derived from this concept, a plurinational state is the existence of multiple political communities and constitutional asymmetry. Plurinationalism has already had a direct impact on world politics through its influence on the constitutions of Ecuador and Bolivia. Plurinational states feature decentralization of responsibility as a key guiding principle.
- ♦ *Chaords (or adhocracies)*. The term chaordic organization was introduced by Dee Hock, founder of VISA USA and VISA International, and refers to an organization that eschews hierarchical organization in favour of a robust network structure.⁹ VISA International itself is touted as an example of such an organization. The term adhocracy is the earlier formulation of the idea invented by futurist Alvin Toffler.
- ♦ *Collective-intelligence entities*. Wikipedia, WikiLeaks, Amazon.com's Mechanical Turk and the various cognitive surplus¹⁰ engines that use large pools of volunteer labour to solve real-world problems,¹¹ can be used with equal effectiveness by our military and its enemies. Distributed sensor nets combined with decision-making algorithms yield inanimate entities, which are essentially a legal individual (like a corporation) identified with a natural system and managed by a computing system.
- ♦ *Online politics*. The computer game World of Warcraft™ (WoW), a massively multiplayer online role playing game (MMORPG), boasted 12 million virtual residents in October 2010.¹² This is more than twice the population of Denmark. Although accurate figures are hard to come by, it is estimated that the number of people being paid to play WoW and related games in order to increase in-game character levels or otherwise influence gameplay, ranges from 100,000 to 150,000 in China alone, an activity worth upwards of \$1 billion in real economic impact.

Crisis in Urdia takes the very small step of combining the notion of cognitive surplus (online political engagement on a massive, collective wisdom scale¹³) with chaordic or open-source organizational structures and MMORPG-type online environments. This conceptual mash-up yields the idea of the online nation, exemplified in the scenario by the global humanitarian charity Aephoria.¹⁴

Included in the mix is the employment of game design techniques, mechanics and tools designed to solve complex problems through the engagement of target audiences. Such

8. For more information on plurinationalism: see <http://www.qub.ac.uk/schools/SchoolofPoliticsInternationalStudiesandPhilosophy/FileStore/EuropeanisationFiles/Filetoupload,38424,en.pdf>.
 9. Dee W. Hock, *The Chaordic Organization: Out of Control and Into Order*, World Business Academy Perspectives, Vol. 9, No. 1, 1995.
 10. How cognitive surplus will change the world. see http://www.ted.com/talks/clay_shirky_how_cognitive_surplus_will_change_the_world.html.
 11. Open source Ushahidi: see <http://ushahidi.com/about-us>.
 12. See <http://us.blizzard.com/en-us/company/press/pressreleases.html?101007>.
 13. *The Wisdom of Crowds*: see http://en.wikipedia.org/wiki/The_Wisdom_of_Crowds.
 14. The HumanBe network could be an early example of a virtual charity: see http://www.humanbe.com/welcome/be_networkA.html.

application of game tools and techniques has become known as serious gaming and more recently as gamification. Typically gamification applies to non-game applications and processes,¹⁵ and in *Urlia* it applies to dispute resolution. Gamification works by making technology more engaging, encouraging users to engage in desired behaviours, showing a path to mastery and autonomy, and taking advantage of humans' psychological predisposition to engage in gaming. The technique can encourage people to perform chores that they ordinarily consider boring, such as completing surveys, shopping, filling out tax forms or reading websites.

In this scenario, we imagine that by 2040 the CF have the characteristics of a more integrated, multi-agency entity. In projecting trends and possibilities into the world of 2040, however, we also must conclude that many other agencies with characteristics similar to those described above will exist as well. For the *Crisis in Urlia* scenario to be consistent, therefore, the CF as imagined in the story must be capable of working within any and all of these systems, organizations and contexts.

15. Crowd-Sourced Redesign of a Protein: see <http://www.scientificamerican.com/article.cfm?id=victory-for-crowdsourced-biomolecule2>.

CAST OF CHARACTERS

(In order of appearance)

Lieutenant-Colonel Vanda Desai – Commanding Officer, Comprehensive Humanitarian / Environmental Response Team (CHERT)

Colonel Leslie Campbell – Director of the Rapid Allocation office
(akin to today's CEFCOM J3)

Lieutenant-General Mark Prior – Commander Joint Operations Command

Muhammad Raheem – Mayor of Urlia

Dr. Hazir Rumay – Urlian bioengineer

Cathy Arkin – specialist tropical diseases, Health Canada

Major Brian Sokolow – CHERT Chaplain and Religious Leader Engagement specialist

Sergeant Rob Ore – CHERT Headquarters chief clerk

Abida Pertwee – Sokolow's secretary

Azad Esani – Sokolow's Aephorian contact

Lieutenant Nancy Sweet – CHERT Nursing Officer

Salim Namvar – Aephorian driver

Jamal Ludhi – Urlian councillor

Darman and Cain – census takers

Imran Cyrus – Namvar's uncle

Sergeant Lynn Harman – CHERT security section leader

Lateef Nasiri – Urlian youth

Sergeant Murray Moffat – Winnipeg-based UAV controller

Private Lem – member of Sergeant Harman's section

Sean Foster – Candidate for Patriot Party leadership

Alberto Torretti – Foster's campaign manager

Lidia Tapscott – Alberto Torretti's Aephorian friend

Alexej Maliar – Chief of Staff to the Minister of National and International Security (DNIS)

Simon Strahan – security analyst

Marjorie Weisman – DNIS reconstruction expert

Malik Sanobar – head of the Uria organized crime network

Dilawar Kermani – militia-installed mullah

Sergeant Alberto Bernarde – Brazilian security team section leader

Seeley Jackson – member of Sergeant Harman's section

“ALMOST EVERYTHING THAT DISTINGUISHES THE MODERN WORLD
FROM EARLIER CENTURIES IS ATTRIBUTABLE TO SCIENCE”

— *Bertrand Russell*

Lieutenant-Colonel Vanda Desai was sitting in the plenary session of a water security conference in Taraz when the call came in. It wasn't entirely unexpected—she knew she was on a very short list for certain kinds of assignments and had been following the news—but she was still taken aback when Colonel Leslie Campbell's communication pulled her out of the day's last plenary session. "They want you," he told her.

"When?"

"Now."

Six hours later, the moonlit trees and hills of south-central Asia were hurtling by the windows of her train at 600 kilometres per hour.¹⁶ It had taken them a while to wind their way out of the new suburbs of Taraz, which was one of the cities miraculously transformed by the new Silk Road;¹⁷ once the train got rolling, though, it was amazingly fast. China's high-speed rail links to Europe, the Middle East and Pakistan had awoken central Asia, and for its part, Taraz had gone from isolated provincial capital to high-tech commercial hub almost overnight. Canada had strong interests in engaging with this dynamic and increasingly prosperous urban centre.

Somewhere off to the left lurked the Himalayas, which Desai had never seen despite working in this part of the world for years. Around her, the more sensible passengers were trying to sleep, but she was talking quietly, and as she turned her head she didn't see the train or the rolling landscape outside. She was attending a meeting¹⁸ through her AR¹⁹ rig.

"Our contribution will be to assemble a CHERT unit," Lieutenant-General Prior of the Joint Operations Command was saying now. "Lieutenant-Colonel Desai will have it on the ground in the city of Uralia within 24 hours." Up and down the virtual conference table, human and virtual-human²⁰ figures nodded. They shared a secure level in the plurinational government's conferencing system; the environment was a distant descendant of online worlds such as Second Life[®],²¹ where people were represented by computer-generated avatars.²² In this case, though, most of the avatars were photo-realistic,²³ and the room itself would have seemed real to Desai had she not been able to feel the vibration of the train through her body.

16. Chinese high-speed trains: see <http://www.ctv.ca/CTVNews/TopStories/20110627/china-high-speed-train-test-run-110627/>.

17. *The New Silk Road*: see http://www.businessweek.com/magazine/content/08_46/b4108046852388.htm.

18. Virtual Meetings: see <http://www.engagedigital.com/blog/2009/02/27/ibm-saves-320000-with-second-life-meeting/>.

19. Augmented Reality: see <http://graphics.cs.columbia.edu/projects/mars/>.

20. Virtual Human Interaction Lab: see <http://vhil.stanford.edu/>.

21. *What is Second Life?* See <http://secondlife.com/whatis/>.

22. Automatic Generation of Personalized Human Avatars: see http://www.mpi-inf.mpg.de/~edeagua/publications/deAguiar_vrst05.pdf.

23. Photo Realistic Avatars: see http://www.image-metrics.com/?page_id=349.

One NGO representative asked, “What will the CHERT do?”

“CHERT stands for Comprehensive Humanitarian / Environmental Response Team,” Prior told her. “It’s not a persistent entity; we generate CHERTs when we need to.” Most of the time, the unit lay in a state of potential, embodied as tagged inventories of supplies,²⁴ aircraft and ship allocations, and personnel links.²⁵ A Canadian Forces supercomputer²⁶ juggled the logistics in real time, ensuring that in the event of catastrophe an appropriate team could be on the ground within hours, anywhere in the world.

“We’ll be there to nail down the cause of the outbreak,” Desai added. “Also, we’re planning to add new desalination²⁷ capacity and, more importantly, a water distribution infrastructure to help alleviate unintended consequences left over from an earlier mission that did not account for local political dynamics.”

“Ah, really?” Two attendees from the young Arab democracies²⁸ perked up at this. “We can help.”

“Good,” said Prior. “Can you spawn a couple of liaisons to work with the colonel?”

“Absolutely.” Two human figures popped into being behind the Arab representatives and walked around to take seats behind Desai. These were liaisons: avatars not of people, but of organizations.²⁹ Liaisons were a common feature of today’s internet, which had evolved over time to include a massive distributed stakeholder- management layer.³⁰ You could interact with a country’s, company’s or person’s liaison as if it too was a person, and they were originally designed to automatically take on the characteristics of the entity it represented. These characteristics manifested in the appearance and personal style of the liaison; for instance, before the power and utility of liaisons became widely known on the global network, a company that boasted of being honest and above-board—but which had been caught engaging in illegal activities of one sort or another—appeared as a rather shifty, weasel-like person.³¹ It did not take long, however, before hackers realized the importance of liaisons and began offering virtual liaison makeover services that decoupled the liaison’s appearance from its owner’s behaviour—for a significant fee. Establishing the trustworthiness of a liaison now required good old-fashioned research and analysis.

The two water-management company liaisons that had just joined Desai’s roster happened to look like fresh-faced, honest young women.

“What about the outbreak?” asked a representative from the Ministry of Health and Safety for the India/Pakistan Plurinational Zone.³² “They’re calling it New Sweating Sickness, or NSS. They don’t know what it is; it doesn’t resemble any known disease. People are dying and we need immediate action on this before there’s general panic or a global outbreak.”

24. RFID Fact Sheet: see http://www.priv.gc.ca/fs-fi/02_05_d_28_e.cfm.

25. Social Networking Trends: see http://blogs.hbr.org/cs/2009/11/six_social_media_trends.html.

26. Top 500 Supercomputers: see <http://www.top500.org/>.

27. Nanotechnology Desalination: see <http://nanotechnologytoday.blogspot.com/2006/11/nanotech-water-desalination-membrane.html>.

28. Arab Spring: see <http://www.guardian.co.uk/world/interactive/2011/mar/22/middle-east-protest-interactive-timeline>.

29. *Corporate Personhood*: see http://en.wikipedia.org/wiki/Corporate_personhood.

30. Stakeholder Management System: see <http://www.consultationmanager.com/>.

31. Online Reputation Management: see <http://www.brandseye.com/>.

32. It is anticipated that “plurinational” states will be increasingly common in this era. In this context, a plurinational “zone” between India and Pakistan would do much to ease tensions in the area.

The Plurinational Foreign Minister raised a hand. He was chairing the meeting and it was his office that had summoned all these stakeholders to the meeting. “We’re getting ahead of ourselves,” he said. “Now that foreign agencies have been called in, we need to scope the operation. First of all, we’re dealing with a multitude of simultaneous issues: drought, mass migration of the farmers into the city, crime and corruption, and now this disease outbreak. No one group is going to be able to manage all of it, which is why I’ve asked you all here today. But I must get consensus on how we’re to manage the problem.”

He did something on his end of the connection and the illusion that they were all sitting together in a conference room disappeared.³³ He’d removed one whole wall of the office and then organizational charts were popping into existence in the dark space beyond, like bizarre clouds in an endless sky. “External agencies will need to work under our direction; are you able to do that?” The question was directed at Colonel Campbell, Director of the Rapid Allocation office for the Canadian contingent.

Campbell nodded. “Part of our doctrine is something we call the comprehensive approach. We’ve spent a couple of decades now practising multi-stakeholder operations; I assumed that was why you called us in the first place. CHERT’s an example of something we call a capability package, a collection of operational concepts, command and force structures, the corresponding doctrine, training and education, technology, and systems with a support infrastructure that can be rapidly assembled to perform a specific mission. In a coalition situation, our capability packages include tools and procedures to do rapid consensus planning with our partners. Our soldiers are fully trained in self-synchronization and command agility. For instance, in an operation like this we build decision rights packages for everybody from the Commanding Officer down to the privates. Everybody knows how much autonomy they have³⁴ and they’re trained to recognize when to exercise it. These doctrines are all derived from the comprehensive approach and NATO’s network-enabled capability practices.”

The minister peered at Lieutenant-General Prior. “Who, then, is *your* boss?”

Prior didn’t take the bait. “I’m the Commander of Canadian Joint Operations Command. My immediate superior is the Chief of the Defence Staff, and her superior is the Minister of National and International Security.”

The minister smiled, but the mayor of Urlia shifted in his virtual seat and said, “I don’t like this. Who are these foreigners going to report to?”

“Raheem, I know this feels like an invasion,” said the minister, “but it’s still your city. This Canadian CHERT has two tasks: water, and investigating the outbreak. They’re building out from your authority, not sitting on top of it.”

He turned to point at one of the org charts hovering behind him. “Command and control usually flow through hierarchies. This operation is not hierarchical. We, too, are adept at new styles of operation, General,” he said to Prior. “We’ve done a strategic fit analysis³⁵ and that tells us that we should deal with the problem as a tightly integrated

33. Virtual Meeting Rooms: see <http://www.businessweek.com/stories/2007-04-16/the-virtual-meeting-room>
businessweek-business-news-stock-market-and-financial-advice.

34. Constrained Autonomy Through Norms; see <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.17.1457&rep=rep1&type=pdf>.

35. In this scenario, Strategic Fit Analysis tools are built into corporate and governmental computing systems, in particular, the liaison system: http://en.wikipedia.org/wiki/Strategic_fit.

network.³⁶ Authority will reside in a clear shared vision of what we wish to accomplish. Your decision rights will derive from that. We will use liaison technology to coordinate our efforts.”

“Humph,” said the mayor. “It is true what they say about the new medievalism.³⁷ No one controls anything anymore.”

General Prior nodded to Colonel Campbell who in turn opened a private channel to Desai. “Get started,” he said. “We’ll need boots on the ground in 24 hours.”

“With your permission, ladies and gentlemen,” said Desai, and bowed out of the virtual meeting. She found herself back in the train surrounded by snoring passengers and with a surreal hurrying landscape flickering by outside.

The authorizations were in place. She called up a virtual command interface and began selecting elements of the capability package. After she’d been working on this for about half an hour, Colonel Campbell messaged. She let him into her working environment where his avatar craned its neck at all the open windows and maps. “I’ve never visited Urlia,” he said. “Closest I got was Zefra. Six million people, you say?”

“I didn’t exist 20 years ago,” interjected the liaison to the city that Desai had open in her interface. “I used to be a bare savannah. When the coastal settlements were flooded,³⁸ people moved to higher ground, and it happened that my site was on the high-speed rail route. Now I am a major port and rail centre for the India/Pakistan plurinational zone.”

“So are you Indian or Pakistani?” asked Campbell.

“Neither,” said the liaison. “I am both. I’m a lot like the other new multi-million-plus cities:³⁹ semi-autonomous because of my size and economic clout.” As the mayor had pointed out during the earlier meeting, nation-states had been steadily losing authority for decades and megacities⁴⁰ were one of the structures moving into the power vacuum.⁴¹ In North America the universal transit pass in Cascadia⁴²—the Seattle–Portland–Vancouver megalopolis—had almost attained the status of a passport. Nowhere was the trend more evident than in regions where central government control had never been strong to begin with.

“Apparently, even though the famine affects the hinterland, I’ll have to go through the city government to deal with it,” Desai added with a grimace. “If we want to get fresh water and medicine to people in the affected area, we have to make nice with everybody. Any given neighbourhood could be controlled by the city council, the gangs, the clans, the various religious leaders⁴³ or any of a number of militias. A substantial number of people belong to online nations⁴⁴ but don’t even have plurinational passports. That’s why

36. Adapting new structures to new challenges: see <http://www.orgnet.com/orgchart.html>.

37. Refers to a theory by Hedley Bull that national sovereignty is on the wane, but that a world government will not result; rather, there will be a loose diffusion of authority. See <http://www.30giorni.it/us/articolo.asp?id=5335> for a discussion of these ideas.

38. Future Sea Level Changes: see <http://www.epa.gov/climatechange/science/futureslc.html>.

39. Largest cities in the world: see <http://www.worldatlas.com/city pops.htm>.

40. Megacities Foundation: see <http://megacities.nl/>.

41. Power balance to shift from nations to cities: see <http://www.planetizen.com/node/45595>.

42. Cascadia: see <http://www.america2050.org/cascadia.html>.

43. Consider the 1998 religious breakdown of Karachi Pakistan: Shia and Sunni Muslim (96.45%), Christian (2.42%), Hindu (0.86%), Ahmadi (0.17%) and other (0.10%). Other religious groups include Parsis, Sikhs, Bahai, Jews and Buddhists. Of the Muslims, approximately 65% are Sunnis and 30% are Shi’ites.

44. Create a Nation Online, Nation-States: see <http://www.nationstates.net/>.

I want to add Padre Sokolow to the team. As a trained and experienced mediator, he's worked with local peace councils⁴⁵ before, and he's a citizen of at least 12 infocracies."⁴⁶

"But not Urlia's."

"Correct, but there should be some overlap. Look, Les, I know you are suspicious of Sokolow—"

"I'm concerned that we can't trust him to keep our interests in mind. He seems to take his online affiliations more seriously than his Canadian citizenship."

"His affiliations are exactly why I want him," she admitted with a smile. Campbell frowned, and she quickly said, "Sokolow's practically a poster boy for the Human Security⁴⁷ foreign policy model. The way Prior told me to play it for the home crowd is that we're not fighting a human enemy here, just a drought, a famine, and now a new disease. Sokolow sees nation-states as tools for getting things done. He thinks they're software. But he cares about people. He can be relied on to keep his eye on the core of the mission."

"If you put it that way, I agree," said Campbell. "Just keep an eye on him."

She created a virtual tasking liaison⁴⁸ that would initiate Sokolow's transfer.

She understood Campbell's feelings about Sokolow. He was one of the youngest army chaplains in the service and came from a generation of kids who no longer seemed to identify with any traditional nation-state.⁴⁹ Plurinationalism had provided the political philosophy; the early online environments such as Second Life[®] and World of Warcraft[™] had established virtual economies and communities that were transnational by definition. Brian Sokolow had been born and raised in Lethbridge, Alberta, but his geographical origin was irrelevant to him. He'd once told Desai that he and other like-minded people thought of themselves as a diaspora; in his case, he lived in exile not from a physical nation, but from the strictly virtual place known as Aephoria.⁵⁰

So now Desai had deliberately included a religiously based (though non-denominational) virtual nation in this operation. There would be diplomatic and operational consequences to that, even if Sokolow was nominally a Canadian citizen.

A pleasant computer-generated voice spoke from the air: "Now entering Afghanistan."

Desai turned to the window; it seemed important to note the crossing of a traditional border, though Sokolow would surely laugh at the idea. She reached out to stroke the window,⁵¹ and letters and lines appeared in it showing the border and the names of the regions to either side. The train was in Badakhshan already, and the rolling mountains to the west were labelled *Ishkashim*. Little icons twinkled here and there in the glass, and she tapped one. It expanded into a daytime photo of the Sultan-Ishkashim valley through which the train was now racing. She could see the crumbling profiles of abandoned

45. Refer to Appendix.

46. An infocracy is an organization whose operation is based on the flow of information: see <http://en.wiktionary.org/wiki/infocracy>.

47. Human Security Gateway: see <http://www.humansecuritygateway.com/>.

48. Cloud computing systems: see <http://www.infoworld.com/d/cloud-computing/what-cloud-computing-really-means-031>.

49. Stateless People: see <http://www.unhcr.org/pages/49c3646c155.html>.

50. The Diaspora Effect: The Influence of Exiles on Their Cultures of Origin: see <http://www.management-aims.com/PapersMgmt/21Kilduff.pdf>.

51. Glass touch screens: see <http://www.prodisplay.com/interactive-glass-touch-screens.html>.

buildings along the dried-up river bed.⁵² The glaciers to the east were disappearing⁵³ and nothing grew here anymore,⁵⁴ but a glittering city beckoned in the distance: Rubati Cheltan, once just a village, was now a mining and trade hub serviced by the Silk Road. She checked; her train would not be stopping here.

Urlia's virtual liaison was telling Campbell about the maze of clans, gangs, plurinational councils and religious leaders that ran the city. He was shaking his head at the complexity of it all.

"Don't even try to keep it all in your head,"⁵⁵ said Desai. "That's what AugCog⁵⁶ is for."

"Never trusted that stuff," he complained. "I like to know who I'm dealing with."

"You're dealing with people whose loyalties are deeply divided," she said, "and not just along political lines. Urlia falls on the ethno-religious fault lines between India and Pakistan, and lies somewhere between the 17th century and the 21st. Most of the city's a slum, but it's a slum with solar panels on all the roofs and fabs⁵⁷ in every home."

"So what's your first priority when you get there?"

"We'll hit the ground running with water services and a mobile hospital. I'm airlifting that in from Australia. But *my* first job is going to be getting buy-in from the local leaders.⁵⁸ And that means," she sighed, "a day full of real, face-to-face meetings I'm afraid."

Campbell laughed. "You'd better take your Alertec."⁵⁹

"I'm way ahead of you," she said. Campbell rang off, Desai tapped a virtual key,⁶⁰ and CHERT materialized.

Automated forklifts⁶¹ in a Toronto warehouse began loading supplies onto skids; the appropriations and allocations had happened online in seconds. The team were receiving their orders even as their flights were arranged. Various liaisons arranged transfer agreements and leaves of absence for those engaged in other duties. And somewhere in Ottawa, an idle artificial intelligence⁶² system suddenly found itself downloading everything that was known about Urlia and its politics.

52. Rivers losing water due to climate change: see <http://www.livescience.com/5417-rivers-losing-water-due-climate-change.html>.

53. Receding Glaciers: see <http://earthobservatory.nasa.gov/IOTD/view.php?id=4594>.

54. Climate change, desertification and migration: see <http://www.rtcc.org/climate-change-desertification-and-migration-connecting-the-dots/>

55. Electrical thinking cap that improves mental function: see <http://blogs.scientificamerican.com/observations/2012/02/06/ethical-questions-surround-electrical-thinking-cap-that-improves-mental-functions/>.

56. AugCog is an emerging field of science (Augmented Cognition) that seeks to extend a user's abilities via computational technologies which are explicitly designed to address bottlenecks, limitations and biases in cognition and to improve decision-making capabilities. See <http://rev.sagepub.com/content/5/1/195.abstract>.

57. Fabricators, or 3-D printers, are capable in 2012 of "printing" three-dimensional objects using a variety of materials. In 2040, it is envisioned that the fabricators are self-reproducing and can create complex electronic and mechanical equipment. See http://www.pcworld.com/article/212440/the_3d_printer_revolution_countdown_print_your_own_pc_coming_shortly.html.

58. Key Leader Engagement: see <http://vanguardmagazine.ca/religious-leader-engagement-a-new-capability-for-conflict-mitigation-in-operations/>.

59. Brand name for a 2040 non-prescription drug that reduces the need for sleep: see <http://www.modafinil.com/article/soldiers.html> and <http://www.pmpbrb-cepmb.gc.ca/english/View.asp?x=524&mp=117>.

60. Minority Report-like Interface: see <http://singularityhub.com/2010/02/17/minority-report-interface-is-real-hitting-mainstream-soon-video/>.

61. Automated forklifts and material handling lifts: see http://www.robotics.org/content-detail.cfm/Industrial-Robotics-Featured-Article/Robotic-Material-Handling/content_id/3767.

62. IBM's Watson: see <http://www-03.ibm.com/innovation/us/watson/watson-for-a-smarter-planet/index.html>.

Even before Desai sat back and turned her gaze to the speeding landscape outside her train, Canadian diplomats in Kabul, Islamabad and New Delhi had their scripts and instructions updated.⁶³ Virtual diplomats in Aephoria and the other online nations had begun negotiating. By the time Desai's train entered Pakistan and began arrowing toward the coast, all the cloud-based⁶⁴ artificial intelligences involved in CHERT had entered a wait state. It was absurd, yet she felt as though she was in a race with the train and that CHERT, and the whole Urlian emergency response, was a prize to be won or lost by dawn.

DISCUSSION

As the story begins we are introduced to the concept of a rapidly deployable humanitarian and environmental task force (CHERT) somewhat akin to the modern-day Canadian Forces Disaster Assistance Response Team (DART). Considering current trends in climate change and the lack of political consensus on how to address the adverse consequences of those trends, how might current force structures, vehicles and equipment, and force employment concepts change in order to remain relevant in the future? To what extent might DART-like organizations become more important in the future? What new or expanded capabilities might a DART-like organization require 30 years from now?

A revolutionary concept for readiness and force projection is described. Through a combination of virtual meetings, artificial liaisons, supercomputers and tagged inventories, a military task force is assembled and put into theatre in just 24 hours, all at the push of a virtual button. Would the realization of such a concept be desirable and, if so, what needs to change for it to be achievable? If not, why not? What are the potential pitfalls of automating the administration associated with the pre-deployment and deployment processes?

How might the presence of a pervasive network with powerful automated planning and decision support tools alter the need to conduct real-world, face-to-face collective training events prior to deployment of an entity such as the CHERT? How would team trust and cohesion be affected? What might be an acceptable minimum level of actual/physical assembly of the virtual team? Could virtual training sessions for collective work-ups ever be sufficient? Is it possible to employ the paradigm "train, warn, deploy" instead of the more traditional sequence, "warn, train, deploy" for general-purpose military forces? Or should this paradigm apply only to high-readiness special units?

We are introduced to a cast of characters that features a more balanced gender mix than is found today in most defence and security organizations. Indeed women fill many of the key positions in this fictional narrative, including Lieutenant-Colonel Vanda Desai who, as Commanding Officer CHERT, commands a multi-purpose task force in expeditionary

63. In the past, it might have taken weeks or months of committee wrangling and internal approval processes before DFAIT would even consider new guidance to diplomats. With the Urlia crisis on the world's centre stage, and with the new Canadian Department of National and International Security, these changes had been generated seamlessly, but not without political involvement and final approval.

64. Google Prediction API: see <http://code.google.com/apis/predict/>.

operations. How important will gender balance be in future defence and security organizations? What changes to recruitment, training, employment, organizational structure and performance evaluation would be necessary to correct the current gender imbalance? What are the risks, benefits and opportunities of gender equality for CF operations in the future?

Human enhancement technologies figure prominently in *Crisis in Urlia*. For example, Desai takes a performance-enhancing substance to minimize the impact of physical and mental fatigue and relies upon an augmented cognition system. Might future generations be more tolerant, or even accepting of performance enhancing substances and human-computer integration? Consider the potential ethical ramifications associated with the use of prescription medications to compensate for natural human limitations. Are surgical enhancements such as limb replacements and brain interfaces too invasive to be considered practical or desirable for defence use? Where might the CF encourage human enhancement and where should it prohibit the use of such technology? Do the potential benefits of human enhancement technology outweigh the ethical, legal and moral complications they engender?

Might cognitive and decision-making artificial intelligence (AI) technologies as depicted in this section increase dangers of adversely affecting human volition and/or increase prospects for nefarious use by those with access to this technology? How can/should AI technologies be introduced to facilitate better decision-making while minimizing their moral, ethical and legal implications?

Considering trends with respect to technology distribution, how widespread does it need to be? Should it be? Given the cost of and degree of access to technology, both on the national and international scales, consider the implications of declining costs/entry fees to advanced technological capabilities.

The planning process as portrayed in this chapter makes a great deal of use of a powerful network, including the employment of “liaisons” to assist people in coordinating a wide range of actions. These liaisons are automated tools, not people. How might the presence of these automated agents affect the development of trust within a newly established team?

The diverse stakeholders attending the meeting depicted in this section, suggests that the comprehensive approach concept has become a globally recognized and widely utilized form of international interaction by 2040. Is this likely to happen? Why or why not?

Given the widespread increase in humanitarian organizations and infocracies depicted in this section, consider how this might impact concepts such as patriotism, allegiances and changes to attitudes toward joining the military or even the nature of military organizations over time. How might recruiting strategies need to change to accommodate shifting priorities and allegiances in the population?

This section introduces a new defence and security organization called the Department of National and International Security. What are the benefits and risks of combining defence and security responsibilities for both domestic and expeditionary operations under a single department?

The concept of using automated decision rights and constrained autonomy derived from a shared vision of what needs to be accomplished is introduced in this section. Might this be overly constraining, or alternatively, absolutely necessary given the increasing complexity of defence and stability operations? How might rules of engagement be affected by such decision rights management systems? Consider whether automated decision rights would augment mission command or rather detract from it.

The deployed CHERT comprises components from multinational partners such as water services and a mobile hospital. Consider the interoperability issues such as power and transportation that would arise from such multinational participation. Also consider the complexity of multinational managed readiness planning. How might these challenges be overcome?

This section introduces the concept of cross-organizational permeability, facilitated by automated tools in the form of virtual liaisons. What technical, structural and organizational changes would be required to realize this concept?

“Where is that water? How can we be expected to be good hosts without fresh water?”⁶⁵ Hazir Rumay stalked over to the door before remembering that he had his augmented reality⁶⁶ glasses on. He tapped the arm of the glasses and looked through the floor⁶⁷ to see where his eldest son was. The low-resolution image of the boy revealed that he was just coming up the stairs carrying something.

Hazir made a quick scan of the rest of the building. His employees were all at their stations, working dutifully despite the distant crackle of gunfire from what he hoped was only another riot. Uneasy, he moved to the window and adjusted the glasses’ display to show local traffic. The grey concrete towers, their windows shaded by dusty solar energy films,⁶⁸ the streets crisscrossed with frayed cables, all faded slightly as cars, trucks and jitneys leaped into stark relief. You could even see them through the buildings themselves,⁶⁹ an effect that had impressed him 10 years ago but one that he took for granted now. Several driverless⁷⁰ taxis were nosing their way through the traffic and a few darting, white-masked people who’d dared the streets today, but otherwise the streets seemed empty. Suddenly, two military vehicles rounded a nearby corner. They’d been invisible in his AR view of the street, which now that he thought about it made sense from a security perspective, but it was still a bit disconcerting. These Canadians had some sort of power over the AR system. Something to ponder later.

“Ah!” He headed for the stairs as the vehicles pulled up in front of his building, his limp returning as it always did when he hurried. The exoskeleton⁷¹ he wore to ease the strain on his right leg gave an extra thump to his footsteps on the stairs; everybody in the factory knew when he was coming because of that thump. He reached the ground floor just as five foreigners were buzzed through the armoured front door.

“Welcome, welcome!” He extended both arms to encompass them all while the facial recognition⁷² software in his glasses overlaid glowing names over their heads. “Lieutenant-Colonel Desai, I’m so glad you came in person; it’s an honour to host the CHERT.”⁷³ He shook the colonel’s hand vigorously.

65. Water Scarcity: see <http://www.unep.org/dewa/vitalwater/jpg/0222-waterstress-overuse-EN.jpg>.

66. Seven things you should know about augmented reality (AR): see <http://net.educause.edu/ir/library/pdf/ELI7007.pdf>.

67. A typical AR system: see <http://www.se.rit.edu/~jrv/research/ar/introduction.html#Section1.3.1>.

68. Thin Film Solar Cell Technology: see <http://www.sciencedaily.com/releases/2010/04/100420132835.htm>.

69. Augmented reality system lets you see through walls: see <http://www.newscientist.com/article/dn18036-augmented-reality-system-lets-you-see-through-walls.html>.

70. Autonomous car navigates the streets of Berlin: see <http://www.sciencedaily.com/releases/2011/09/110920095258.htm>.

71. Raytheon XOS 2 Exoskeleton: see http://www.raytheon.com/newsroom/technology/rtn08_exoskeleton/.

72. Face Recognition Homepage: see <http://www.face-rec.org/general-info/>.

73. Comprehensive Humanitarian/Environmental Response Team

“You’re a very important man in Urlia, Dr. Rumay,” said Vanda Desai with a warm smile, “and Canadian military doctrine is to coordinate our forces with other agencies and institutions, including businesses. We call it the comprehensive approach. I’m here to see how we can work together to help resolve your city’s crisis.”

Rumay returned her smile while trying to assess her. She had Hindustani features, but her accent was pure Canadian. He guessed she was in her mid-40s, but then, it was hard to judge anybody’s age⁷⁴ these days, especially if they were from the Americas.⁷⁵ “Important?” He smiled with sad irony. “To a tiger, a sheep is very important, but I’d prefer not to be important in quite that way.”

“That’s why we’re here, to take some of the pressure off people like yourself. Ah, let me introduce Cathy Arkin; she’s a tropical disease specialist from Health Canada. We have her because her lab is affiliated with ours at DRDC.”⁷⁶ Hazir had already read this from Arkin’s AR tag,⁷⁷ but smiled politely as he shook the scientist’s hand. His software couldn’t identify the other three, but from their size and the unobtrusive exoskeleton cuffs poking from under their uniform collars and sleeves, he guessed they were private security. One of them was herding two cargo robots⁷⁸ loaded with olive-green bags and boxes from the back of the second transport.

As they entered the warehouse behind the front foyer, Desai switched from English to Pashtu. “This is all your stock?”

“We don’t need much space for what we do.” The switch to one of the local languages made it possible for his employees to listen in on the conversation, which he supposed, was why Desai had done it. Still, it was a bit annoying; he had few opportunities to converse in English these days, especially since every wearable,⁷⁹ embed,⁸⁰ mobile, or even old terminal he used automatically translated between the major languages.⁸¹

He waved to one of the boys. “Open them up.” Turning to Desai, he said, “You can take samples from wherever you want.”

The warehouse was simply a few windowless ground-floor rooms holding rolling racks. On the racks were biofoam⁸² pallets with rounded depressions in them, and in these little cups were eggs. There were big white ones and tiny blue ones, yellow translucent ones and others that were pebbly grey as if they were made of concrete. There were more varieties than the eye could distinguish, but Hazir knew each and every one. “We’re seeding 344 species,” he said proudly. “Some are local and merely endangered.”⁸³ Most are foreign varieties we’re importing—but more than a hundred of them are new, from our own ecosystem designers.⁸⁴ They’re mostly birds, intended to fill ecosystem niches

74. Strategies for Engineered Negligible Senescence: see <http://www.sens.org/sens-research/what-is-sens>

75. Continuous Medical Monitoring: see <http://web.mit.edu/newsoffice/2011/update-microworms-0217.html>.

76. Defence Research and Development (DRDC) Centre for Security Science: see <http://www.drdc-rddc.gc.ca/drdc/en/centres/drdc-css-rddc-css/>.

77. Data Representation for Mobile Augmented Reality: see http://www.perey.com/ARStandards/GIST_QRCode_for_AR.pdf.

78. BigDog – The Most Advanced Rough-Terrain Robot on Earth: see http://www.bostondynamics.com/robot_bigdog.html.

79. Wearable Computing: see <http://www.futurephysical.org/pages/content/wearable/keywords.html>.

80. Embedded Technologies: Power From the People: see <http://www.smithsonianmag.com/specialsections/40th-anniversary/Embedded-Technologies-Power-From-the-People.html>.

81. Mobile Language Translation: see <http://pocketpccentral.net/software/language.htm>.

82. Ecovative technology: see <http://www.ecovativedesign.com/about-our-materials/core-tech/>.

83. Species threatened by climate change: see http://wwf.panda.org/about_our_earth/aboutcc/problems/impacts/species/.

84. EcoSystems Design Inc.: see <http://www.ecosystems-design.com/Home.html>.

that have gone vacant.”⁸⁵

“Mostly?” Arkin was unclipping equipment from a cargo-bot. “But not all?”

“Oh, we have a substantial stock of worms.”⁸⁶

“I’ll want to see those.”

“Of course.” He opened the worm cabinet. “Of course we keep exact records as UNESCO⁸⁷ requires. Otherwise we wouldn’t be able to import the designs we need. I have a secure terminal upstairs where you can download the genetic designs.”

“Cathy, I’ll be upstairs if you need anything,” said Desai to the scientist, and then she accompanied Hazir to the stairs. “I really do appreciate your accommodating us,” she said as they walked up to his office. “Your cooperation is going to open other doors for us.”

“Oh, I know that very well,” he said with a smile. “Your people are all over Urlia-net talking about this ‘comprehensive approach’ to military operations.”⁸⁸ I have to admit I’m not sure what a ‘combination military and civilian agency’ looks like, much less what it is exactly that you do.”

“It looks like this,” said Desai, spreading her hands. “You and us working together.” She could see from his expression that this obviously wasn’t enough of an explanation, so she added, “It’s something called the integrated approach. CHERT wasn’t sent here by just one arm of the Canadian government, but Canada as a whole. From your perspective, what that means is that we have to pay attention to more than just primary effects—you know, drop off the water and leave. We have to plan for the secondary and tertiary effects of what we do here—like, for instance, the effect on local businesses of us setting up a new desalination plant. And we can bring in other departments, or our own business advisors, to help sort those things out. We’d like you to be one of them.”

Hazir nodded. “In that case, you won’t mind if we pose for a few photos before you go. I’d like to tag⁸⁹ our building—oh, why not the whole block?—with images and interviews from your visit, so everyone can see how we’ve been fully exonerated. Maybe the attacks will stop once people know we weren’t responsible for the outbreak.”

He didn’t have to tell the colonel that the building had become a fortress of sorts. He’d originally chosen it because the ground floor was windowless, thinking to avoid theft. In hindsight that had been a good decision. What Desai probably didn’t know was that he’d supplemented the usual building security software with ultra-sensitive nanowire⁹⁰ bomb-sniffers and cutting-edge commercial pattern-matching⁹¹ software. If anybody so much as looked at the place the wrong way, his sensors would tell him.

They entered Hazir’s office and he gestured for the colonel to sit in one of the comfortable armchairs. The place was modern, except for an old teak desk in the corner that Hazir kept for its beauty; he almost never sat there. “Would you like some water?” he asked, pouring Desai a glass without waiting for an answer.

85. The Living Planet Index: see <http://www.greenfacts.org/en/biodiversity/figtableboxes/1037-living-planet.htm>.

86. Genetically Modified Organisms: see http://nature.ca/genome/03/d/30/03d_30_e.cfm.

87. Biodiversity: see <http://www.unesco.org/en/education-for-sustainable-development/themes/environment/biodiversity/>.

88. NATO – A Comprehensive Approach: see http://www.nato.int/cps/en/natolive/topics_51633.htm.

89. Location-dependent tags are a major component of augmented-reality systems. For an example current in 2010: see <http://www.psfk.com/2009/08/mobile-augmented-reality-tagging.html>.

90. Ultrasensitive Explosive Detection: see <http://www.technologyreview.com/computing/26327/page1/>.

91. Machine Vision Technology: see <http://www.microscan.com/en-us/technology/machinevisionsystems.aspx>.

“Thank you; that’s very generous.” Desai looked at the large panes of glass that stood between the chairs. One of them displayed the holographic image of a liaison⁹² in secretarial garb, a spray of icons and captions surrounding it.

The liaison smiled and said, “Lieutenant-Colonel Desai, I trust the drive down was uneventful.”

The liaison was an interface to Pantheon, the open-source⁹³ stakeholder management service⁹⁴ that Hazir used. Pantheon was as big as Google had once been, and hugely influential, supplying the liaison software and a back-end that provided virtual liaison services for nearly every company and organization in the world. When Rumay had heard that the CHERT team was coming to Urlia he’d downloaded the CHERT liaison. He hadn’t expected anything to come from it but had given it some information about his own interests and concerns. To his surprise, it had contacted him this morning and asked whether he would like to meet with Desai.

“I’m glad you’re using Pantheon,” said the colonel. “Now that I’m here I can give you a secure liaison to replace this one. I’ve also got secure liaisons for our partners in this operation, if you’d like them.”

“Yes, please!”

Hazir noticed that Desai didn’t even move her hands to upload the new liaisons to his office.⁹⁵ The colonel wasn’t wearing augmented reality glasses like he was, but clearly she had some interface to the net—probably video contact lenses.⁹⁶ No doubt she was also festooned with sensors;⁹⁷ wasn’t everybody these days?⁹⁸

Partly to test this suspicion, Hazir said, “You can see our situation,” and gestured to the windows behind the liaison. To the naked eye the view showed only the facades and windows of the other buildings on the street, but even Hazir’s low-level data subscriptions⁹⁹ fed him a wealth of information about what was going on locally: weather, pollution levels, the number of people in the street and how many were loitering. That number—the loitering index¹⁰⁰—had been going up for days. It was a bad sign; the index had shot up just before the recent attack.

Desai frowned. “I saw burn marks on the wall outside your front door. Was that...?”

“A Molotov cocktail, yes. There’s a rumour that the plague is genetically engineered,¹⁰¹ so naturally everyone in my business is now suspect. The only thing that’s kept the mob from our door this long is the fact that we bring jobs into the neighbourhood.”

Desai nodded gravely, then said, “You understand that I can ask certain questions off the record, but there are things we need to know. People are saying the sweating sickness

92. AI-based personal digital assistants: see <http://www.zabaware.com/assistant/index.html>.

93. The Open Movement: see <http://theconversation.edu.au/explainer-what-is-the-open-movement-10308>.

94. Stakeholder management systems evolved from customer relationship management tools. These systems allow an organization to track the needs and act on the concerns of customers, business partners, etc. Stakeholder management is envisioned as an important tool in this implementation of the Comprehensive Approach. See <http://www.sugarcrm.com/crm/>.

95. New Technology to Use Human Body as Digital Transmission Path: see <http://www.physorg.com/news3153.html>.

96. Multipurpose integrated active contact lenses: see <http://www.ine-news.org/view.php?article=0056-2008-06-11&category=technologies%3Asensors> and megapixel contact lens eyewear: see <http://innovega-inc.com/press-2012.php>.

97. See http://www.edn.com/article/512851-Researchers_claim_millimeter_scale_computing_system.php.

98. See <http://inhabitat.com/silicon-chips-embedded-in-human-cells-could-detect-diseases-earlier/>.

99. Example of a data subscription service: see <http://www.co.larimer.co.us/store/subscription.htm>.

100. Surveillance video software tools: see <http://www.technologyreview.com/computing/39552/>.

101. Genetic Engineering: see <http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=a1ARTA0003204>.

was genetically engineered, and you're one of the only local gene splicers."¹⁰²

"You want to know whether I have customers besides the UN and the regional agricultural council," he said. "I do—but not who you might think."

Desai paused a moment, then said, "I understand what you have to do sometimes to get things done. There's a fine line between the legal and the illegal, and—"

Hazir laughed, although the colonel's insinuation was insulting. "You think I've been dealing with the gangs. No. They have their own labs. Pantheon should have told you that."

"I didn't mean to offend you," she said. "I'm just trying to eliminate all the possibilities."

Grudgingly, he nodded. "Lieutenant-Colonel Desai, we don't have to worry about financial pressures from organized crime. Our biggest clients aren't even human."

Desai half-nodded. "We were wondering about that."

Hazir retrieved the container he'd earlier placed on the desk. He'd been right to bring this prop up from the warehouse; now he opened the case and displayed the little green eggs in it. "They're called tick-stalkers. A kind of bird—I don't remember if they're natural or genetically engineered. Anyway, they're a special order from the mud flats."

Desai frowned minutely. "West of town, right? We're aware that somebody's doing biodiversity work there, but not who it is. Do you have a client?"

"Yes, but not a human one. That's the point. The order for these came from the flats themselves."

The colonel sat motionless for a moment. Hazir guessed she was interfacing with whatever resources she had at her disposal—online encyclopaedias, people, even AIs¹⁰³ that might be listening in and triangulating on everything they said—in short, the normal, expected systems any high-ranking business person might carry around these days.

"So it's true," she said finally. "The flats are an autonomous legal entity."¹⁰⁴ The flats were an engineered ecosystem designed to function on their own after being initially seeded with new and traditionally local species. The whole idea was to create an area of biodiversity that could flourish without human intervention; Desai was not surprised that part of that autonomy included legal and economic independence of a sort.

Hazir nodded. "The entire Urlia watershed is saturated with smart dust sensors.¹⁰⁵ They're the eyes and noses and ears of a botnet¹⁰⁶ AI that represents its environmental interests. These were seeded there by a radical ecological group—with the city's blessing, of course. They then registered the watershed as an autonomous legal entity so that it could be self-sustaining. Effectively, it owns itself. And, since the watershed provides an ecosystem service—water purification—the city pays it. That is cheaper than building more water filtration plants. And the watershed—well, in this case, the mud flats—can use that money to buy things. For instance, tick-stalkers to fill an empty ecological niche."

102. Gene Splicing: see <http://www.genesolutions.com/page8.html>.

103. What is Artificial Intelligence? See <http://www-formal.stanford.edu/jmc/whatisai/whatisai.html>.

104. The 1992 Paraguayan constitution recognizes the rights of nature. This concept derives from Bolivian foreign minister David Choquehuanca's notion of *buen vivir* or "living well." *Buen vivir* includes the notion that Nature should have rights. In Urlia the legal framework for natural rights is adapted from the American precedent of granting corporations rights as legal persons.

105. Future Chock-Full of Chips: see <http://www.technewsworld.com/story/71895.html> and the Industrial Internet of Things: see <http://www.gereports.com/meeting-of-minds-and-machines/>.

106. Botnets are a form of distributed computer system that are non-localized and hence do not have to be "hosted" by a human or organizational patron. See <http://en.wikipedia.org/wiki/Botnet>. The mud flat AI is simply a resource-allocation botnet whose "herder" is an algorithm dedicated to maximizing the biodiversity within the mud flats.

“So there’s an AI that thinks it *is* the mud flats.”¹⁰⁷

He shrugged. “That’s putting it crudely, but yes. The City is trying to get the flats to process more of our grey water, but it refuses. Says it has to look out for its own health first. But it’s still interested in the business, so it’s paying me to upgrade the—”

But Desai wasn’t listening; she suddenly stood up, frowning.

PATTERN MATCH: POSSIBLE RPG.

The letters appeared suddenly in the top-left of Hazir’s field of vision—projected there by his glasses. He’d been half-turned toward one of the windows when it happened. “Excuse me,” he said and held up a hand while he focused on the letters with both eyes. “I need to check something.”

Across the street was a band of open windows. These were apartments that he’d long ago stopped noticing, but somewhere a camera, either the ones in his glasses or one of the ones mounted on the outside of the building, had spotted something.

There was an open window over there, and movement in it—

ATTACK CONFIRMED.

Even before he could react, he felt Desai’s hand on his back and the colonel was shouting, “Down!” as she shoved Hazir towards the teak desk. He stumbled forward and Desai hauled him down just as glass shattered and then the room was tumbling around him. He’d heard nothing, just felt a shock over his entire body, and then he was face down in broken plaster and spears of teak.

Miraculously, his glasses had stayed on. There was nothing to see but swirling dust an inch from his face, but their display was still working, so he was able to watch the local loitering index suddenly plummet from about two dozen to zero. He could picture the scene: everybody on the street running pell-mell as the echoes of the rocket attack faded.

These modern conveniences, he thought in wonder. And then he passed out.



The crowds had changed as they approached the night market. Brian Sokolow saw more and more people in tan uniforms and carrying guns. Some wore lower-body exos.¹⁰⁸ There were also more robots, and the people in the street increasingly traveled in silent groups. He saw many old people¹⁰⁹ and grim children in shabby T-shirts with Chinese cartoon characters on them. Many groups were flagged¹¹⁰ in augmented reality with distress icons of a sort he’d never seen in real life: appeals for water or money. Many were carrying

107. Natural intelligences evolved to identify themselves as their physical bodies. There is, however, no reason why an artificial intelligence would have to identify itself with its actual systems. It could experience its “body” as anything its designer chose it to be, including distinct physical objects such as the mud flats.

108. Exoskeletons around the world pictorial: see <http://spectrum.ieee.org/robotics/medical-robots/exoskeletons-around-the-world/0>.

109. Global Aging 2010: An Irreversible Truth: see <http://www.cfr.org/economics/standard-poors-global-aging-2010-irreversible-truth/p23299>.

110. Yahoo invisible status checker: see <http://www.statusdetect.com/>.

plastic jerry cans, obviously hoping to fill up with water at the market. Considering the effort it must take to even move in this heat,¹¹¹ he couldn't imagine how they'd manage to get any amount of it home.

He turned to Ore, the Canadian soldier who was seated beside him in the transport. "They have smart phones, but no water?"

Ore nodded. "A lot of these people have relatives in Canada¹¹² and they're begging them for help. So the families are putting huge pressure on the government."¹¹³ That's partly why we're here. It doesn't matter to somebody in Calgary whether their mother is across town or across the planet. If she's crying on the phone about not having water... you have to act."

CHERT had been busy since the first boots had hit the ground. After consulting with the national and city governments, Lieutenant-Colonel Desai was coordinating a series of peace councils where the local leaders could air their concerns. That was why Sokolow was here—to act as an experienced facilitator for the councils. The Canadians were positioning themselves as clients of the Urlia stakeholders; Ore had told Sokolow that he and his section had been acting like errand boys half the time, toting supplies back and forth across the invisible boundaries of Urlia's neighbourhoods. He'd remarked that it sometimes seemed like the NGOs were his real employer. Yet everything his team had done in the past few days had served Canadian interests as well as those of the locals.

Sokolow said nothing more as they made their ritual entry through the security perimeter around the night market. Swarms of remote-controlled insects¹¹⁴ zizzed around the bus, but the driver also opened the door to let a few in. One came to hover over Sokolow's head. He knew his retinas were being scanned, and other biometric sensors¹¹⁵ were comparing him and Ore to their profiles. After a minute the swarms retreated and the gates lifted for the bus to pass. Moments later he was disembarking with the others and entering the temporary headquarters of CHERT in Urlia.

When he'd first arrived in Urlia he didn't know what to expect, but surely some sort of controlled chaos. Now, it was mostly quiet in the big arched concrete corridors where vendors normally set up. Though there were a lot of people and machines here, there was order to all the movement. Everything was already in its place; the queues were orderly and whatever medical crises might be taking place were happening out of sight. There was plenty of light from skylights overhead and partitions had been set up to divide the large space into roofless rooms. Sokolow had never seen such a concentration of robots¹¹⁶ in his life: lifters, automated gurneys, spindly diagnostic units, and even child-sized helper robots¹¹⁷ of manga-inspired¹¹⁸ design. Most were just standing idle; the work had been done and CHERT was in action.

111. Average global temperatures continue to rise: see <http://www.scientificamerican.com/article.cfm?id=average-global-temperature-rise-creates-new-normal>.

112. Canada's ethno-cultural portrait: The changing mosaic: see <http://www12.statcan.ca/english/census01/products/analytic/companion/etoimm/canada.cfm>.

113. Domestic Demographics and Canadian Foreign Policy: see <http://www.cdfai.org/PDF/Domestic%20Demographics%20and%20Canadian%20Foreign%20Policy.pdf>.

114. DARPA hatches plan for insect cyborgs to fly reconnaissance: see <http://www.eetimes.com/electronics-news/4074728/Darpa-hatches-plan-for-insect-cyborgs-to-fly-reconnaissance>.

115. Biometrics Patent Applications: see <http://www.faq.s.org/patents/class/000508278>.

116. Robotics Technology Center: see <http://roboticstechnologycenter.com/>.

117. Aldebaran Robotics: see <http://www.aldebaran-robotics.com/en/Discover-NAO/Key-Features/hardware-platform.html>.

118. Manga 101: see <http://comicbooks.about.com/od/manga/ss/manga101.htm>.

His personal bodily network (PBN) was cleared for the CHERT overlays, despite being a notorious hacker's rig, so he could see all the labels and status icons¹¹⁹ that hovered over and in the market spaces. Someone was doing triage in the crowd outside and every few seconds a new icon would pop into view¹²⁰ updating the status of this or that patient. Critical status icon tags moved forward and stretchers or wheelchairs emerged from behind partitions or pillars, the tags hovering over them like the word balloons in some cartoon.

A reed-thin man with ruddy Anglo features, but dressed in worn local garb, stood watching the loading dock. As Sokolow approached, the man craned his neck to look past him. He frowned at Ore and the other military personnel who'd disembarked, obviously puzzled.

"Looking for someone?" Brian asked him. The man wasn't wearing AR glasses, which put him at an obvious disadvantage in a situation like this.

"I was told that Padre Sokolow would be arriving in this transport," said the man.

"That would be me."

The man blinked at him. Sokolow sighed. He knew what the other was seeing: a soft, slightly overweight youth whose tousled uniform and relaxed demeanour belied his skill as an experienced facilitator. Sokolow was often mistaken for a computer programmer when wearing his preferred worn T-shirt and jeans, a fact that he often found useful in many of the circles in which he traveled. Clearly, though, that impression would present some challenges here in Urlia.

It only took a second for Sokolow's own AR system to do a facial recognition¹²¹ check on the thin man, so he was able to put out his hand and say, "You must be Abida Pertwee, my new secretary."

"Y-yes," said the red-faced secretary, obviously unsure what to make of his new boss. He shook Brian's hand, clearly trying to decide what to say next.

"I see that we have services at six," Sokolow supplied, "and that you've arranged a couple of counselling sessions for this evening. It's pretty traumatic intervening in a situation like this, so I'm glad you took the initiative to arrange those."

"Oh," said Pertwee. "Well, yes, it's only been a couple of days, but some of the soldiers are on their first assignment and they've seen things... well, it's been hard on them."

"Of course." Sokolow smiled down at him. "You've lived here since the founding of the city, I understand?"

"Yes, yes I have." Pertwee remembered to smile. "I was an architectural consultant originally."

"Then I am absolutely going to need your help over the next few days."



119. AR Tags: see <http://www.artags.org/>.

120. Systems for Disaster Management: see http://www14.informatik.tu-muenchen.de/konferenzen/Jass07/courses/3/2_Systems-for-Emergency-Management_Slides.pdf.

121. Face Recognition Homepage: see <http://www.face-rec.org/general-info/>.

Desai found herself crouched in the doorway to Rumay's office. She wasn't clear on how she'd gotten here.

Dark swirls of dust cavorted through the room. In the corner, Hazir Rumay was stirring. Still feeling curiously detached, she watched herself crab-walk over and check him quickly for serious injuries; at the same time she was aware that she was mumbling something. Her vision was swerving back and forth, picking out odd objects on the grit-strewn floor and scored plaster walls. She reached out and gingerly picked up a black shard, about the length of her finger. She turned it over, continuing to mumble something. Then, sharp clarity invaded her mind: her systems were still on automatic defensive override mode.

She shook her head and control of her body and senses returned to her. "Doctor Rumay." She grabbed his hand. "Are you okay? Let's get the hell out of here."

His eyes opened and she saw him realizing where he was. "My desk," he muttered in Pashtu. "It shielded us." Then he frowned. "I can't hear."

She patted his hand again and pointed at her own ear, shaking her head, even though she could hear just fine. Her eardrums were artificial¹²² and ruggedized—a little bonus from the first time she'd been bombed, in Zefra,¹²³ Central Africa. She wiped dust from her face and cautiously poked her head above the debris.

She tried to access the city's camera system so as to locate their attackers, but couldn't get a picture. Her body network was working so she could see her own soldiers bursting out of the egg factory's front doors and taking up positions behind the military transports—but theirs was the only other perspective she had right now.

Her attention had been registered by the sergeant's own AugCog system without prompting. He said, "I have eyes on the hostiles. Fight or follow?" She could see the icons of micro-UAVs spreading out across the street—and now their feeds were accessible. A small group of men was piling out of a door in the back of the building across the street; the sergeant must feel confident he could keep them in sight using the UAVs.

"Follow," she commanded. "We're okay up here. There's no reason to get into a firefight with them."

"What if we lose the UAVs?"

"I'm ordering in support," she said. "Extra eyes ahead and around them, and the UAVs are doing gait analysis¹²⁴ on them right now." A glowing icon indicated this; it was a default mode for the UAVs. "Even if these guys disappear down a manhole, our cameras will be able to pick them out of a crowd of thousands when they pop up again. I want to see where they go."

This was a judgment call; modern interrogation techniques could painlessly extract¹²⁵ anything¹²⁶ these young adversaries knew, but a thicket of international laws surrounded the use of such systems. And there were too many civilians around to initiate a firefight.

Relying on passive surveillance¹²⁷ was risky because it could be gamed. The four men

122. To Engineer an Eardrum: see <http://www.fighttagging.org/archives/2006/04/to-engineer-an-eardrum.php>.

123. *Crisis in Zefra*: see http://www.army.forces.gc.ca/DLCD-DCSFT/pubs/zefra/Crisis_in_Zefra_e.pdf.

124. For more information: see http://en.wikipedia.org/wiki/Gait_analysis.

125. Future of Lie Detectors: see http://www.futureforall.org/brain/lie_detection.htm.

126. Brain Scan Lie Detection: see <http://www.policyinnovations.org/ideas/briefings/data/000172>.

127. Cheap Digital Surveillance: see http://www.fastcompany.com/1802688/pew-rising-cell-phone-worldwide-brookings-villasenor-surveillance?partner=homepage_newsletter.

racing into the alleys might have altered their gaits with lifts in one shoe, and she could see that they'd painted their faces to stymie facial recognition software. She was gambling that they hadn't been thorough enough. If the section downstairs had been able to get into line-of-sight in time, they might have been able to paint the attackers with nanotags¹²⁸ using their rifles, but the moment had passed.

... But this was odd. An automated alarm signal would have gone out the instant her systems recognized the attack; by now there should be other, bigger UAVs overhead, and she should at least have received a query from the duty officer back at the night market. But there was nothing—no sign of a connection to CHERT at all.

Two young men ran into the room. AR had tagged them as being Rumay's sons; he waved away their help in getting to his feet. One of his pant legs had been split in the explosion and she could see the smooth white plastic of an exoskeleton brace there. He stood easily and smoothly with its help, then put his hands on his lower back and winced. "I can't hear," he said again.

"We'll fix that," she said. When he shook his head in exasperation, she called up a menu and texted him: TURN ON AUTOMATIC TRANSLATION IN CLOSED-CAPTION MODE. He fumbled with his glasses for a moment, then looked at her questioning. "Can you read me now?" she asked. He nodded.

"Enough, enough, I'm fine." He batted away his sons' attentions. Then he smiled wryly at her. "How did you move so fast?"

Desai hesitated. "Training," she said. "My heads-up warned me just before they fired."

He didn't need to know that her military AugCog¹²⁹ interface had enhancements that civilian models lacked. Its¹³⁰ interfaces were designed to communicate with both the conscious mind and its subconscious processes; hers were optimized for the kinds of responses a soldier might need in the field.

Before she'd re-entered the service, she'd spent a summer in a fire-watch tower in northern Alberta. It had been in the final year of the towers, before they were replaced by UAV and satellite observation. One day she'd been standing in her tower when a bolt of lightning hit it. Suddenly she was on the floor—but not because she'd been knocked down. Some deep and ancient part of her, an element that lived somewhere between reflex and instinct, had taken over and had moved to protect her. Her AugCog rig could communicate with that elemental part of her cognitive system, and together they could make decisions and execute them faster than her conscious mind ever could.

"Sergeant," she said, this time subvocalizing¹³¹ her words so that Rumay wouldn't be able to overhear. "We were late on the detection. I nearly got fried. What happened?"

"They fired from an inner office, ma'am, with a narrow line of sight. Good shot with an improvised and inaccurate weapon; they stood a good chance of blowing out their own wall instead of hitting you. Anyway, our all-hazards system tapped into Rumay's video feeds, interpreted them, and fed them back to you. First I knew was the *boom*."

128. NanoTag Technology: see <http://www.nanotag.com/>.

129. Augmented cognition is an advanced brain-computer interface technology designed to address limitations in human beings' ability to perceive, process information, and make decisions. See <http://journals.sfu.ca/jnonlocality/public/journals/1/PREPRINTS/JamesLakeAugmentedCognition071912.pdf>.

130. DARPA Augmented Cognition: see http://web.cecs.pdx.edu/~strom/onr_workshop/pavel.pdf.

131. Machine can convert thought into speech: see <http://www.telegraph.co.uk/science/science-news/7987821/Mind-reading-machine-can-convert-thoughts-into-speech.html>.

“What about base communications?”

“We were cut off for a minute, ma’am. Some sort of router attack. The municipal system seems to have been compromised, but ours is back online now. First responders are on their way.”

She gave Rumay an appraising look. “Your building’s surveillance coverage is pretty thorough.”

“Building is covered in cameras!” Rumay was shouting the way people did when they couldn’t hear themselves. “Precautionary!” he added. “I’ve had years to position sensors for maximum coverage.”

“Can you still see them?” he yelled; Desai shook her head. “What do we do now?” he continued, for the first time seeming to realize how dusty and dishevelled he looked.

“You wanted a photo-op,” she said. “Let’s get cleaned up, go downstairs, and pretend this never happened. Send the other side the message that they missed, and send the street the message that they’re incompetent.”

Rumay grinned. “I like that thinking. But which ‘other side’ was it that did this? The fundamentalists? The gangs?”

Desai walked over to the blown-out window. Her feeds were coming back online and she could see dozens of mini-UAVs, black saucer shapes the size of a dinner plate, hovering in from all points of the compass. She could see herself in kaleidoscopic reflection in CHERT’s monitoring interfaces. Her own section’s machines had established complete reconnaissance and told her that it should be safe here now.

CHERT had come to Urlia to find the origin and nature of the mysterious disease outbreak that was ravaging the city. Other international investigators were on their way, including Médecins Sans Frontières and a team from the U.S.’s Centers for Disease Control. CHERT was a first-in group though. Desai hoped to have NSS characterized before any of the latecomers arrived.

The disease... “I don’t think you were the target,” she said reluctantly. Crossing her arms and gazing out at the chaos of grass¹³² and solar-panel strewn rooftops, she added, “I was.” Desai paused, “Somebody out there doesn’t want CHERT finding out where NSS came from.”

DISCUSSION

This chapter opens with the description of a highly developed commercial augmented reality infrastructure that military forces could manipulate in order to mask their advance through the city. Although beneficial from a military security perspective, might such military manipulation of commercial information systems result in user backlash? How might access to such systems by security forces and commercial users be balanced?

132. Green Roofs for Healthy Cities; see <http://www.greenroofs.org/>.

In an increasingly networked world, gathering mission-essential information will demand access to and freedom of manoeuvre within the cyber environment. What capabilities might the CF need in order to effectively conduct future cyber operations? What is the lowest level that should have the capability to prosecute cyber operations, i.e. strategic, operational or tactical, and why? How might the connectivity that exists in 2040 be used to prevent rather than facilitate productive change? What are the implications of this wired world for our ideas about individual security and notions of privacy?

Urlia is described as a world of ubiquitous sensors coupled with powerful algorithms in a pervasively networked environment. What threats and opportunities might such connectivity pose for military forces? For example, the mud flats at the edge of a coastal city had been declared an autonomous legal entity. Might other inanimate objects become similarly autonomous entities by the year 2040? What impacts might these radical changes have on local, regional and national governments? What implications are likely for local regional and global security issues?

Sokolow connects to the CF network via his own personal sensors and computing devices rather than through military systems. Given the rapid pace of technological change and the continuing convergence of information networks, the ability to connect in this manner is plausible, though not without risk. What are the risks, opportunities and benefits of the CF continuing to pursue capability development exclusively in the area of military-grade “soldier systems,” versus building a military network capable of true modularity and scalability that can easily connect to civilian devices and infrastructure?

While some futuristic capabilities may be plausible in theory, in practice, a lack of relevant international law serves to raise questions concerning their development. For example, although painless interrogation techniques and cyber operations that will not result in physical harm are envisioned, they still present potential concerns to sovereignty and privacy. What are the risks and opportunities pertaining to capability development in areas where international law is not yet well defined? How might they be effectively addressed?

Desai’s Augmented Cognition system includes a defensive mode that forces her to subconsciously move in order to avoid injury. Consider the potential risks and benefits of future soldier systems that include control of bodily movement by artificial intelligence. Where it is possible to introduce technology that is almost certain to preserve human life, is there a moral obligation to provide it to all soldiers? Why or why not?

Desai is seen communicating to a subordinate through a process called subvocalization. This is essentially an advanced communication system that converts human thoughts directly into electronic communications. Would such a capability be useful to Canadian soldiers? What are the risks associated with such a capability?

The characterization of Padre Sokolow points to the importance and usefulness of skills and experience that extend well beyond domains of faith, ceremony and celebration. Consider the types of skills and character traits that might be required of future soldiers and how this might change recruiting and staffing models.

The pace of technological advance is coming to be understood as a self-reinforcing feedback model where advances today accelerate the pace of those in the future. What might this mean for capability development and acquisition strategies in the future? What efforts might need to be undertaken in the next five years to significantly influence the types of equipment and systems the future force described in Urlia has at its disposal?

What impact might technology have on future comprehensive approach plans? Might humankind's decision-making monopoly be challenged by autonomous technologies that form part of the negotiation space? Consider the risks, opportunities and benefits of artificial intelligence entities able to access and manipulate massive online databases and sensor feeds.

In this chapter, an open-source stakeholder management service is introduced and described as being bigger than Google and hugely influential. Even the CF maintained a presence on this public system and supplied AI liaison services to the public using this service. Consider the risks, benefits and opportunities to defence and security forces that adopt such public information systems. Would it be better to avoid these systems? Why?

Extensive use of machine translation is depicted in this chapter and indeed today, machine translation abilities are advancing at a rapid pace. If machine translation in the future was as proficient as that depicted in the story, consider the need for human translators. Would they become unnecessary? How much of the complexity of social interactions might be resolved by machine translators versus human translators? How important might accurate and timely machine language translation be for future defence and security operations?

In this chapter, deployed Canadian defence forces are seen engaging in non-traditional military roles and tasks. How might military roles, tasks and structures evolve as new technologies are introduced and societies morph and adapt to energy challenges and climate change? How might National Security organizations of 2040 differ from those of today?

How might the prevalence of powerful new technologies available to the soldier affect their notions of risk and danger? How might their behaviour change? What advantages and disadvantages (if any) might such changes create for soldiering and security operations?

Technologically enabled capabilities are not immune to failure or interruption, and indeed, this chapter demonstrates several technological disruptions. How might defence and security forces best leverage new technologies while balancing the potential adverse consequences of system disruptions or failures? What are the advantages and disadvantages of relying on the technologies presented? To what extent will redundancies be needed as a guard against technological malfunction?

“Sokolow,” said a voice in his head.¹³³ “Briefing in 10 minutes.” It was Desai, whose status icon he could see hovering over a brightly lit pavilion on the far side of the pillared space. Pertwee accompanied Sokolow to where his office was (it was just a desk behind a plastic partition, one of many in this space), then Sokolow let him know that he needed to prepare for the briefing. Once Pertwee left, Sokolow breathed a heavy sigh and leaned against a pillar for a while. It was just as hot in here as it was outside,¹³⁴ even though the fans were moving the air to some degree. He sought one out and stood in front of it while he waited for the briefing to start.

He closed his eyes and entered Aephoria. His intraocular implants¹³⁵ gave him high-definition virtual reality¹³⁶ (VR) inside his own eyeballs—an increasingly popular operation, but one still avoided by the combat arms types over concern that the implants might do irreversible damage to normal vision, or even interfere with their mission-critical decision-making. He could use his visual, auditory and tactile augmentations¹³⁷ to interact with the data overlays around him. He could treat them as a door into entirely virtual worlds. Or, as now, he could move into an intermediate realm, the world of Aephoria and its sister states.

He seemed now to stand in a city again, but this wasn’t Urlia. The sky was awash in gorgeous auroras, and the towers were slabs and pillars of light. This was Aephoria itself, a virtual metropolis¹³⁸ whose inhabitants were people from every corner of the Earth. The boulevard he stood on was crowded with the avatars of real people, all moving from point to point with the quick economy of video-game characters. The streets and skyscrapers that were their destinations were not all so easily reached, however. Some you could just click your way to; some you had to approach on your virtual feet. Some were spimes,¹³⁹ objects that could be remotely tracked through space and time, existing in both the virtual and the real world. And some—the most secure of all—were located only in the real world.

Aephoria was a place for facilitating collaboration¹⁴⁰ of humanitarian efforts in the real world. It attracted religious and non-religious alike from everywhere to an

133. Bone conduction headsets: see <http://sonify.psych.gatech.edu/research/bonephones/>.

134. NASA Surface Temperature Analysis: see <http://data.giss.nasa.gov/gistemp/graphs/>.

135. Intraocular Retinal Prosthesis: see <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1359018/> and <http://www.darpa.mil/NewsEvents/Releases/2012/01/31.aspx>.

136. Virtual Reality: see <http://www.vrs.org.uk/>.

137. Global Market for Human Augmentation Systems to Reach \$877 Million by 2020: see [http://www.abiresearch.com/press/1590-Global+Market+for+Human+Augmentation+Systems+to+Reach+\\$877+Million+by+2020](http://www.abiresearch.com/press/1590-Global+Market+for+Human+Augmentation+Systems+to+Reach+$877+Million+by+2020).

138. Virtual World: see <http://www.virtualworld.com/>.

139. Spime definition: see <http://en.wikipedia.org/wiki/Spime>.

140. Solve for X: see <http://www.wesolveforx.com/>.

environment where their individual interests became invisible to each other; Aephoria monitored all traffic in such a way as to prevent proselytization. You could only organize¹⁴¹ to help people in the real world, and given the increasing frequency and severity of destructive weather events¹⁴² and their resulting humanitarian impact, there were plenty of situations in which this collaborative virtual world was needed.

Sokolow's network was lighting up as his Aephorian friends learned he was in the city. He ignored the chat requests, texts and tag clouds,¹⁴³ and zipped up the avenue to the Global Affairs building, which had the apparent solidity of a concrete and stone structure. The gate-bot waved him through and, once inside, he shortcut the virtual architecture, moving in one step from the foyer to the office where his contact was waiting.

"Brian, how was your recent trip?" The avatar¹⁴⁴ was of a middle-aged man, slender with black hair and Persian features.

"Azad. I have a meeting in five minutes, but I want to take you up on your offer of sitting in on a session of the peace councils. Where can we have a proper sit-down?"

Azad Esani's avatar reached into a virtual desk and pulled out a ring of keys. "These are for the Urlia public extensions." He opened his other hand, showing two more keys.¹⁴⁵ "And these are for the Global Affairs safe houses. I'll meet you in this one." He palmed one key, showing Sokolow the other. "At, say, four o'clock?"

Brian was dead on his feet, but he couldn't very well refuse. "How far is it?" He needed to be back in time to lead the inter-denominational service.

"From your current location? Only about a kilometre. I'll send a driver to pick you up."

"Great. I'll see you then." He took the virtual keys and made a particular gesture with them; they glowed green for a moment. Azad nodded again and disappeared, and Sokolow opened his eyes.

The peace councils were part of the multi-dimensional solution being applied to Urlia's complex problems, pioneered in the region 30 years before,¹⁴⁶ but with a difference. Aephoria was supplying sophisticated facilitation technology that guided the workshops using a methodology known as structured dialogic design (SDD).¹⁴⁷ Structured dialoguing tools like SDD had been around for decades without ever gaining traction, but with the development of liaison technology and the massive stakeholder management layer built into the internet by companies like Pantheon, SDD was now coming into its own.

He was reluctant to leave the vicinity of the fan, but a gently bouncing green arrow was superimposed on the concrete-and-plastic of the night market. After the artificial perfection of Aephoria, the real world always looked shabby and grim; this mobile field

141. For an early example: see <http://seeyourimpact.org/>.

142. Human contribution to more intense precipitation extremes: see <http://www.nature.com/nature/journal/v470/n7334/full/nature09763.html>.

143. The Structure of Collaborative Tagging Systems: see <http://www.hpl.hp.com/research/idl/papers/tags/tags.pdf>.

144. Microsoft's prototype avatar looks and talks like you: see <http://content.usatoday.com/communities/technologylive/post/2011/02/microsofts-prototype-avatar-looks-and-talks-like-you/1>.

145. Digital data files suitable for 3-D printing: see <http://www.zcorp.com/en/Press-Room/ZEdit-Pro-Software-Makes-Files-3D-Printing-ready/news.aspx>.

146. The Strategic Advisory Team in Afghanistan – Part of the Canadian Comprehensive Approach to Stability Operations: see <http://www.journal.dnd.ca/vo9/no3/09-stlouis-eng.asp>.

147. Structured Dialogic Design (SDD) can be used to gain traction in solving otherwise intractable, complex social problems: see http://en.wikipedia.org/wiki/Dialogue#Structured_dialogue, and for a presentation on the structured dialogic design process, see <http://www.slideshare.net/SoCoDesign/structured-dialogic-design>.

hospital with its queues of desperate people and swiftly moving gurneys was shocking. He tried not to look too closely at what was going on behind the partitions he passed, but he had to do a little hunting to find what the green arrow in his AR display was pointing at.

The 3-D printer¹⁴⁸ he was looking for was next to a concrete pillar. It was dropping tongue depressors, otoscopic cones for ear examinations, and other medical supplies into the partitions on a little rotating turntable. His print job¹⁴⁹ was in the queue, but it was going to be another five minutes or so. He couldn't afford to wait, but he also couldn't afford to let his key printout be picked up by anybody else. He paused it, locked the job to his own ID, and then hurried on to the designated conference room.

Having ensured that the planning process was underway, Desai stood rocking on the balls of her feet and watched as people entered for the briefing to the remainder of the CHERT. There was no conference table here; the place had been set up in theatre style. The "room" was an area of the market that had been closed off by plastic sheeting, but Sokolow noticed that sound dampeners had been installed near those sheets and that they were not ordinary plastic to begin with. They were probably bombproof though they seemed porous enough to let air pass over and under them...

He put up his hand.

Desai arched an eyebrow at him. "Meeting hasn't even started yet, Padre."

"Yeah, but he's a keener," drawled Ore as he sat.

"That's—okay, that may be true and all," Sokolow admitted, "but shouldn't there be air filters installed here? We've got sick people right on the other side of those sheets, and there..."

"Short answer," said Desai, "NSS is not airborne."

"But—"

"I'll explain in a minute... If you'd like to be seated."

Puzzled, Sokolow sat, tapping and rubbing the front of his jaw as he watched the rest of the attendees settle in. All were labelled in his AR overlays and he was just in the midst of reading some of those labels when Desai waved her hand and his augmented view of the room disappeared.

"Hey!" Then he realized she'd done more than switch off his overlay—she'd turned on jammers throughout the room. Desai looked grim, and he'd heard about the attempt on her life. So, belatedly, he shut up and tried to look smaller in his seat. The commander waited for a few seconds after the last attendee had stopped moving. Then she said, "As you all know by now, I was the target of an assassination attempt—or maybe the target was the local businessman I was with—yesterday," she said. "It wasn't just a warning shot; we were only saved by the fact that Dr. Rumay likes solid furniture and that the attackers used an ineffective improvised device.

"The question is, who tried to kill us?"

Such a leading question made Sokolow itch to pull down some assessment menus and see what the DNIS AIs thought, but Desai had made that impossible, which was really annoying. He held up his hand, and with a sigh Desai said, "Yes, Padre?"

148. Layer by Layer Manufacturing: see <http://www.technologyreview.com/article/39316/?nlid=nlmat&nlid=2011-12-22>.

149. 3-D Printing: see <http://www.cadinfo.net/general-mechanical/3d-printing-gets-into-top-gear>.

"I'm hoping that was a rhetorical question?"

"It should be," she said, "but it's not. The situation is evolving rapidly. That's why we're having this talk." Sokolow opened his mouth to comment on that, but then changed his mind.

"CHERT was called in to solve a well-defined problem," Desai went on. "There's been an outbreak of an unknown disease and people are dying. We're tasked with finding out what the pathogen is and how to stop it. I know that all of you were given this explanation before you arrived and I understand that we had to sell the mission at home with a clear-cut mandate. The truth is it was never that straightforward."

A couple of the NGO reps shifted in their seats. Years of using augmented reality made Sokolow imagine little thought balloons over their heads containing words like "What have I gotten myself into?"

"There's a story going round the streets," said Desai. "People are saying that NSS is a bioweapon¹⁵⁰ and because *we're* here they think we're studying its effect on people—that we caused it."

"Ridiculous!" said one of the medical staff.

"I know you've just come off a 24-hour shift¹⁵¹ Nancy," said Desai. "And if people could see how hard you were working they might not believe the stories, but..." Sokolow had put up his hand again. "Yes, Padre?"

"Why can't they? We could put a rider camera on her, anonymize the faces of the people she's treating and upload a live feed onto the net. Let people watch what we're doing, even let them contribute ideas for treatments and so on to a public forum. Crowdsourcing¹⁵² the response. They did that in Brussels when the—" Desai was shaking her head.

"It's a great idea and we'll probably do something like it soon. Up until today, though, we weren't sure we had an effective treatment. Letting the whole world watch us fail, and people die, would have been counterproductive."

"People back home—"

"Brian, it's not about the people back home. This is about the judgments of the people in this city. They're suspicious of us to begin with. While I agree that full transparency¹⁵³ is the way we operate back home, it has the right supports there. To date it hasn't been a good way of keeping *these* people safe." She waited until he sat down and then, with a shrug, said, "We're getting ahead of ourselves. Before we decide what our next move is, we need to agree on what the situation actually is." She frowned at Sokolow. "What is our problem?"

The assembled experts and stakeholders blinked at her.

She pointed to Sokolow. "Padre. What's our problem?"

That's what he got for speaking up. He stood and, while this was obviously some sort of trick question, he said, "Disease outbreak. People are dying."

She cocked her head. "Sure, the CHERT's here now, but we weren't the first feet on the ground. The Strategic Support Team was here before the outbreak. Why were they here?"

"Well... there was a famine. Because of the drought."

150. Research into engineered avian flu: see <http://www.popsoci.com/node/60139/?cmpid=enews012612&spPodID=020>.

151. PROVIGIL (modafinil): see <http://www.provigil.com/>.

152. Crowd Creativity: see <http://www.crowdsourcing.org/community/crowd-creativity/3>.

153. Transparency International Canada Inc.: see <http://www.transparency.ca/>.

“But the drought’s been going on for years. Urlia’s a kit city in the Chinese model—planned, built and populated in the last 20 years. Not populated *according* to plan, which is one of the problems, but they built it knowing the climate was changing and that droughts would be more common. Vertical farms¹⁵⁴ were part of the plan from the beginning.

“Of course the VFs concentrated power in the city and the village leaders and the tribal militias didn’t like that. So, problem number one,” she held up a finger, “there was huge resistance to building the VFs but there weren’t enough to feed the city. Second, there’s local legislation requiring the city to import a certain amount of its food from the countryside. Since the countryside couldn’t supply enough food, the city had a responsibility to invest in the hinterland to improve its production capacity. With a chronic drought there was nowhere to grow anything, but Urlia was on the hook anyway, so money poured out of here, ostensibly into the hands of the farmers who weren’t farming anymore because nothing would grow... and so the money eventually went into the coffers of the militias and organized crime who are extorting the farmers for potable water and security services.”

Ore raised his hand. “Don’t the gangs control the vertical farms?”

Desai nodded. “Yes, and they’ve been keeping the price of food as high as they possibly can. The Strategic Support Team determined that this was a classic reinforcing loop; the farmers couldn’t feed Urlia because production was so poor due to the drought, so Urlia turned to the VFs, which reduced demand for the farmer’s goods, but the less demand there was for farmed food, the more Urlian money that should have gone to the farmers went to the militias and criminals. So the drought’s been in their interests and now they’re profiting from the famine too.”

A fresh-faced medical technologist nodded. “And that’s why we brought in the GM crops.”

“Right, a desalination¹⁵⁵ plant was built during a previous mission. As soon as they left, the plant’s new owners priced their water out of reach of the farmers. So the only way to break the cycle was to empower the farmers themselves, making sure they weren’t put into another state of dependency by whatever solution we gave them.

“That solution,” added Desai, “is also why the coalition wants me to do some public relations work. That is why I met with a local businessman named Rumay. He does genetic engineering.”¹⁵⁶ Sokolow remembered from his in-transit theatre briefings that there was plenty of genetic engineering expertise in the subcontinent, and various forms of golden rice,¹⁵⁷ and saltwater-compatible foods¹⁵⁸ were available. These companies had a lot of incentive to sell patented GM solutions¹⁵⁹ to the local farmers, but the local farmers couldn’t afford to pay for them. The City could, but corruption on the local level kept that solution from happening.

154. Vertical farming is high-density hydroponics in skyscrapers. It has been estimated that a vertical farm one block square and 45 floors high could supply food to 50,000 people year-round on a sustained basis. Accordingly, 60 such buildings could feed all of Toronto, and 600 could feed the entire country of Canada. For more information, see www.verticalfarm.com.

155. Nanotechnology Desalination: see http://www.nanotech-now.com/news.cgi?story_id=42797.

156. Genetic Engineering: see <http://www.globalchange.com/geneticengin.htm>.

157. GMO Rice: see http://www.gmo-compass.org/eng/grocery_shopping/crops/24.genetically_modified_rice.html

158. GM cereal crops created to grow in salty water: see <http://www.sciencenewsdaily.org/energy-news/cluster9163687/>.

159. Food Patents: see <http://www.globalissues.org/article/191/food-patents-stealing-indigenous-knowledge>.

"Rumay is one of a set of local entrepreneurs who were taking genetic engineering to the next stage," she continued, "by engineering entire ecosystems. Rumay and his partners had supplied detailed information about the Urlian biome to open-source biotechnologists,¹⁶⁰ who in turn had come up with what were essentially edible weeds: tough local scrub-grasses and other plants that produced grains compatible with human and local animal nutritional needs. Unlike GM crops controlled by the multinationals, the farmers barely had to seed these crops at all: just harvest the crops that sprang up in their ditches and backlots naturally."¹⁶¹

"I went to Rumay partly to promote the coalition comprehensive approach plan, but also because I wanted to talk to him about the transitional ecology." The weeds were just the start; ecologies didn't stand still, and weeds were biological commandoes sent in to pacify the ground and make it fertile for the next wave of plants. Successive waves of growth would eventually lead to forests and what was called a climax ecosystem,¹⁶² which was self-sustaining and rich in both plant and animal species. "We wanted the farmers to get beyond monoculture farming like we've started to do in North America. They'd become stewards of an area of land that produced a bounty of edible food without the need for cultivation, fertilization, herbicides and pesticides."

Great plan, thought Sokolow. The problem was that too many people profited from the status quo. He rubbed his chin, thinking, then put up his hand again.

"Padre?"

"In a sense, does it matter who shot at you? I mean, clearly the militias and the gangs are the obvious suspects. But they have the same interests, so one of them targeting you is as good as the other. I mean, checkmating one would also checkmate the other."

"Maybe. But *why* did they attack us?"

Sokolow's eyebrows wrinkled in puzzlement. "Because we're threatening their business?"

"We already did that when we distributed the GM crop to the farmers. Nobody shot at us then."

"Well—"

"No, somebody took a shot at us yesterday because we stand a chance of finding out where NSS came from."

Someone swore. "So it is a bio-weapon!" Desai nodded.

"We're pretty confident. If it is, it changes everything. The CDC are checking and if their findings confirm ours, then we won't be undertaking a humanitarian operation anymore. This will get ugly. And the U.S. can't afford a new entanglement here right now."

"Doesn't the same apply to us?"

"All the stakeholders knew when they included us that Canada's foreign policy is built on the Human Security¹⁶³ model. Everybody knows we won't make any distinction

160. Open-source biotechnology: see <http://itidjournal.org/itid/article/viewFile/697/295>.

161. GM and the Environment: see <http://www.organicfooddirectory.com.au/general-issues/gmo/genetic-modification-the-environment.html>.

162. Climax ecosystem: see http://www.arborealinternational.com/?page_id=87.

163. The Human Security model of foreign policy makes the individual rather than the nation-state the concern of foreign relations. Canada was one of the early promoters of this model, and the Ottawa Convention, which led to the widespread banning of antipersonnel landmines, is one example of the Human Security model in action. For more information, see <http://www.humansecuritygateway.com/>.

between a natural humanitarian crisis and a man-made one.” Then she smiled grimly. But maybe not everybody here really believed that.

“Why not attack us while we were distributing the seeds? Because, clearly, somebody in Urlia is thinking the same way we are. To attack the seed distribution would have been to treat the symptom of their problem—namely our presence here. Ultimately, it would have reinforced our mission. No, clearly they knew they had an option that could drive us out of the country entirely—blame the foreign coalition. Word on the street is that the outbreak is our fault. I’m sure those rumours didn’t start themselves.”

Sokolow nodded. “Connect the outbreak to the GM food and you could discredit the whole foreign effort. Whatever local interest was behind this, they weren’t just doing a smash-and-grab on the city; they were after long-term power.”

“Add to this that the local people don’t trust us,” continued Desai. “Then add in the national and international political situation. Canada’s made a commitment to perform here and we can’t afford to fail, but there are many who have a vested interest in seeing us do just that and they’re going to be lining up. Even if we find out who caused the outbreak, people are going to say that we’re lying. The conspiracy theorists are going to have a field day with this.”

“They already are.”

Everybody turned. A harried-looking, out-of-breath duty officer stood at the door to the conference area. He was holding up a tablet; Sokolow could just make out the banner of a popular syndicated news service on its screen.

It was easy to see the headline underneath the banner though:

CANADA IMPLICATED IN URLIA OUTBREAK

DISCUSSION

This chapter introduces the prospect for future surgically implanted performance enhancing technological aids. In this context, might it be possible to lower the physical and cognitive entrance standards for new recruits? Consider the risks and opportunities that this might introduce. How might such embedded technologies enhance or detract from training and education activities? To what extent might technological advances resolve future complexity? How and to what degree might it increase it?

The briefing described in this chapter appears to be the first face-to-face gathering of the CHERT leadership. The meeting also includes participants from outside the military formation, including NGO representatives. Consider the risks, benefits and opportunities of such multi-stakeholder participation. For example, might this improve or detract from the development of trust within the collection of diverse stakeholders?

The virtual world of Aephoria is presented in detail in this chapter. It is described as a place for facilitating collaboration of humanitarian efforts in the real world—not unlike many of the online collaborative tools that are available today. How might a world of virtual and non-

virtual nations and organizations impact citizen loyalties? How might old-style or traditional nations (i.e. non-virtual) interact with virtual nations? Could the influence of virtual nations eventually eclipse that of traditional physical nation-states? What are the implications of such technology for notions of sovereignty and for the idea of the nation-state?

Might there be a proliferation of virtual nations in the world of 2040 given the current pace of network development and online collaborative communities? How might such virtual nations interact with each other? Might conflict in the virtual world mirror that of the real world? How might non-virtual nations protect themselves against unfriendly or nefarious virtual entities?

How might the application of a comprehensive approach to operations affect the behaviour of populations and their perception of the legitimacy of international intervention?

He'd thought it was impossibly hot inside the night market, but Sokolow was always shocked by the outdoors. The light was blinding, and the heat—the heat! He'd been thankful for the air-conditioned military vehicles, but he'd literally never felt anything like the heat in the city. Warily approaching the black asphalt of the parking lot he tried to breathe shallowly and squinted as he descended. Strangely, what came to mind was the winter he'd spent in Edmonton and a foolish walk to the corner store he'd taken with some friends. It had been minus 40 and the air had burned as he'd breathed it in shallow sips. When he'd gotten back inside and taken off his instantly fogged glasses, a strip of skin from over his ear had gone with them—frozen to the glasses' arm. This air felt the same for entirely opposite reasons.

Desai had been enthusiastic but cautious about his plan to attend the peace council, so when he made it across the roasting pan of the lot he was passed through the bombproof paneling and around the security barriers without being questioned. A veritable cloud of mini-UAVs hung around him for a second, sniffing and checking his biometrics, but then they all retreated.

“Mister Sokolow!” The voice was generic—computer generated.

He looked through the heat haze and saw a battered-looking truck across the street. One of its headlights was broken and its long bed was stacked with crates. The driver was holding his phone out the window, aiming it at Brian. Since both side windows were open, Sokolow had to conclude that the truck wasn't air conditioned. “Great.” Feeling increasingly heavy under the weight of his backpack, he stalked over to the vehicle, which was wallowing in a shocking miasma of diesel fumes.

The driver said something in Pashtu and his smart phone instantly translated¹⁶⁴ it into English: “Good afternoon. I am your driver; Azad sent me.”

He could have been absolutely anyone, from aggressive freelance taxi driver to kidnapper—except for the rotating green tags hovering over his head in AR that identified him as an Aephorian citizen and verified his contract with Brian. There were municipal police cameras on every other corner, and far overhead, coalition UAVs were tracking Sokolow's every movement, not to mention that his personal body network had geo-location¹⁶⁵ services built into it.

Still, he reflexively checked the driver's tag. His name was Salim Namvar.

164. Google developing a translator for smart phones: see <http://www.physorg.com/news184916311.html>.

165. Geo-location definition: see <http://blog.api.orange.com/en/2011/02/geolocation-definition-uses-and-limitations.html>.

Sokolow got in and tried not to make some naïve and parochial comment about not having driven in a fossil-fuel-powered vehicle for years.¹⁶⁶ The thing was shockingly loud; he couldn't help but edge his feet away from the front of the foot-well as he thought about the thousands of tiny explosions happening inside the metal case in front of him. While the West had been slowly weaning itself off of fossil fuels for decades, here he'd better get used to it; fossil fuels were still widely used as in much of the continent.

"And how are you this fine day?" asked Namvar as the truck bounced off the curb and into the concrete canyons of the city. The night market where CHERT had set up was in a warehouse district, brand new like the rest of the city but already barnacled over with shanties and shacks. The street was a sea of people, mostly on foot, all dressed in voluminous white against the blistering sun. Scooters, jitneys, bicycles, cars and robots swam slowly through this surf of people.

He glanced at Namvar and did a double take. "You're actually *driving*?"¹⁶⁷

Namvar grinned. "The truck is old," he said. "Doesn't have its own brain." He reached down to manually shift the gears as Sokolow watched in fascination. Brian had owned a new car for three years, ever since he landed his current secondment with the diplomatic corps as their religious leader subject-matter expert, but he'd never actually *steered* it—though he had that option.

Namvar leaned on the horn, and Sokolow found his attention returning to the dusty, busy street. After some fiddling with his AR controls, Sokolow found an augmented reality overlay¹⁶⁸ in English. He superimposed it over his vision, and suddenly the Pashtu signs all sprouted glowing English captions, street signs and arrows appeared overhead, and little informational icons popped up whenever he focused his gaze on anything.

He found himself relaxing a bit; here, at least, was something familiar. As they crawled through the crowds, he tried a few other overlays including one provided by Aephoria that highlighted some of the real properties owned here by his adopted country.

Namvar had to carefully manoeuvre though the streets, which were wide and without distinct sidewalks—a design borrowed from Europe—but here they remained extremely congested. Whether the local council had made this decision or not was hard to tell; Urlia was a kit city, its plan based on the hundreds of million-plus inhabitant metropolises that the Chinese had built in the past 20 years. Brian could even see the tall red frame-shapes of building printers, like immense daddy-long-leg spiders, here and there on the horizon. There was a telltale uneven check pattern in the concrete walls of the towers they were driving past—all had been constructed by such rigs, which could put up a tower in days.¹⁶⁹ Printed buildings could take any shape, and in Canada they often took startling, organic forms. Here, the latest 3-D architectural technology had been used to make towers that looked exactly like the cinderblock monstrosities of the last century.

They passed a postmodern shantytown; breaking like waves against the base of the nondescript towers in this neighbourhood were all manner of ad hoc structures that had

166. Demand for electric cars up in 2012–2013: see <http://www.cars-electric.com/electric-cars-in-2012-and-2013/>.

167. Driverless car technology: see <http://news.discovery.com/autos/ces-2013-driverless-cars-motor-ahead-130109.html>.

168. Augmented Reality Overlays: see <http://www.kurzweilai.net/augmented-reality-app-allows-users-to-visualize-sketchup-designs>.

169. For more about the technology of building printing, see <http://www.dailymail.co.uk/sciencetech/article-2187623/Contour-Crafting-builds-house-24-hours.html>.

been built into, onto and around the planned ones. According to the AR tags poking above the towers, the printers had walked slowly through here, as they normally did, depositing a ready neighbourhood from their spinnerets. For a whole day a perfect model street had stood here, but before the legal tenants could get their moving trucks into the lanes, thousands of displaced migrants, former farmers and refugees had poured past the temporary barriers. In a rush, they'd filled every room, the brand new parking garages never receiving a single car as they were suddenly converted into mazelike dwellings. The rows of identical balconies vanished under makeshift tenting and walls; carefully planned windows were boarded up or new ones knocked through the walls while the new tenants faced down riot police in the streets outside. The original buildings were found objects, turned and crafted into new use by those who'd found them before the people who'd paid to have them built could object.¹⁷⁰

The one thing nobody had messed with was the solar generators. Immense, sail-like triangles and diamond shapes stretched between vast white towers. They dwarfed the apartments and offices that huddled in their shadows.¹⁷¹ Geometrically perfect and icily clean, they seemed utterly alien, yet it was only their shadows that made the temperature remotely tolerable in the bustling street. Clearly, the solar sails didn't produce enough power for the city because everywhere he looked he saw old-style combustion engines and open fires in street-side ovens. The street was overlaid with a pall of smog and, in augmented reality, with dozens of different and often competing tag styles.

Namvar was wearing AR sunglasses so Sokolow tapped his own temple and said, "There're lots of overlays here!"

Namvar shrugged modestly. "More than you can see," he said through his phone. "Every clan has its own version of the city, and you can bet the gangs have theirs too. They show who claims what street and what the boundaries are. Taggers are everywhere. But, you know, it's difficult because most of these overlays are private. I have to pay to see the important ones. But I can't afford them all and there are many disputes about who owns what. You try to follow the signs, but you can't see all the signs. The last thing we need is more tags, but there are more every day."

Sokolow put his head out the window and stared about at the chaos. It was, he'd just realized, *deterministic* chaos—not random at all. Namvar knew where he was going, but not entirely because of the AR tags. Since he lived here, he knew he had to read the constantly renegotiated boundaries between the many powers who contested these ways day by day. Familiarity would have taught him to read signs that weren't formalized in augmented reality nor painted on the sides of buildings. Maybe he read the tension of the street, the faces of passersby, the density and pace of the crowds, and maybe just the *sound* of the place.

He straightened up, biting his lip and watching the sea of people drift by. *It can't be done*, he thought. Desai had brought him here to integrate the online and virtual stakeholders into the mission. She didn't know what she was asking. It was impossible.

"Here we are," said Namvar's phone. He grinned at Brian and pointed at the building

170. Squatters have used high-priced real estate before, see <http://www.bbc.co.uk/news/world-latin-america-11942501>.

171. Clarke Quay shopping district in Singapore: see http://www.streetdirectory.com/stock_images/travel/preview/11593493130024/19602/clarke_quay/.

they'd pulled up beside. Sokolow thanked him, but before getting out he looked up and down the street anxiously. Was he the only Westerner here? Would he stick out like the proverbial sore thumb? But no—there were Chinese men and women in business suits, other Europeans in white linen; in his casual attire, he wasn't *that* conspicuous.

Still, he left the truck quickly and hurried into the lobby of the building, shoulders hunched. There were five people in the elevator, but he was the only one who got off on the sixth floor. The corridor here was empty and had just one door in it—a featureless slab of metal that looked new. He fished in his pocket for the keys he'd printed in the night market and tried one in the lock. The door opened.

A blast of cold air hit Sokolow as he stepped inside. He closed the door and, for a moment, just basked in the cool relief. Then he realized where he was: in the real counterpart to the Aephorian office where he'd met Azad Esani earlier. The virtual office had obviously been put together from a photo-mosaic of the real one¹⁷² because they really were identical—right down to Azad himself,¹⁷³ who was advancing between a couple of desks to shake Sokolow's hand.

"Good to see you," he said in perfect English. "No problems getting here?"

"What problems should I have had?"

"There's some rumour that Canadian scientists are behind the plague."

Sokolow nodded glumly, unsurprised at the speed with which the news had spread.¹⁷⁴ "The story is that the Canadian company that sold the rights to the GM food crops to the Urlia farming co-ops seeded the disease so that we could then send in CHERT to study it. It's ridiculous of course—who would believe it?"

Azad shrugged. "Only the worst sort of people. And yet, they are the only ones you have to worry about. But enough about that—you're here. Let me show you what we're doing."

He led Sokolow from the fairly nondescript outer office to a larger space, an open lounge with big conference rooms leading off it. "This is the physical side of Aephoria's Urlia Foreign Affairs office. Can you see how the conferences are set up?" Sokolow could see past the glass walls of the closed conference rooms to where several meetings were taking place. The walls of these rooms were painted dark colours, and to ordinary vision they would simply make for a sombre backdrop, but in augmented reality the walls weren't there; other rooms and spaces opened out visible to him, and to the people seated around the conference tables, because they all wore AR glasses. Teleconferences of arbitrary size could be held this way, and visual displays and presentations could appear anywhere in the walls. One of the conference rooms had three virtual rooms surrounding it, and these each had three more, receding into the pixelated, virtual distance. Azad saw where Sokolow was looking and said, "That's the plurinational farming coalition trying to solve the refugee problem. You wanted to observe one of the peace councils, and I think they'd let us sit in if I ask."

172. Photorealistic building modelling and visualization: see <http://www.isprs.org/proceedings/XXXV/congress/yf/papers/922.pdf>.

173. Photorealistic Avatars: see <http://www.dailytech.com/Microsoft+Develops+Prototype+Next+Generation+PhotoRealistic+Avatar/article21004.htm>.

174. Social media accelerates the spread of news: see <http://web.mit.edu/newsoffice/2011/twitter-growth-research-1221.html>.

“That would be nice.” Aside from couches and informal meeting areas, the lounge contained 3-D printers, barrels of feedstock for them, and scanners capable of digitizing anything up to the size of a human being. Two men and a woman were sitting at desks, each talking to someone out of sight while swirls of colour and blocky virtual shapes hovered over the desks in front of them. “This is a safe point,” Azad said, “where we can do secure processing outside of the cloud. But here—I’d like to introduce you to someone.” A dark-skinned, well-dressed man with a high forehead and a pleasant face stood up from one of the couches. He’d been talking to two similarly dressed men with long North African faces. “Councillor Ludhi, this is Brian Sokolow—he’s with the Canadian Army.”

Ludhi shook Sokolow’s hand and grimaced. “I wish we could meet more openly. There would be consequences; not all the constituents in my ward trust foreigners. I was just trying to explain that to these... what are you again? Census takers?”

The North Africans, both in their early 20s, also shook Sokolow’s hand. “Darman,” said one, and “Cain,” said the other, “of the Dialogic Design Institute of Tunisia.”

“I know you’d like to visit all the city councillors,” Ludhi said to them. “But that may not be possible.” To Sokolow he added, “Many of our older people wanted you all to leave. The younger ones—well, they mostly accept the fact that the rest of the world is constantly in their pockets because they’d grown up with that. But they have little power except to riot—which some of them are happy to do.”

“But, to answer your other question,” said Darman, “We would like to ask your constituents some questions. But their answers may lead to other questions.”

Ludhi looked sceptical. “You work for the same military coalition as Mr. Sokolow here,” he said. “The Canadians are supposed to be finding the source of the plague. Are you helping them with that?”

Cain smiled. “I wish our work was that important. No, we’re just trying to create an accurate picture of the city. Who lives here, what they do, and what they want.”

Ludhi waved a hand. “We did a census three years ago. All the information is there.”

“Three years is a long time,” said Darman. “And the census is missing a lot of key information.”

“Gentlemen, these meetings you’ve shown me seem impressive, but I don’t have time for more meetings. I represent my ward, and with the famine, water shortages and now a plague, I have a lot, as they say in English, ‘on my plate.’ Unless you can help me with my problems I—” but the North Africans were both nodding.

“That’s why we’re here,” said Darman. “I mean, ultimately. Once we’re done, you will have access to all our findings and to new decision-making tools. We can help you bring your constituents into your planning and problem-solving process, and provide you with full accountability for all your decisions.”

Ludhi blinked at them. “Bring my constituents into my problem-solving process? And what do you suppose will happen if I let my constituents make my decisions for me?”

“It’s not about letting them make—” Darman began, but Ludhi cut him off.

“The reason I am here is because the coalition dangled some nice enticements and promises to me in return for me visiting your office. But let’s get something straight—the people I represent do not have a proper grasp of the complex issues involved in running a city. They’re easily led astray by the media and by whatever overlay is dominating AR this afternoon. They can’t see farther than their block or next week and have no idea

what is or isn't possible. Am I supposed to believe that you have a solution to their ignorance and short-sightedness?"

Now Darman smiled. "Yes sir, you are. Because we can prove that what we do works." He called up some presentations in AR. "If you review these cases, you'll see we can do exactly what we claim to."

That was clearly not the answer Ludhi had been expecting. He leaned back in his chair, looking from the North Africans to Sokolow and Azad. Sokolow knew that the coalition included many non-governmental organizations and that members of Tunisia's busy new democracy were prominent members. They and their neighbours were fabulously wealthy owing to their solar power and carbon-sequestration industries,¹⁷⁵ and though their customers were mostly European, they had gained reputations as going their own way, politically.

"What are you really after?" Ludhi said finally.

Darman and Cain glanced at one another. "We're part of a larger effort to help the city," said Cain. "It starts with having accurate information. Have you ever heard of the Law of Requisite Variety?" Ludhi shook his head.

"It's also called Ashby's Law," Cain continued. "In a complicated place like a city, every disturbance has to be matched by some regulatory reaction. The greater the variety of disturbances, the greater the variety of reactions regulators like yourself have to have available to them. How many legislative tools do you have to deal with a simultaneous drought, famine, and disease outbreak, for instance?"

"I'm not sure," said Ludhi.

"Another way you could phrase it," said Darman, "is that the variety of options open to Urlia's government must be equal to or greater than the variety of possible disturbances in the city's day-to-day workings. Otherwise you lose control."

"But what do you mean by 'variety of options?'"

"All it means for us today," said Cain, "is that we want to learn who really lives in your ward. What the real variety of people is in your neighbourhood."

Ludhi barked a laugh. "I can tell you what the real variety of people is in my neighbourhood—it is almost entirely Baloch. It really is very simple; in Urlia, the Balochs hate the Brahui who hate the Kashmiri who hate the Pashtun. We all shun each other. All of which is not to even include the Hindus and the Jews, or the Chinese."

"Why do you say they hate each other?" asked Cain.

"Urlia is a city of ethnic enclaves," said Ludhi. "No one mixes."

"Interesting," said Darman. "May I show you something?"

Looking half-entertained and half sceptical, Ludhi said, "By all means."

Darman called up a grid in a common augmented reality overlay.¹⁷⁶ The grid was filled with red and green squares in a seemingly random pattern. "Let's say these squares are people of different tribes," said Darman. "There's a green tribe and a red tribe. Now, every one of these people is happy to have a majority of their neighbours be *of the other*

175. In this future, the Desertec Project (<http://www.desertec.org/>) has gone ahead. Desertec reflects Europe's commitment to green energy, and its customers are European; most African states maintain older, cheaper fossil fuel energy systems, creating a cultural and economic divide between North Africa and the rest of the continent.

176. Darman is running a simple Urban Segregation Simulator. An interactive version of such a simulator may be found at <http://www.dartmouth.edu/~segregation/simulator-help.html>.

tribe. Greens are happy to be surrounded by reds, reds by greens—as long as they each have at least one neighbour of their own colour.”

“Okay...” said Ludhi doubtfully.

“So, let’s let them move, one space at a time, to fulfil that rule: a majority of your neighbours can be of the other colour as long as at least one is your own colour.” On the grid, the squares began to change places. Flick, flick, flick, flick... a pattern quickly emerged.

Ludhi stared at it. “But that’s...”

“Not what you would expect, is it?” All five gazed for a moment at the grid, which was now divided into several big blobs of colour, each one either all red or all green. “Even extreme tolerance leads to segregation if there’s even the tiniest amount of preference there.” Darman dismissed the simulation. “Do you still believe that Urlia is divided into ghettos because the different tribes actually hate each other?”

Ludhi thought about it. They all worked shoulder to shoulder; the marketplaces were a maze of different ethnic types, and people loved the marketplaces.

“We want to give you the ability to include *everyone* in your ward in your deliberations,” said Cain. “The greater the variety of opinions and the greater you understand the variety of motives out there, the better you can act. We have tools—some of them little simulations like the one I just showed you, others much more sophisticated—that can help you become more effective.”

“What do you wish me to do?”

“Give us your official support while we conduct a full survey of the ward,” said Darman. “And not just of the men. We need to include the women,¹⁷⁷ old people, transitories, beggars, and even the children.”

“Requisite variety,” Ludhi mused. “And what will all this knowledge lead to?”

“For you it will lead, Councillor Ludhi, to a greater ability to act.”

Ludhi sat, doubtful, until Azad stood up and said, “I was about to show Brian Sokolow what a local peace council looks like to get a feel for how we develop inter-communal trust. Why don’t you join us and see if it might be useful to you?”

The city councillor thought for a moment then shrugged. “All right,” he said. “Show me this magic process of yours.”



Namvar pulled his truck into a small parking lot surrounded by high walls. The cinderblock building on the opposite side of the rectangle sprouted a number of bright metal pipes that rose up to rooftop vents. Nothing grew here, so Namvar was always struck by the irony that someone had painted an extravagantly green tree on the building’s wall.

He shut off the truck and got out. Two of his cousins sidled past him, making for the back. They began unloading the big CO₂ canisters he’d brought from the carbon outlet¹⁷⁸ across town. Namvar watched them haul the canisters inside and stack them next to the door.

177. Equality between men and women: see <http://www.acdi-cida.gc.ca/equality>.

178. Carbon Credit Corp.: see <http://carboncreditcorp.ca/>.

The machinery in the little plastics factory was idle; its six workers were gathered around a portable stove that had been set up in one shadowed corner. Namvar's spider-thin uncle Cyrus was unreeling a rubber hose from the stove to the pipes that the CO₂ canisters were usually hooked to.

Namvar greeted his uncle formally and cautiously, then said, "You're not using those?" He gestured to the canisters.

Imran Cyrus grunted. "You didn't look at the requisition, did you? Those are empty. Cost me next to nothing. They're for show. As long as the inspectors are too spooked by the plague to come around here, I'm getting my gas the cheap way—by burning gasoline."

"Very clever, Uncle."

"Yes, and then at the end of the month we'll still apply for our carbon credit, and get paid twice!" Cyrus flashed a grin at his nephew, then looked past him at the courtyard and the truck. "Did you take your *countryman* where he wanted to go?"

Namvar nodded. Cyrus hated Aephoria and had nothing but contempt for the online world. He took every opportunity to let Namvar know this, despite the fact that it was he who had insisted Namvar become an Aephorian citizen. "I have the street address, but not the floor. The elevator was crowded, but the building is not tall—"

Cyrus waved away the problem. "The building is good enough. The Oceanside Lions will pay us well for knowing where Aephoria's bunkers are. And the Canadian?"

"A Christian minister of some kind. I don't know what he was there for."

"But he's part of the Canadian mission." Cyrus thought about it. "He might be useful to us. I want you to go back. Make sure he's safe, and become his friend. He could be useful to us."

Namvar hesitated. "But is he Aephorian or Canadian?"

Cyrus snorted at the question. "Both, I'm sure. But the Aephorians will no longer be a problem, by..." he glanced at his watch, "oh, about supertime. The Canadians may last a little longer, but by tomorrow morning they'll be needing every friend they can get. And we'll put ourselves in their way."

Namvar nodded and turned to go. "And if they turn out to be enemies?" he asked over his shoulder.

Cyrus shrugged. "Then they'll go the way of the Aephorians."

DISCUSSION

In this chapter, Padre Sokolow roams the operating environment without a human force protection element of any kind. This represents the Army of Tomorrow's Adaptive Dispersed Operations concept taken to the limit. Here, Sokolow's force protection is instead generated through his ability to interact with the local population coupled with visual surveillance by UAVs and electronic surveillance by local sensor networks. Do the risks outweigh the benefits? What capabilities would the CF require in order to allow soldiers to conduct operations alone? When might it be reasonable to do so?

The role of the chaplain on operations is currently evolving with the development of a new initiative known generally as religious leader engagement (RLE). In this and subsequent chapters, the chaplain is portrayed working within the military unit and also among the local population. What advantages, disadvantages and risks does this type of operation pose to the unit and for the mission? What might the implications be for the chaplains' non-combatant status? How might chaplains interact with DFAIT personnel? Should RLE factor into the "diplomatic" role? How could Sokolow be linked to his ecclesial chain of command in such an environment?

It is expected that future military operations will take place in dense urban areas and congested or contested electronic environments. As such, operations might be routinely conducted in GPS-denied areas. Is it reasonable for the CF to rely solely on GPS for navigation, targeting and blue force tracking? Should priority be given to capability development of alternative geo-positioning solutions such as those that rely upon cameras and other sensor systems? Similarly, in a future of ubiquitous sensors, should the CF deploy with its own sensor networks or should it simply possess sufficient cyber capability to tap into local networks? What are the risks and opportunities of each approach?

The augmented reality (AR) systems depicted in the scenario offer real-world overlays, eliminating the need for paper maps or even digital maps on computer screens. Such technology, however, will be an information management (IM) challenge, particularly given the expected rate with which information will change. Could the benefits of real-time AR outweigh the risks associated with IM complexity and the burden of securing such systems against deception? Why or why not? Might there be better ways to represent information visually in the future?

“There are so many cross-cutting loyalties here,” Brian Sokolow was saying. “We need to get a sense of them. That’s primarily where Aephoria can help. It could be a good-faith move to help with the medical emergency, quite apart from the fact,” he added, “that withholding aid at a time like this would just be flat-out wrong.”

Azad shook his head. “Aephoria may be an online humanitarian charity, but we’re real and sovereign. We have a certain duty to our own citizens.” He and Sokolow had just watched a group of ethnically diverse and mutually suspicious people come to grudging agreement about the meanings of seemingly trivial words. The whole process seemed to take hours—but the city councillor who’d accompanied them had obviously seen the subtle shifts of attitude and engagement that it had taken Sokolow himself years to recognize. He’d left happy. Now Sokolow and Azad were back in the outer office where they were discussing the complexities of the Urlan situation.

Sokolow decided not to respond to that argument. It was a line he’d heard many times from people who wanted the principle of distributed, multiple citizenship to win out over the old loyalties to nation-states.¹⁷⁹ As far as Brian was concerned, this attitude was more about the online countries trying to puff themselves up to look like traditional states than it was about their contributing something new to the world.

“In any case,” he said, “it’s a mess out there. We’re walking on eggshells; try to fix one problem and we might spawn seven more. The colonel knows this so she’s enabled an augmented-cognition¹⁸⁰ mode for us that does the heavy lifting on systems analysis of the situation. It’s managed by one of our AIs.¹⁸¹ I’ll send you a liaison for it.”

“Thanks.” Azad was obviously curious. In the old days, Brian might have talked in terms of “giving him access” or “creating an account” for him in the system; liaisons made those metaphors from early computer science obsolete. “But meanwhile people are dying,” Azad pointed out. “It really is chaos out there, like you said, Brian. How are the councils going to achieve anything if people can’t even cross the street safely?”

Sokolow shrugged. “We don’t have the mandate to replace your own security forces; things simply aren’t that bad here right now. But don’t worry—the Canadian Forces and our coalition partners are quite willing to supply the glue to hold the process together. If it gets bad...” he shrugged. “Armies are all about dealing with chaos. It’s what they do. They’re the perfect partners in a reconstruction exercise—provided they’re given the right role.”

179. Citizenship in a Globalized World: see <http://www.migrationinformation.org/Feature/display.cfm?ID=369>.

180. Augmented Cognition International Society: see <http://www.psychologytoday.com/blog/the-techno-human-condition/201106/augmented-cognition-beyond-zebra-sure>.

181. Apache™ Hadoop® open-source software for reliable, scalable, distributed computing: see <http://hadoop.apache.org/>.

He stood up and walked to the window. “We need a method that will work even when nobody knows what’s really going on. Dialogic Design workshops can help with that, and the military can supply the discipline to use it and implement the results. At least,” he said as he turned back to Azad, “that’s the hope.”

The words INITIATING LOCKDOWN suddenly flashed across his visual field. The room darkened as shutters on the window snapped shut, and Azad and the other office workers all stood in unison.

“What the—” Sokolow realized that the “doors” to the other, virtual parts of the office had disappeared leaving black rectangles in their place. And his data feeds... he issued some commands through the virtual menus in his glasses and realized what had happened.

“We’re in data quarantine. Is somebody trying to hack into Aephoria?”

“Trying to cut us off, more like. Look.” Azad pointed at the floor. Looking through it with the benefit of AR, Sokolow saw a mob of at least 30 men pouring into the entrance of the building. “How’d they get there?” As with the attack on the colonel the other day, the building’s and streets’ camera systems should have seen the crowd coming.

“They must have been given random paths that would all intersect at our building at the same time or maybe they used a cyberattack,” said Azad. “They know how to fool the loitering detection system.”¹⁸²

Somewhere outside in the city there was a quick bark of sound like a miniature crack of thunder. Sokolow might not have even noticed it if he hadn’t heard something like it before, and if his AR hadn’t suddenly been flooded with warning icons.

Azad had heard it too. “Brian, is there something you’re not telling me?”

He hesitated, but either everyone would know soon enough or—if that explosion had been the sort of weapon it had sounded like—the wrong people already did know. “The disease,” he said. “NSS. It’s not natural. It’s an attack. We’re not just dealing with systemic governance problems. There’s an enemy.”

“Your enemy, maybe; why come after us?” They could clearly see, through the walls, virtual red flags popping up all over the city, and the meeting rooms around him were suddenly emptying of shouting, alarmed people. Most of Aephoria’s Urlian operations were under simultaneous attack, and someone was uploading pictures of smoke and debris from a grenade or rocket attack somewhere to the south. He accessed the security cameras in the building’s lobby and saw a swarm of men carrying machetes and guns pouring into the stairwell. Whoever this was, they were investing a lot of resources in one attack. Brian shook his head; it didn’t make sense.

Azad shouted, “Is the ladder secure?” and when one of the office workers nodded, he started organizing the panicky civilians into small groups. “Is there a safe way out of here?” Sokolow asked one of the other Aephorians.

She pointed at the floor. “See that broom closet there, one floor down, just to the left of the elevator stack?”

“Yes.”

182. Smart Surveillance Systems: see <http://www.research.ibm.com/peoplevision/>.

“It doesn’t exist. It’s a trap room—part of the official plan of the building, *but not the real plan*. Everybody trusts augmented reality a bit too much these days—they’ll follow what their glasses tell them and we’ve made sure the official plan is easily available.” Hoisting an expensive fab unit over her shoulder, she ran from the room.

“What’s on the real plan?” Azad was herding the meeting participants into a small closet off the back of the main lounge. When Brian got to it he saw that a low door in its corner opened into darkness. The rungs of a ladder were visible down there. He helped the other Aephorians shepherd people into the hole, then stood back as the Aephorian office workers followed them. Finally, only he and Azad were left.

Bam! The whole building shook as the armed mob knocked the front office doors down.

Azad sat down on the closet floor and stuck his legs into the ladder hole. “If we’re lucky, they won’t see *us*,” he said. “Be a good chap and shut the closet door, will you?”



“What’s a prion?” asked Sergeant Lynn Harman. Cathy Arkin had placed a pico projector¹⁸³ on the table in the mess tent and, wirelessly streaming from her wearable networked computing, spawned two CBC composite personalities¹⁸⁴ projected against the white wall talking about the Urlia plague.

Arkin grimaced. “Ever heard of mad cow disease?¹⁸⁵ Same thing.”

“It’s a virus?”

“No, a prion is an abnormal protein that induces abnormal folding of specific normal cellular proteins called prion proteins. They damage the central nervous system. Prion diseases are usually rapidly progressive and 30 years ago were always fatal.”

“...The Iranian scientific team says that the pathogenic prion is generated by an interaction between natural products in the local food chain and Canada’s GM food. They claim that the odds of such an interaction happening naturally are one in a trillion and that, therefore, NSS is a bio-weapon.”

“Is that true?” asked Harman.

“What part?” Arkin dismissed her CBC video feed. “Yeah, it appears to be prion related, but we haven’t characterized the source yet. How did the Iranians do it so fast? That’s what I wonder.”

Harman activated her own news feed, but Arkin had had enough. She went to the door of the shipping container and looked out over the temporary camp they’d erected for families of people from the countryside who’d taken ill. There was a lot of fear in Urlia these days, and although the building printers were working day and night, it was still very hard to find places to put people. This temporary city—its towers built of shipping containers, its avenues dockland concrete—was taking some of the pressure off.

Harman cursed at something one of the talking heads had just said. “Damned opposition wants us to pull out!”

183. Top 10 Pico Projectors: see <http://www.projectorcentral.com/popular-pico-projectors.htm>.

184. Instead of human announcers, it is envisioned that AIs will track trending topics and aggregate journalistic efforts, and hold publicly accessible conversations about them. These composites capture the essence of both journalism and social networking in a friendly, accessible medium. See <http://infolab.northwestern.edu/projects/news-at-seven/>.

185. <http://www.cdc.gov/ncidod/dvrd/bse/index.htm>.

Arkin shrugged. “They’re just reporting what they see in SimCanada.¹⁸⁶ It’s their job.”

“Yeah, well it sucks.” SimCanada, an open crowdsourced initiative, was a vast real-time simulation of the country that encompassed political, economic and social trends in a continually updated forecast. You could slide forward and back in time in the sim, and this morning Arkin had been exploring a month ahead. She didn’t like what she’d seen, but of course the government-run, open-sourced national simulator, SimCanada, was rarely wrong where standard trends were concerned. In SimCanada, support of the Urlia mission was plummeting.

Harman left the mess tent and a moment later Arkin followed. Outside, a member of some North African NGO was interviewing one of the refugee tribesmen. AR provided a running translation:

“So, why don’t you and your clan try to work with the plurinational government?”

“They never tell us what’s really going on. They just ignore us. Whatever we might say, they’ve already made up their minds about what they’re going to do, so why bother trying? And they’re corrupt.”

That’s about right, Arkin thought to herself—and it was a depressing thought. To cheer herself up, she walked past the UAV flight-control tent, which was a splash of cool white among the towers of blue, brown and green containers. The sound of children laughing and shouting made her smile, and she poked her head inside.

It was pandemonium; kids of all ages were posing like storks or raptors, arms outstretched, making swooping motions and spinning around. They wore AR glasses, but these weren’t entirely immersive. They could see each other, and what they saw both in reality and in AR was apparently hilarious.

The flight-control tent was one of those ideas that had emerged from the collective intelligence processes of the coalition. Nobody knew quite where it had originated, but the colonel had been happy to implement it. “It’s their country,” she’d said. “They should be the ones to take care of it.” And here they were, refugee kids and the children of dirt-poor farmers, remotely piloting dozens of hummingbird-sized robot aircraft¹⁸⁷ along the Urlia estuary. This wasn’t just for fun. Arkin was paying them to collect environmental samples using the UAVs’ little syringe legs. The kids were trying to outdo one another in acrobatics, but they took their job very seriously and they all had a mortal terror of damaging their little flyers.

While the tent might appear to be in a state of chaos, AI liaisons¹⁸⁸ were watching—through the eyes of the UAVs, through the adults supervising the kids’ play, and even through Arkin’s own AR glasses. Liaisons were gathering ethnographic data, basically sopping up the kids’ own understanding of Urlia and its people. This was a very public activity, one Desai had announced that the Canadian Forces were doing as a way of better understanding the stakeholders in the city. Public or not, the effort was massive, but almost entirely invisible.

Some activities were more secretive. Arkin knew that not all the hummingbirds were samplers. A substantial number were surveillance drones coordinated by professionals

186. NationStates is a nation simulation game: see <http://www.nationstates.net/>.

187. AeroVironment’s Nano Hummingbird: see <http://www.avinc.com/nano>.

188. Virtual helpers: see <http://www.technologyreview.com/computing/39560/?nlid=nldly&nld=2012-01-30>.

sitting in the fusion centre in Winnipeg. In terms of public relations, though, the colonel had made sure that when the Urlian man in the street saw one of the little things zizz by overhead, he thought of the kids. It mostly worked—people largely just waved at the UAVs. Every now and then, though, a shot gun would appear at a window somewhere and the bird would be shot down.

“Stop, Lateef, you just ran into a *wall*!”

“Did not!” The boy, Lateef Nasiri, continued making soaring motions with his arms. Two of his friends had stopped and were standing, hands on hips, glaring at him.

“You’re a wreck, Lateef, you’re not even moving. What are you doing?”

“Sure I’m moving. Look, I’m diving over the estuary.” Lateef made a swooping motion. His friends glanced at one another in confusion.

Arkin began to turn away, then noticed that a bunch of the other kids had stopped and were whispering together. Suddenly the organized pandemonium in the tent no longer looked innocent. Some of the children were staring at others—a number of the boys and girls were like Lateef, blithely continuing with their flying motions while the rest obviously saw something out of place.

It was creepy. Feeling a sudden, inexplicable anxiety, Arkin ran to the crowd of milling children. “What do you see?” she demanded. “Quickly!”

“Big crowd,” one said. The others nodded gravely. “Big crowd coming here.”

The two young women who were supervising the kids had come over. They looked worried. “Can you patch me through to Winnipeg?” Arkin asked one.

Subvocalizing,¹⁸⁹ eyes slightly glazed, she saw something or someone invisible to Arkin. “I’m patching you into Sergeant Moffat,” she said.

“Moffat here. Arkin, is it?”

“I need an operator to put a UAV over the docks,” Arkin commanded.

“I’ve got a feed from the docks on my screens now.”

“Can you patch me in?”

“Road’s clear, ma’am.”

Arkin went down on her haunches and frowned at the girl who’d spoken to her. “This crowd,” she said. “Is it on the road by the docks?” The girl nodded, reaching out to hold the hand of her brother who’d come up beside her.

Arkin looked around. Half of the kids in the tent were still obliviously flying. Lateef was trading his glasses with his friend who insisted he was a wreck. Having swapped glasses, both boys looked shocked and immediately pulled them off again. “See!” shouted Lateef’s friend. “I told you!”

Arkin hit the virtual panic button. Establishing a subvocal communication link with the duty office, Arkin reported, “Our data feeds are corrupted, sir. UAVs are down. I repeat—the UAVs are down. There may be a large force approaching along the road. We need to get real eyeballs on scene to verify it. The cameras are lying.”

“Roger that Cathy. Thanks.”

Arkin felt relieved at having passed the information on and began to look for Harman in the crowds outside the tent. Then she had that stomach-dropping feeling again—something was terribly wrong.

189. Brain Computer Interfaces for Communication and Control: see <http://cacm.acm.org/magazines/2011/5/107704-brain-computer-interfaces-for-communication-and-control/fulltext>.

Cathy? Thanks? The duty officer was Duchamp who was very precise in his language. He would never say that.

She ran for the mess tent. “Harman! We’re in trouble!”

Along with Harman, there were a few other soldiers in the tent; everybody looked up as Arkin ran in. “There’s some sort of force approaching the camp,” Arkin went on.

Harman looked puzzled. “I haven’t heard any—”

“Communication’s been compromised.” She quickly explained what she’d seen in the UAV tent. “You’re sure?”

Arkin nodded at a private who was sitting at another table. “Call *him* and tell him there’s a problem at the gate.”

Harman and the private exchanged a look that said, “This one’s crazy.” Harman tapped her earpiece and said, “Private Lem, there’s some sort of force approaching the camp.”

Lem had put his hand to his own earpiece and was listening as he watched Harman speak. He swore. “Sergeant, you just said ‘report to the work detail at the north barricade!’”¹⁹⁰

Arkin watched an almost superstitious look of shock ripple through the soldiers in the tent as they realized that their communications were being spoofed in real time.¹⁹¹

“Listen up!” shouted Harman. “Network communications are compromised—face-to-face communications only! We’re old-fashioned, sneaker-net, self-synchronizing as of this moment.” She tasked three soldiers with spreading the word about the communications and said, “Everybody else, you’re with me.”

As she headed for the exit Arkin said, “Is there anything I can do?”

“Make sure the civilians are aware of the situation.”

During one of their lunch conversations Harman had explained self-synchronization to Arkin. It was part of networking doctrine that NATO had developed. This doctrine had been developed to deal with situations where the hierarchical command and control methods of the past failed or were outpaced by the sort of self-organizing “flash mobs”¹⁹² an adversary could bring to bear. Much of the capability focused on training officers when to exercise autonomy. Self-synchronization came from the science of emergence,¹⁹³ where large numbers of autonomous units following simple rule sets could appear to miraculously coordinate their behaviour in the absence of central commands. Bee hives, ant colonies and flocking birds showed this kind of behaviour. Harman had said that the Mission Command Package for Uralia included similar personal automated rule sets for everybody from the Commanding Officer down, which theoretically, would let the military units continue to operate together in the absence of command as if command still existed.

“Yer in the flockin’ army now,” was the way Harman had put it. Theoretically,¹⁹⁴ self-synchronization could generate extremely complex coordinated behaviours within large groups of soldiers—but Arkin wasn’t aware that it had ever been tested in battle.

They were about to put the theory to the test.

190. Real-time audio manipulation tool: see <http://synth.me/node/4473>.

191. Diminished Reality – video spoofing: see <http://techcrunch.com/2010/10/21/diminished-reality-impressive-video-manipulation-in-real-time-video/>.

192. What a flash mob is and how you can participate: see <http://www.makeuseof.com/tag/flash-mob-participate-examples/>.

193. Flocks, herds and schools – a distributed behaviour model: see <http://www.cs.toronto.edu/~dt/siggraph97-course/cwr87/>.

194. Quantifying Complexity Theory: see <http://www.calresco.org/lucas/quantify.htm>.

Citizenship had its privileges; if the Canadian, Sokolow, and his Aephorian allies knew the location of the nearest Aephorian safe house, then so could Namvar. He was a citizen of Aephoria too.

He barrelled his truck recklessly down the street until he reached the intersection. A gang of youths was hanging out there. They had an alert look about them, all watching the overlays of the city shift and flicker as if the information attack wove through them.

Namvar braked hard next to the kids. Being careful to shield his face from the many security cameras, he yelled out the window. “A thousand Yuan if you set a car on fire in the middle of this intersection.”

They stared at him. Namvar held up a baggy full of paper cash—even an anonymous over-the-air financial transaction would have failed right now. He gunned the engine to point out that he could leave at any moment.

“Come on!” shouted the oldest of the kids, and they headed for the nearest parked vehicle.

Namvar stopped half a block down and ran back. He knew the Canadian was headed this way on foot, but it was hard to spot him among all the darting people. Most of the crowds were heading home, day workers spooked by the collapse of the overlays and the sudden presence of circling helicopters. They sensed the city tipping over the edge into some new chaos. Meanwhile, Namvar knew the gangs would be coming out of their holes looking for opportunities.

It was strange though; the overlays seemed to be resisting the attack Cyrus had said would be irresistible. Red crescent symbols were popping up over the buildings, and green tags he’d never seen before labelled *safe zone*. Who was behind those? He’d never seen anything like it.

Here came the Canadian and his friends, just as the kids torched the car they’d rolled into the intersection. Namvar made sure his Aephorian tag was visible and ran out holding up his phone and shouting, “Mister Sokolow! This way!”

Black smoke roiled up, starkly framing the Aephorian safe house tag hovering several blocks beyond it. As the Aephorians hesitated, Namvar grabbed Sokolow’s arm and said, “My truck is this way!”

“Oh, yes—” Namvar dragged him away, trusting the jumble of running figures to separate them from the other Aephorians.

Sokolow pulled away. “But we have to wait for—”

“No time! I can get us there!” Namvar pretended to be on the edge of panic, which wasn’t hard to do amid all the shouting and pointing. Just up the street, camouflage-clad figures carrying old AK-47s were pouring out of a men’s club. The militia were mobilizing.

In seconds he and Sokolow were at the truck. “Get in!” Namvar leaped in as somebody took a shot at the kids who’d torched the car. That was all it took for Sokolow to jump in the cab, despite the shouts of alarm coming from his rapidly approaching Aephorian friends.

Namvar started the engine and banged the truck into gear. The tires chirped as he pulled them out into a rapidly emptying street and floored the gas pedal.

“And this is when it all went wrong,” said Foster.

Alberto Torretti watched as his boss worked the black-tie dinner crowd up to the level of intensity needed to get them to open their wallets. Torretti stood in the right front corner of the hall while the candidate for Patriot Party leadership paced up and down on the low stage. His view of the wealthy crowd was overlaid with AR tags that showed the level of interest and agreement in the room. Real-time analyses of the crowd’s reactions were being fed back to Sean Foster, the candidate. He was adjusting his performance accordingly, and so far it was perfect.

“The data corruption attack on our troops knocked out their communications,” Foster was saying. Behind him a huge wall screen showed jumbled phone-cam images of men with clubs, axes, and guns overrunning the outskirts of the Urlia refugee camp. “We just barely managed to keep it together to stop the attack, but look at what happened in the meantime. I warn you, these won’t be easy pictures to see.”

Torretti ignored the images flashing beside him. Everybody knew by now that the mob had killed over a dozen farmers and injured two Canadian soldiers. A rumour had spread like wildfire through the city that NSS was spreading from the camp and from the homes where many people from the countryside were billeted. There had been many more casualties in the city itself and only a few hours ago a state of martial law had been declared by the region’s badly coordinated Plurinational Governing Council.

Torretti knew that Foster wasn’t being entirely fair to the Canadian Forces personnel who’d responded to the attack. Apparently they’d been able to repel the attackers despite having no warning and losing all their communications. That didn’t matter though; what interested Torretti was how the endless repetition of the riot coverage could be used strategically to pluck at the heartstrings—and purse strings—of the rich and powerful men and women in tonight’s audience. The Patriot Party was still a minority in Parliament, but they were trending upward and Foster’s charisma was widely being credited with fuelling the upturn. That was part of it, Torretti had to admit, but more, he knew, had to do with Foster’s ability to follow the instructions of his handlers.

Sure, the software they were using to do real-time cognitive analysis on the crowd wasn’t strictly legal—but given the high stakes, Torretti hadn’t had any difficulty in convincing Foster that they were justified. People often didn’t know what they wanted, after all. They were easily confused. Ad agencies used this same kind of manipulation all the time; the grey-market software Torretti was running had been developed in Latvia for mass marketing applications. Right now it was popping new tags up over the heads of key figures in the crowd; they weren’t buying the argument that Canada had no legitimate military interest in the South Asian Plurinational Region. Torretti sent a sharp glance at the candidate. Foster reached for his water glass, the prearranged signal that he understood the dynamics of the argument had to change.

You couldn’t quite get away with saying what everybody was thinking, after all, namely: *Who cares what happens down there? We in the North cleaned up our act, we’ve paid through the nose to mitigate climate change, and meanwhile the South keeps*

*building coal plants and pumping gigatonnes of CO₂ into the air. It's time for us to reap the Climate Dividend; time for them to pay for a change.*¹⁹⁵

The Dividend movement was huge across America and Europe, but lately it was running afoul of a vocal group of economists and political liberals who pointed out the North was reaping a huge benefit from climate change anyway. This message was particularly potent here in Winnipeg, which was Canada's fastest growing city.¹⁹⁶ The multiple rail lines that now ran to Churchill, now the country's biggest port,¹⁹⁷ fed an enormous amount of wealth into the heart of the continent. Foster's challenge was to convince the voters here that it didn't matter; the southern nations were still climate freeloaders and didn't deserve an investment of Canadian resources and lives.

"We're getting new reports about how the riots started," said Foster. He'd stopped at the front of the stage and was rocking back and forth on his heels. Square-jawed and silver-haired, he had great presence and a deep commanding voice. "Hours before they started, the augmented reality overlays in Urlia changed." He paused, letting his words sink in. "It wasn't just our communications at the camp that were hacked. The entire city experienced an unprecedented cognitive adjustment."

Cognitive adjustment. Torretti had to hide a smile. Foster was using all the latest buzzwords, this one being the newest euphemism for mass propaganda. "All kinds of data feeds were simultaneously hacked," Foster continued, "inserting reports of new NSS outbreaks, distorting other legitimate news items to make it look like the poor farmers flooding into the city were spreading the disease, and suppressing the news that NSS is not being spread by touch, through air or through water."

He took a deep breath. "Nobody in Urlia has the kind of resources needed to mount an attack like that. None of Urlia's neighbours has any kind of motive for doing it either. What we're left with, ladies and gentlemen, is one culprit, and by now it should be one that's very familiar to all of you. I'm talking, of course, about international organized crime."¹⁹⁸

Now *this* had traction. The Canadian public had become distressingly familiar with the term *kleptocracy*: government by theft. In many places around the world traditional law and order had collapsed, replaced by extra-legal arrangements coordinated by mind-bogglingly wealthy international crime syndicates.¹⁹⁹ The budgets of the hyper-mafia,²⁰⁰ those global crime syndicates, had begun to exceed those of many nations and corporations. Ironically, in regions they fully controlled, the gangs imposed sophisticated legal systems of their own design; in these places they had become a kind of feudal oligarchy, efficient, but brutal. People in America and Europe were terrified that this kind of thing could spread. Kleptocracy was a burgeoning global security threat.

"Who are we helping in Urlia?" asked Foster, scowling at the crowd. "Where is our money going? We should have learned our lesson from previous stabilization projects. The money gets intercepted before it gets to the people who need it—we know that.

195. CIDA – Climate Change: see <http://www.acdi-cida.gc.ca/acdi-cida/acdi-cida.nsf/eng/JUD-1118152429-RXG>.

196. Winnipeg population growth trends: see <http://winnipeg.ca/cao/pdfs/AdjustedPopulationForecast2009To2031.pdf>.

197. Polar ice melting opening shorter northwest passage: see <http://www.nytimes.com/2005/10/10/science/10arctic.html?pagewanted=all>.

198. Transnational organized crime: see <http://www.un.org/events/10thcongress/2088f.htm>.

199. The world's most powerful crime syndicates: see http://www.foreignpolicy.com/articles/2007/05/20/the_list_the_worlds_most_powerful_crime_syndicates.

200. Future mafia: see <http://www.iwatchnews.org/2008/11/25/3003/europes-future-mafia-states>.

Well, I'm here to tell you it's happening right now. The hyper-mafia have taken an interest in Urlia, and they're taking advantage of our natural sympathies to make the city into a pump to suck money and material out of Canada. Well, Patriots²⁰¹ won't stand for that."

Foster's message was staying within the party's policy spectrum, and he was about to deliver the main appeal for money.²⁰² He was on a roll and didn't need his campaign manager's oversight for the moment. Torretti was tired so he stepped out of the hotel ballroom for a breather before the complexities of dessert conversations called him back.

Floor-to-ceiling windows gave him a view across the Assiniboine River to Wellington Crescent where the lights of some of the biggest mansions in Western Canada peeked out from thick trees. On this side of the river the construction boom was continuing with no signs of a slowdown—with vast condominium towers and the original experimental vertical farms²⁰³ dominating the mix.

This new, half-built Winnipeg was overlaid with others, virtual and aspirational cities that so far existed only in augmented reality. Two blocks east of the Palmerston Hotel was Winnipeg's first spine²⁰⁴ tower, a fairly ordinary-looking office tower whose interior was highly reconfigurable; it had been designed by a company that usually did museum planning. Torretti could see it from here, and in augmented reality the building was peppered with tags and signs ... that is, it usually was.

Torretti blinked and adjusted his glasses. He'd been spending a lot of time over there, moving between four floors that were owned by the one virtual nation where Torretti had felt comfortable getting a citizenship. When he walked into what he liked to call the "holodeck"²⁰⁵ that was the spine tower (the young people just looked at him blankly when he used that term) he could meet directly with like-minded people from all over the planet. While Torretti might not admit it to the more conservative of his supporters, he loved visiting a place where cities and rooms from all over the planet became one space where people anywhere could conduct business and socialize. The spine tower eliminated distance in a way the mobile phone, television, and even traditional internet tools never could.

Yet at this moment, two of the spine tower's floors were dark and missing their usual tag clouds. Torretti reached out²⁰⁶ to sweep the remaining tags into clearer focus and tapped one of them. (He wasn't wearing haptic feedback gloves²⁰⁷ and didn't have the courage to get the fingertip implants²⁰⁸ that would let him feel virtual objects; the tag flashed green when he tapped it, so he hardly saw the need for that level of commitment.) A moment later the tag was replaced by a window showing the face of Lidia Tapscott, one of his new friends in the virtual world.

201. The Canadian federal party system: see <http://www.jonathanmalloy.com/uploads/4/0/3/2/4032854/fjls090408.pdf>.

202. Ending Funding for Parties Will Change How Politics Is Conducted, Experts Say: see http://www.huffingtonpost.ca/2011/10/04/ending-per-vote-party-subsidy-canada_n_995143.html.

203. Rewilding Canada through vertical farming: see <http://www.worldchanging.com/local/canada/archives/008855.html>.

204. Spines are precisely located in space and time. They have histories. They are recorded, tracked, inventoried, and always associated with a story. See <http://mitpress.mit.edu/catalog/item/default.asp?tid=10603&tttype=2>.

205. Towards Cyber-Physical Holodeck Systems Via Physically Rendered Environments (PREs): see http://www.cs.colorado.edu/~rhan/Papers/WCPS08_holodeck_krunic.pdf.

206. Minority Report-style gestural interface: see <http://www.engadget.com/2011/06/27/kinectnui-enables-minority-report-style-interaction-in-windows-s>.

207. Force and tactile feedback: see <http://www.hitl.washington.edu/scivw/EVE/I.C.ForceTactile.html>.

208. A sixth sense for the wired world: see <http://www.wired.com/gadgets/mods/news/2006/06/71087?currentPage=all>.

“Hey Alberto, can I call you back? Got a situation here.”

“What’s happening?”

“We’re under attack. Data corruption and spoofing.²⁰⁹ Nothing we can’t handle, but some of the high-bandwidth services are affected. The marketplace has simplified and the social floors are down.”

Torretti swore. “But who would attack Aephoria?”

She laughed humourlessly. “Haven’t you heard? It’s because of our commitment to Urlia. Look, I gotta go. Talk to you later?”

The window closed, and Torretti was left blinking at the real, darkening sky.

He spawned some search agents as he walked back to the hall, and the answers that immediately came back made him hesitate with his hand on the crash-bars of the door. He could hear Foster winding up his call for an immediate withdrawal from Urlia; the crowd was erupting in applause. A lot of money was going to flow into the campaign tonight and the pullout position was trending to become a core part of the Patriot platform.

And yet the population of Aephoria was larger than the population of Canada²¹⁰ and it wasn’t leaving Urlia.

His digital agents were showing him the outpouring of aid and attention that was flowing through the online nation. Aephoria did not have an army—not yet, or at least not officially—but it had wealth and influence through the collaborative efforts of its members.

Whoever was messing with the Canadian mission to Urlia was also trying to take down Aephoria, a place where Torretti had come to feel safe and welcome. The crisis in that distant city had been an abstraction until now and easily dismissed. But now—now they’d threatened his friends.

He pushed into the ballroom where he would have to spend the next hour shaking hands with people and vocally agreeing with a pullout policy that he suddenly no longer agreed with.



The augmented reality tags were acting funny. As Brian Sokolow watched, the overlaid signs embellishing every shop and building all flickered and disappeared. Namvar braked suddenly and swore. The two men exchanged a shocked look.

“There goes the public system,” said Sokolow. “What about those independents you mentioned before?” He could see a solar-powered router stapled to the side of a nearby building; from what Namvar had said on their first drive together, local clans, gangs and businesses all had their own mesh hardware,²¹¹ meaning they all had semi-hardened networks of their own. They shouldn’t all go down at once.

He craned his neck out of the idling truck. Far overhead, the mauve symbol of Aephoria still turned slowly at the top of the sky. At least nobody had touched their satellites.

“I’m going to call in,” he said to Namvar. The man shook his head and said something in Pashtu, and a second later Brian realized that Namvar’s phone had not translated it. “We’re cut off?” he said, and Namvar made a helpless gesture and then tapped his ear.

209. What is a spoofing attack? See <http://www.computer-network-security-training.com/what-is-a-spoofing-attack/>.

210. Facebook statistics: see <http://www.facebook.com/press/info.php?statistics>.

211. Self-organizing wireless mesh networks: see <http://research.microsoft.com/en-us/projects/mesh/>.

With his communications lifeline to CHERT HQ severed, Sokolow forced himself to take a long breath and say a little prayer. These were fixable problems—as long as the Aephorian satellite routers were untouched. Since Aephoria was part of the coalition, his authorizations there should at least be able to reroute a message stream through the Aephorian network. “How’s this?” he asked after he saw Namvar reach out to tap at invisible buttons in the air.²¹²

“We can talk again.” Namvar grinned, but his expression was uncertain, as if this wasn’t entirely a good thing.

“It looks like somebody’s taken down all the urban networks,” said Sokolow. “But it looks like it’s only affecting local devices. Maybe there’s a nanotech²¹³ component to it...” He glanced behind them. “The safe house is back there.”

“I know somewhere better.” Namvar kicked the truck into motion again. For the first time Sokolow began to wonder if getting into this vehicle had been a good idea. He had no time to think about it as he almost bashed his nose against the dashboard; Namvar had screeched to a halt as they’d rounded a corner to find a military roadblock up ahead.

“Is that the national army?”

Namvar shook his head as he spun the wheel wildly and backed them away. “Yes. No. Urlia is plurinational, yes? A coalition of interest groups. Army’s the same, but in a crisis it could fall apart into separate divisions. Those could be national army, or they could have gone over to one of the clans, or whoever’s paying them. Better to be safe.” He took them down another street.

Sokolow stared at his driver for a moment, wondering just what he’d gotten himself into. He had a terrible feeling that he wasn’t keeping up with vital events. Deliberately, he turned and activated his connection to Aephoria, closed his eyes and summoned up the full Aephorian world in his virtual sensorium.

His satellite connection only let a dribble of information through, but it was enough for him to see the nation arrayed around himself, a vast network of people spread around the Earth with billions of dollars of ready cash, huge databases and fixed assets in every country in the real world. Aephoria was mobilizing against some sort of attack, and it couldn’t be a coincidence that it was happening now.

The usual virtual gardens, boulevards and buildings of Aephoria were missing; instead, Sokolow found himself suspended in a vast tactical display space, a kind of wheel of icons and windows wheeling slowly around him. Before he could consciously get his bearings, his AugCog systems interpreted where his subconscious attention was going.²¹⁴ It immediately connected him to the Global Affairs liaison department. “What’s going on?” he asked the GA’s liaison, who appeared to be a woman floating in a cloud of icons and translucent displays.

“The coalition is experiencing a sophisticated network attack,” said the avatar. Its response time seemed a bit slow; who knew how many other conversations the liaison’s AI was trying to manage right now?²¹⁵

212. Gestural Interfaces: see <http://www.technologyreview.com/computing/37201/>.

213. Nanotechnology: see <http://www.nanotech-now.com/>.

214. Phone that knows your emotional state: see <http://www.technologyreview.com/computing/39434/>.

215. Dell’s Cloud Computing: see <http://content.dell.com/us/en/enterprise/cloud-computing>.

“The CF is purging their data systems,” it continued. “They’ve shunted some non-critical traffic to commercial satellite systems while theirs diagnoses and immunizes²¹⁶ against further attack.”

“Can I talk to the CHERT duty officer?”

“Wait... I’m afraid I’m unable to—” An explosion of images and sound flashed in Sokolow’s sensorium and then there was silence and a startling absence of AR tags around them.

He opened his eyes just as a clap of sound reached his ears. Leaning out the window he saw a puffball of smoke far overhead. “Damn. A pulse grenade.”²¹⁷ The cyberattack had been supplemented by an electronic pulse; all around them, cars and trucks were gliding to a halt as their on-board microchip-based navigation systems died. Namvar kept on driving, oblivious.

It was obvious to Sokolow that Namvar was kidnapping him, but he judged that he was likely not in immediate danger. The truck was moving too fast for him to jump out, and he knew that the neighbourhood they were passing through wasn’t safe. Its liaison could probably have told him why that was the case, but for the moment he didn’t care.

Drawing upon the little Pashtu he made himself remember, he said casually, “So, where are we going?”

“There,” said Namvar tersely, pointing to a half dozen gigantic glass beehives that rose above the white sails of the city.

They were approaching some of Urlia’s vertical farms. If any part of the city could be called a fortress, it was these towers. They were surrounded by multiple concrete walls to foil truck bombs or mob attacks, and nowhere in the city was ubiquitous surveillance more complete. There could be no more perfect place from which to reach out and manipulate the rest of the city.

“Oh,” said Sokolow. “I guess that makes sense.”

DISCUSSION

Aephoria is described as a humanitarian NGO with non-denominational ties to major world religions. Although it has sovereignty it is primarily a virtual nation. Like the mud flats outside Urlia which have been declared an autonomous legal entity, a sovereign (mostly virtual) NGO could have major impacts on a number of local, regional and global security issues. What might the implications be of large sovereign NGOs and inanimate but autonomous legal entities on future operations of the Canadian Army and the CF? To what extent could virtual organizations be effective and reliable partners when practising

216. Computer Virus Could Disable Cyberattack Source: see http://www.sci-tech-today.com/story.xhtml?story_id=013001G9F2YX.

217. How non-nuclear pulse weapons might work: see <http://science.howstuffworks.com/e-bomb3.htm>.

the comprehensive approach? Given what is known of Aephoria, what would its general political philosophy be? What role—if any—would its citizens see for the nation-state, international organizations, etc?

Today, information exists in many forms, stored on multiple networks and accessible through a variety of software interfaces. It is anticipated that network convergence in the future will replace the current cumbersome paradigm of individual users with multiple user IDs and passwords accessing a multitude of accounts on different networks. *Crisis in Urlia* introduces the concept of artificial liaisons as one means of sharing and data mining information in such a networked world. What other technologies would be useful in helping soldiers access, find, process, and understand the increasing volume of information that will surround them on the future battlefield?

In this chapter, Arkin tasks a UAV with changing its location in order to collect information in a different part of the operating environment. In a comprehensive approach to operations, might situations arise in which ISR assets could be tasked by non-military personnel? What are the risks, benefits and opportunities of such capability?

In this chapter, Sokolow proves himself to be technologically proficient. How much cyber competence should we expect of our soldiers in the future? Should such knowledge and ability rest only in specialist occupations or across the force?

If networks become pervasive in the future, what can be done to build in redundancy for humans/soldiers on the ground who rely on the network? Might recruiting and training need to change to develop individuals and teams who can adapt to changing levels of network performance? How?

The world of 2040 as depicted, presents a world rife with international criminal organizations, large multinational corporations and widespread kleptocracy in various states and societies. In this context, how might industry adapt its business practices and target markets? How might nation-states influence industry to resist the temptation to sell to these potentially unethical and nefarious organizations? Might nation-states lose their near monopoly on well equipped and organized armies? What does this mean for the future of conflict?

Given the technological advances in weaponry that the world of 2040 portends, what are the prospects for effective arms control and disarmament within such a world? How—if at all—might these goals be effectively pursued?

“Ladies and gentlemen, thank you for joining us.” Alexej Maliar, Chief of Staff to the Minister of National and International Security, nodded at Desai as she looked around the virtual table at the other people—real and virtual—attending²¹⁸ this urgent meeting of the coalition. “I hear you had an adventure. I was glad to hear you were unhurt.”

Desai tried to smile in reply, but it came out as more of a grimace. In fact, her head was still pounding periodically and she hadn’t had any sleep since the attack the day before. The simultaneous network takedown that had isolated her team at Rumay’s factory had briefly fragmented the entire Canadian contingent in Urlia. Luckily, training and mission command had allowed nearly everyone to keep functioning, but Desai had found herself in the humiliating position of having to drive back to the night market cut off from the network. All kinds of mayhem had ensued during the information blackout, and coming out of it everybody in the city was blaming each other. It was like one of those murder-mystery movies where the lights go out for a few seconds, there’s a gunshot and when the lights come back on, somebody’s dead on the floor with a smoking gun next to them. Neighbourly and tribal trust had collapsed in Urlia—and it had happened on her watch.

“Ladies and gentlemen, I’ve invited Lieutenant-Colonel Desai to join us as well as Colonel Campbell from the Rapid Allocation office. Simon Strahan is from one of our fusion centres and Marjorie Weisman is one of our reconstruction experts.” The avatars of these Canadian coalition partners sat with Desai in chairs behind Maliar’s. Maliar himself sat at a virtual table with the other high-level members of the coalition—representatives from the local civic and plurinational governments as well as diplomats and staff from Brazil and other international partners. Each also had their virtual staff of avatars. Some of these were real people linking in, as Desai was doing, from around the world. Some were liaisons. The various NGO partners, major clans, militias, and significant demographics were represented by liaisons. These entities did not all have decision-making powers at this level, but their input and opinions were definitely valued.

The two ambassadors of the Urlian Plurinational District conferred briefly, then one stood, fixing his gaze on Maliar. “Your security forces have been attacked. Are you failing us?”

Maliar kept his expression neutral as he said, “It is intended to look that way.”

One of the ambassadors blinked. “What?”

“I mean, sir, that it *appears* that way. By design. Part of the attack that we’re under

218. Virtual conference room: see <http://www.pcmag.com/article2/0,2817,888151,00.asp>.

right now is an attempt to paint our team as incompetent. Our intelligence tells us that this is all part of an attempt to drive the NGOs out.”

“Riots in the streets, an attack on a refugee camp, and now it looks like civil war—and you still haven’t got a handle on this plague. I’d say that looks a lot like incompetence to me.”

“Yes, sir. It does.”

“The Americans have pulled their CDC people, and half the other NGOs on the ground are leaving too. The coalition’s civilian partners are going to abandon ship unless we can guarantee their safety. I was hoping you could tell me that you have a solution.”

“Under our agreement, Canada can commit our Rapid Expeditionary Force to confront a threat to the refugees or the urban population,” said Maliar. “But for that to work, we’ll require the cooperation and political commitment of everyone at this table. You’re asking us to escalate our involvement, and while we are willing, we need to ensure that what we’re doing is seen in the proper light.”

“Fair enough,” said the ambassador. “What about Brazil?”

The Brazilian²¹⁹ representative nodded. “We are willing to match the Canadian response.”

For the next hour they discussed the political ramifications of the transforming mission while shifting the boundaries of responsibility and action for all of the partners. Maliar called upon Desai and the other Canadian partners at times, but he was the only one to speak at the virtual table.

As things were wrapping up, Campbell suddenly sent Desai a message on a private channel. “Look at this!” Desai reviewed the intelligence analysis that Campbell sent her; by the fixed, immobile expressions on the avatars of the other Canadians behind Maliar, she could tell that they were distracted in the same way.

They set up a back-channel discussion of the findings while Maliar discussed the new coalition strategy with the high-level stakeholders. After the meeting ended, Maliar reconfigured the virtual room into a smaller conference table with just him and the Canadian avatars present. Liaisons for all the other coalition partners were lined up behind them in the shadowy half-space of this online world, but none had real connections to their respective organizations now. This was a secure and isolated conversation.

“Is committing more forces going to work?” Maliar asked bluntly once the visuals had settled in. Campbell’s avatar glanced at Desai, then shook its head.

“Not by itself, sir.”

“What do you mean?”

“We think we know how to get to a solution, but it will require a reassessment of why we’re in Uurlia and what we’re supposed to be doing there. I propose that we bring in SMART.”

Maliar didn’t look happy. “We have our ships offshore and the coalition partners are ready to move if we have to. Why do you think we need the Strategic Multi-departmental Advisory Reconstruction Team?”

Desai answered, “Sir, as you know, our original mission was humanitarian and limited to providing clean water. Then it shifted to investigating a disease outbreak. Now it’s become preventing anarchy in the entire region. Those are not independent issues.

219. The rise of the BRICS: see <http://www.globalization101.org/brics-the-new-world-powers-3/>.

We need a group that can tackle all of them at once, and potentially, that means facing deeper problems that aren't going to be resolved by a security operation."

"What do you mean?"

She took a deep breath. Where to begin? "Climate change has created chronic drought conditions, and those have driven people off their lands. Some of those people have become insurgents or joined militias, and some of the militias pay for themselves by running narcotics. Some work for the government and some do both. The plurinational government is at odds with the tribal governing councils, and both of them are hostile to the city council. The city infrastructure is brand new but has no stable supply lines for things like water, which means the price of cement has skyrocketed, so infrastructure development cannot keep pace with the influx of refugees. Crime was already high and is now through the roof, and local street gangs have stepped in to keep the peace, but they war among themselves. Meanwhile, international organized crime rings appear to have co-opted the information system—" Maliar had held up his hand and was shaking his head.

"It's a mess," he said. "I get that, it's a *wicked problem*—you can't even define exactly what's wrong much less find any single solution."

"Exactly, sir, even systems thinkers despair at diagramming a wicked problem. When you're tasked with solving one, the overwhelming temptation is to just fixate on one aspect of it and try to fix that in the hopes that somehow the rest of the problems will go away. Like, say, we could focus on ensuring that there's enough water for everybody in the city."

"Desai, that's *precisely* why we created the Urlia mission. I hate to put it this way, but the Canadian people know that we went in with one particular goal in mind. If we can solve that we can leave without egg on our faces."

"Understood, sir, but I'm saying that there's no way we can achieve that goal without solving a whole bunch of other problems as well."

"So are you telling me that we are in a no-win situation here?"

Desai smiled. "If this were 25 years ago," she said, "that would be true. In the early part of the century we didn't have systems powerful enough to model or even define a wicked problem like Urlia."

"You're saying we do now?"

"I'd like to turn the floor over to Marjorie—but before we do that, we've just received an intelligence report that I think you need to see, sir." Colonel Campbell interjected.

Maliar sent his patented, room-clearing glower at Campbell. Campbell sat up a little straighter, but otherwise showed no sign of concern. "Sir, I'm sure you've seen the way the Urlia mission is trending in SimCanada."

"You bet I have," said Maliar. "All the futures show us pulling the plug within weeks."

"We have reason to believe that SimCanada has been hacked."

Maliar stared at Campbell for a moment and swore. "Can you prove this?"

Simon Strahan nodded. "Now that we know what to look for, it's clear in the numbers."

"SimCanada's projections are based on a skewed perception of public support for the Patriot Party," Strahan continued. "When you plug in the actual data from the Patriot Party itself—"

"—Wait a minute," said Maliar. "How did you get that data?"

“A top-ranking member of the party brought it to us,” said Strahan. He glanced at Campbell.

Campbell had told Desai the story in strict confidence—how a man he’d known for 20 years, now the campaign manager for Sean Foster the Patriot candidate, had phoned him late last night and told him about his suspicions. Torretti had known for weeks that SimCanada’s projections looked strange compared to what he himself saw in the party’s own numbers. He confessed that he’d been happy not to think too much about why it was happening—that is up until the attack on Aephoria. That incident had made him realize that some sort of cyber-based manipulation was happening and so he’d come to Campbell, who in turn, had put him on to Strahan.

Torretti was taking a big risk here. Anyone along the chain of command could out him to his own party; despite the stated principles of his party, he might yet pay for putting his concerns for Aephoria ahead of the Party.

“When you said that we’re supposed to think that things are falling apart, you were more right than maybe you realized,” said Desai. “Support for the mission is slipping, yes, but not as much as we all thought. As you indicated earlier, sir, the Canadian people *are* committed to helping the people of Urlia; after all, many of them have relatives in the region.”

“Somebody’s tried to directly manipulate the Canadian governing process,” said Maliar. “I can get support for a counterattack on that basis. But who are they?”

Strahan said, “We don’t know, exactly. But we’re feeding every piece of data we’ve got into simulating stakeholders who might want to do that. Right now they’re all represented by this one liaison.” He summoned a liaison avatar, which appeared as a black-robed figure with a shadowed face. “We’re calling him the Phantom for now,” said Strahan, “and we’re doing massive parallel simulations²²⁰ to see what kind of stakeholder he is.”

“The successful sims all share certain features, sir. All our hypothetical Phantom candidates act as if there was at least one large criminal organization feeding the chaos for its own ends. We believe this organization is behind the outbreak, as well as the riots, and it’s definitely behind the cyberattack.”

Maliar sat back heavily. “Really. Hell, why didn’t you tell me that at the start?”

“Because it’s still only part of the picture, and neutralizing that organization won’t necessarily solve all our problems,” said Marjorie. “It’s an outrage that this group has hacked SimCanada, but in a sense they’re just one more factor in the wicked problem of Urlia. In the past 20 years our ability to deal with such problems has improved immensely. It’s not just raw computing power that’s improved exponentially;²²¹ we can use so-called big data analytics²²² to understand and move through complex social systems on the fly. If we know that this criminal organization exists, we can simulate it. In a way, we can consult with this Phantom—add him to the stakeholder pool—without even having to know who, or what it is exactly that he represents. SMART was designed to deal with that kind of complexity—even the extra complexity that the Phantom adds to the situation.”

The DNIS reconstruction technologies specialist continued, “The Situational Complexity Index²²³ of a normal democratic process is about three. Urlia’s is currently 35, and

220. Mining massive data sets: see <http://www.stanford.edu/class/cs246/>.

221. Top 500 supercomputer lists: see <http://www.top500.org/lists/2011/11>.

222. Big Data Analytics: see <http://tdwi.org/portals/big-data-analytics.aspx>.

223. A Structured Dialogic Design measure: see <http://dialogicdesignllc.com/>.

climbing, which is well beyond the limit that unaugmented human decision-making can cope with. SMART's computers are already tasked with doing this, and we're running 50,000 simultaneous simulations of Urlia and its hinterland. Each one of these simulations includes software agents for every person in the city—abstracted, of course, though we took census information collected by our international partners to get as close an approximation to the mix of people that we could. These agents have simulated histories, allegiances, religious beliefs and moral character. We've been running the sims ahead a few hours at a time and then we pick the ones that match what actually happens best and let them breed in a digital natural selection process.”²²⁴

She was encouraged that Maliar was familiar with such analysis techniques. “Yes, it's complex social systems modelling²²⁵ coupled with genetic algorithms,” he said. “We use that in election campaigning too.”

“Yes, sir, and SimCanada works the same way. We're using orders of magnitude more computing power and detail with Urlia. And we've learned some things.” She turned to Strahan, who peered down at some tablet or other data source out of sight in the virtual display.

“There are patterns to the chaos,” he said, “like Mr. Phantom here. The problem is that the more stakeholders you have and the more they need to work together to solve problems, the harder it is to get them to agree on an action plan. Luckily, we have a methodology for dealing with that; Lieutenant-Colonel Desai and some of our coalition partners are already using it.”

“The Urlians have to solve this problem themselves, but SMART can help. Structured Dialogic Design sessions are going on already,” said Desai. “As you know, the chaplain who was kidnapped, Sokolow, was involved in those. So a lot of what SMART would do is already happening. It's a matter of putting a fully dedicated team into the field to coordinate it.”

“How's it going to help us in a mess like this?”

“As I said, we're already halfway there,” Desai pointed out. “We use distributed problem-solving tools all the time.”²²⁶ SMART will just allow us to coordinate these actions more strongly with the other coalition members. In other words, instead of just providing physical safety on the ground, I think we should be guaranteeing safe spaces for dialogue between the gangs, militias, companies, tribes and so on.”²²⁷

“That's incredibly abstract,” said Maliar. “How am I going to get the Minister to sell this to the Canadian public?”

“It gets concrete real fast,” said Campbell. “The SDD teams have been gathering data up until now, but the next step will get everybody's attention.”

Desai nodded. “SMART has the capacity to create a new, secure AR overlay on top of Urlia,” she said. She explained what this overlay would look like, and Maliar looked encouraged.

224. Genetic Algorithms: see http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol1/tcw2/article1.html.

225. Modelling of Complex Social Systems (MoCSSy): see <http://www.irmacs.sfu.ca/research/research-clusters/mocssy-project>.

226. Strategies of cooperation in distributed problem solving: see <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.77.1678&rep=rep1&type=pdf>.

227. What Desai is proposing is an augmented group cognition application; it is intended to increase the efficiency of distributed cognition within groups. For more information about distributed cognition, refer to *Cognition in the Wild* by Edwin Hutchins (MIT Press, 1995): see <http://cscs.umich.edu/~crshalizi/reviews/cognition-in-the-wild/>.

“You’re confident that you can do that?”

She smiled. “The Urlians by themselves couldn’t. The recent cyberattacks show that the city needs an upgraded military-grade information backbone—now that we have successfully characterized and adapted to the initial attack, we can do it. Those cyberattacks, and the physical ones, were designed to fragment our response and drive a wedge between all the different players. Sow discord—divide and conquer essentially. But with our help... absolutely! What SMART can build is potentially as powerful an enabler as Twitter® and Facebook® were in the 2011 Arab revolutions.²²⁸ But... an even more democratic one. With your permission, I’d like to take the idea to the rest of the coalition and give the go-ahead to SMART.”

“Hell, yes. But how is this going to work if the city’s falling apart? The riots, civil war, the gangs—”

“If there’s any role for the Canadian Army in the 21st century, it’s this,” Desai declared. “It goes beyond policing, but it’s not invasion or occupation either. When you’re dealing with a wicked problem, no one group, organization or profession has the jurisdiction or flexibility to deal with every part of it. Some people can handle a drought, others can manage an outbreak or policing or governmental breakdown, but none can do it all. That’s where the military comes in. Our forces can act as the glue that holds all those efforts together. There’s no other group in society that can deal with such radical uncertainty. That’s why we need to be there.”

Maliar sat back, thinking. “You want to build ever-widening circles of consensus,” he said. “I get that. But what about this criminal organization? It sounds like it’s feeding off the chaos. You can make up liaisons for it all you like; but really, they’re just hand puppets. These people aren’t likley to come to the table.”

“It would oversimplify things to say they were the only ones to blame,” Desai countered. “If we went after them directly they’ll just fade into the chaos. From the nature of their attack it’s clear their data-processing systems are nearly as sophisticated as ours.”²²⁹ *Maybe more so*—but she didn’t voice that thought out loud. “It doesn’t matter what they know though. Their goals and purposes constrain how they’re capable of responding. When we build our overlay, we expect them to react quickly and violently. When they do, we need to be ready to neutralize them.”

Maliar nodded. “They’ve hacked our governmental process. As soon as you report that you know who they are, then I will make sure the Rapid Expeditionary Force gets activated as part of the UNRRF.”

Desai smiled grimly. “Then, sir, we have all the pieces we need.”

“And Desai,” said Maliar, “find the padre.”



228. Facebook and Twitter abetted if not enabled the historic region-wide uprisings of early 2011.

See <http://www.thenational.ae/news/uae-news/facebook-and-twitter-key-to-arab-spring-uprisings-report>.

229. Even US Pentagon has been hacked: see <http://www.technewsworld.com/story/Pentagon-Yep-We-Got-Hacked-70699.html?wlc=1282913228>.

As Lieutenant-Colonel Desai flopped onto her cot in the night market and finally slept, CHERT reconfigured itself to make way for SMART. The Reconstruction Team's scope was broader than CHERT's water and medical security mandate, but it included those aspects. The upshot was that Cathy Arkin found herself seated at the same desk, doing the same things, but suddenly working for new masters. That was okay, because Lieutenant-Colonel Desai was still overseeing this part of the mission and the same soldiers were here—people like Sergeant Harman who had safeguarded Arkin and saved the lives of many refugees during the attack on the refugee camp.

Arkin was back in the night market, and she couldn't pretend that she didn't prefer the sense of safety this gave her. Everybody was talking about that Army chaplain, named Sokolow, who had been kidnapped during the confusion. Nobody'd made any ransom demands yet. Arkin found that very ominous.

Much of Arkin's day had been spent in a virtual workspace where she was surrounded by displays created by her augmented reality glasses. A lot of liaisons hung around like ghosts; mostly, they represented CDC and Canadian biohazard AIs, which were all working the NSS problem day and night. Since the attacks, though, new SMART liaisons had appeared, and several from new Canadian Forces all-source intelligence centres were attached to the coalition.

Arkin's efforts were beginning to pay off, starting with something very small: a single molecule, in fact. This was a protein, the prion that caused the New Sweating Sickness. She knew it was engineered,²³⁰ a kind of biological nanotech²³¹ really, but where was it coming from? The best guess so far was that it was in the food the victims had eaten,²³² but her team had failed to find the protein in any of the staples you could buy locally. It wasn't in the flour, vegetables, spices or meats. So where was it coming from?

"Ah, is that it? Thanks." One of her assistants had brought her a new set of samples. These were different from those her team had been examining. She began setting them, one after the next, into a gas chromatograph.²³³

On a hunch she'd taken some samples of local flour and other baking products that had tested clean and had them made into a meal. Nobody was allowed to eat this. All the samples in front of her now came from that dish. Arkin was almost certain that she wouldn't find anything in them either—but how else could she eliminate this nagging feeling that the prion was appearing magically somewhere between the larder and the plate?

The first sample came back negative. She put a new one in the chromatograph and hit the switch on it. Then she nearly dropped the one she'd taken out as somebody nearby roared, "*Stop him!*"

"Down, down!" Suddenly there were soldiers waving guns everywhere and Arkin's team was scattering, diving under tables, around partitions (as if those flimsy things would protect them) and behind pillars. Somebody dove over a toppling chair and ran straight at Arkin. She recognized one of the local orderlies.

230. Synthetic Biology – Engineering the Future: see <http://www.ontariogenomics.ca/event/2009-10-08/407>.

231. Nanobiotechnology: see <http://fbae.org/2009/FBAE/website/our-position-nanobiotechnology.html>.

232. Evidence of cross-kingdom regulation by microRNA: see <http://www.nature.com/cr/journal/vaop/ncurrent/full/cr2011158a.html>.

233. Gas chromatography ("GC") and mass spectrometry ("MS"): see <http://www.scientific.org/tutorials/articles/gcms.html>

Before she could think, she'd stuck out her foot and tripped up the running man. The orderly went sprawling and as Arkin realized what she'd done she jumped back. Soldiers surrounded the fallen man and quickly had him zip-tied and frogmarched off.

"Good shot," said a sergeant to Arkin. "But next time just get the hell out of the way."

The whole night market was in an uproar and all work stopped for a while. Somebody said that the surveillance system had matched the orderly's walk to the gait of one of the attackers who'd fired at the Lieutenant-Colonel—and sure enough, apparently an explosives scan of his apartment had picked up traces of explosives residue. The night market was full of cameras, of course, and some of them were connected to the coalition's ASIC where artificial intelligences kept a sleepless eye out for suspicious movement patterns. The section that had been with the Lieutenant-Colonel when she was attacked had been able to record her attackers running away and then slowing to a walk several blocks later before they'd disappeared into a large marketplace. Sensitized to the gait of the assailants, the coalition's cameras had been watching out for them ever since.

This realization spurred a new commotion as investigators from the ASIC began turning the night market over looking for bugs. The presence of an enemy in the heart of the humanitarian operation explained a lot—in particular, how the enemy had learned that Arkin's team knew about the prion. This leak didn't reflect well on Arkin herself, and despite her impromptu heroism, she answered a lot of questions over the next couple of hours.

So, it was nearly dark by the time she staggered back to her desk. All her energy and will to work had been sapped by the afternoon's events and she intended to just shut down the chromatograph and secure the samples before heading to the mess. As her fingers reached for the off switch, she glanced at the monitor screen next to the unit and stopped.

The prion was present in this sample.

She checked, then double-checked. Finally, she sat back and swore. Somehow, between larder and plate, the prion had appeared.

Arkin forgot the excitement of the afternoon, she forgot how tired she was, and she forgot she was hungry. She summoned ASIC, her team, awoke all the AIs, and made several international calls. Invigorated by new-found optimism, Arkin now felt that she could follow the New Sweating Sickness to its source.

DISCUSSION

The meeting in this chapter involves a senior member of the Canadian minister's staff, other high level foreign government officials, Urlian officials, and the tactical commander of the CHERT, among others. What advantages and disadvantages does this sort of flattening of the existing hierarchical structures provide?

In the Urlian narrative, DND has morphed into a much larger federal department. What advantages, disadvantages, and risks would be posed by combining and integrating multiple Canadian Government departments (DND, DFAIT, Public Safety) into a single Defence,

Diplomacy, Development, and Security organization, notionally called the Department of National and International Security within the narrative?

The concept of trust-building with defence and security partners within a comprehensive approach implies accepting a certain amount of risk. One example of such risk involves operational security (OPSEC). How can OPSEC be maintained in the future, knowing that the CF will be even more closely linked to, and engaged with, a multitude of external partners? What sorts of guidelines or procedures might help a soldier to balance the “need to know” concept central to OPSEC, with the “need to share” concept which is so central to the comprehensive approach? How can solidarity among the various stakeholders be maintained and nurtured?

The nature of complexity within the Urlian social and political structure was detailed in this chapter, suggesting that a reductionist approach to problem solving would be ineffective. It is envisioned, however, that exponential improvements in raw computing power and data analytics would, by the 2040 timeframe, be able to make sense of complex social systems on the fly by personification of information and intent of multiple actors through simulation. In this context, consider the importance of data mining the massive amounts of data generated by a massive number of sensors. What challenges might arise for information management, and what systems and structures would be required to enable this capability?

The situational complexity within Urilia is described as exceeding the limit that unaugmented human decision-making could cope with. In the scenario, however, massive simulations were used to characterize and gain an understanding of complexity. Should the CF develop and maintain the ability to use such simulation and modelling tools or simply partner with an organization that offers these services? What are the implications of this for human analysts? Might these computerized capabilities make human analysts somewhat obsolete? How might this affect the broader human dimension and development of trust between people? What role should human intelligence (HUMINT) play in this context?

In the hypothetical future world portrayed in this scenario, where kleptocracy is widespread and organized crime is rampant, would it be reasonable to trust the information provided by nations and the organizations that serve them? What measures—technical and/or procedural—might be needed to help ensure that sources of information are legitimate and trustworthy?

Might the existence of virtual nations (such as Aephoria in the Urlian narrative) trigger a clash or conflict with governments in the non-virtual world? (Could the Patriot Party, as depicted in this scenario, be an example of such conflict?).

Ever since the media have been able to turn around news stories in minutes or hours from all over the globe, the media cycle has been an ever more significant part of military planning/appreciation. What might a future with augmented reality, real-time cognitive analysis and potential influence of such data sources mean for the future of comprehensive approach planning/appreciation?

Namvar stood with one foot on the low concrete lip of the vertical farm's sixth floor, watching as the convoy of the Lions' armoured trucks clattered into the walled courtyard below him. He was reluctant to lean against the floor-to-ceiling windows which were made of some sort of plastic called ETFE²³⁴ rather than hard glass. He was afraid he'd just pop through if he leaned on it, though Uncle Cyrus had laughed when he'd voiced that fear. He did know that rounds from the automatic weapon he held would go through the stuff as if it wasn't there.

The ocean lay to the right of this vantage point; the vertical farms were located on the shoreline and integrated into the port lands. That meant that they were uncomfortably close to the Canadian refugee camp, which was visible as a kind of toy-block version of a city made of shipping containers in the middle distance. The city sprawled away on the horizon in all directions but the south, where the ocean was greenish-grey today. Everything seemed peaceful right now, except for a single pillar of smoke rising in the city's north end. Namvar knew it was anything but peaceful out there. The air around the vertical farms swarmed with what looked like big bugs—but Namvar knew these were micro-UAVs,²³⁵ dragonfly-sized robots constantly on the hunt for even smaller spy systems²³⁶ from the coalition. Every now and then tiny aerial battles erupted, but these were almost always false alarms as the micro-UAVs killed an actual dragonfly or mosquito. A week had passed since Uncle Cyrus's allies had attacked the foreign coalition, a week since Namvar had, to his eternal shame, kidnapped an innocent man. The Canadians were trying to get him back, sending emissaries and offers to negotiate out through numerous channels. Cyrus had decided not to respond for now, figuring that a very public silence would further destabilize the Canadian position. Namvar wasn't so sure. After all, the Canadians had moved quickly to re-establish security after the attack and were consolidating their reputation as fair-dealers among the city's people.

The last of the trucks rolled in and Namvar watched the heavy concrete gate roll in to shut off the courtyard. The vertical farms were the most fortified location in the city, which was one of the reasons that some of Cyrus's allies on the City Council were relocating here. Unrelenting political pressure and downright extortion from Uncle's other allies was the other reason.

234. Ethylene Tetra Fluoro Ethylene: see <http://www.architen.com/technical/articles/etfe-foil>.

235. Micro robots hover more effectively than flies: see <http://www.scientificcomputing.com/news-ds-RoboFly-Micro-Robots-Hover-More-Effectively-than-Flies.aspx?terms=robofly>.

236. Insect Cyborgs. Researchers at Case Western Reserve University report that an insect's internal chemicals can be converted to electricity, potentially providing power for sensors, recording devices or to control the bug itself. See http://www.robotictrends.com/research_academics/article/implanted_biofuel_cell_converts_bugs_chemistry_into_electricity.

Namvar switched on his usual AR view of Urlia. The overlays showed a city dividing into warring neighbourhoods with some safe corridors controlled by the foreign coalition. Everybody had cameras or micro-UAVs in the streets nowadays and kids with pop-guns were hunting for cameras. You could scout your location as you moved, watch for snipers or gangs of thugs, but only until the cameras you were using were shot out—fortunately they were cheap and easily replaceable.²³⁷ In the meantime, streets would go dark and then you just didn't go that way, or the cameras were left alone to deliberately show off the burning cars and barricades you'd encounter if you entered them.

Namvar heard a sound behind him and turned to find Uncle Cyrus approaching through a maze of metal and green leaves. "They're here," he said unnecessarily, and Namvar nodded.

Cyrus looked tired. "Now maybe things will settle down." He wasn't wearing AR glasses, but his glance out the window took in the city and in his mind he must be seeing something similar to Namvar. "Come on. You can sit in on the negotiations."

Namvar made to follow him, noticing one last outside detail as he did; two more ships had joined the large flotilla in the harbour. They were tagged, of course, one as a Chinese²³⁸ missile ship and the other a Canadian Surface Combatant loaded with UAVs. The jackals were circling.

"I can't believe they chose you as the negotiator, Uncle. It's a great honour." They ducked and swerved through the dense growing racks of the farm, rapidly leaving daylight behind for a strange realm of sharp OLED lighting²³⁹ and glowing green leaves. Namvar had meant his praise sincerely, but ahead of him he heard Cyrus growl.

"It's only because I look harmless, nephew, can't you see that? The city council can't be seen to be negotiating directly with the gangs. They've sworn to the Canadians that they won't cut a separate deal with anybody and that they're relocating here of their own free will."

The vertical farm was cylindrical with a circular concrete core where water, electrical and HVAC systems ran. Cyrus found an elevator there and as he stepped in said, "We warned them during the drought that we could make things much worse for them. Only now do they understand what we're capable of."

Namvar stood with him watching the doors close. He opened his mouth to ask what Cyrus meant by "what we're capable of" but then closed his mouth again. Cyrus often acted as though Namvar had the same knowledge of the situation as he did, but that extra knowledge came with a price. Too often lately, Namvar had discovered that he didn't want to know what Cyrus knew.

One example of that appeared as the elevator doors opened; two blond-haired men dressed in dark suits blocked the doors as a flight of micro-UAVs entered the elevator to sniff around the two locals. Namvar studiously ignored the insulting imposition, mostly because being checked for bombs and bugs was so common these days. The suit on the right said something in a Slavic language, which Namvar's glasses translated as "Go on."

237. Sensor proliferation: see <http://www.militaryaerospace.com/articles/print/volume-19/issue-7/features/technology-focus/locked-down-sensors-everywhere.html>.

238. The rise of the BRICs: see http://aib.msu.edu/publications/insights/insights_v012n03.pdf.

239. Nanomarkets OLED Lighting: see http://www.nanomarkets.net/oled_lighting.

Cyrus strolled past them as if he was in charge, but if he'd really been in charge he wouldn't have had to wait.

The ground level of the vertical farm was a grocery store in the Western style with cheerful bright lights and many rows of shelving and display space. What was grown above was sold below, but in between, a glassed-in gallery ran around the second level of the tall retail space. This was an area for store employees and managers, and the windows that looked down on the store were mirrored. A small knot of men stood at the angled surface looking down, much as Namvar had stood watching the trucks roll in a few minutes ago. One glanced back as he and Cyrus approached.

"Put them on," said Sanobar, the head of the city's extensive organized crime network. In his palm were a little contact-lens case²⁴⁰ and a tiny earpiece. Cyrus stared at the things in distaste, and Sanobar's hard eyes narrowed as he saw the hesitation.

"You didn't think you'd be talking to them alone, did you?"

"No, no, of course not," said Cyrus, reaching out his spidery hand to pick up the devices. "It's just that—a face-to-face dialogue, you know, between men—"

"Is not going to happen today." It was one of the foreigners. He was watching Sanobar and Cyrus with apparent amusement—perhaps because he himself was wearing various tiny glittering things that might have been jewellery, but which Namvar knew were the latest in augmentation and communications technology. The foreigner stepped forward to poke the contact-lens case. "The city fathers, they negotiate with us, not you, understand? You say what our AI tells you to." A big grin split his face. "Just like the Canadians."

Everybody believed that everything the Canadians said was orchestrated by some computer back in their capital city. The older citizens of the city were having trouble trusting the idea, some going so far as to call the Canadians "Borg" after the monsters in some old American TV show. For Namvar, and people his own age he knew of, what they were doing made a lot of sense; his generation understood the concept of augmented cognition and he'd developed a lot of respect for the Canadians' activities. They weren't puppets of some icy artificial intelligence; on the contrary, the systems they were using were there to amplify their autonomy and decision-making powers and Namvar suspected they worked all too well. He'd tried to warn Cyrus about this, but Uncle merely dismissed the idea. Namvar didn't know what the Canadians were up to, but at least he knew they were up to something. Cyrus couldn't even see that much.

Down in the central space of the grocery store, chairs had been set up in a makeshift meeting area. Members of the city council were starting to filter in and sit in their places. Most of them had expressions on their faces not dissimilar to the one Cyrus showed now. "I've never put these... things... in my eyes before," he muttered.

"I'll help you, uncle."

"You better," said the foreign gangster. "Or I'll do it myself."

Namvar helped his uncle insert the contact lenses. Cyrus was trembling, whether from insult or moral outrage Namvar couldn't tell. It was all too clear now where everything had been heading from the start and Namvar's own ignorance began to seem to him as

240. Computerized Contact Lenses Could Enable In-Eye Augmented Reality: see <http://blogs.scientificamerican.com/observations/2011/11/23/computerized-contact-lenses-could-enable-in-eye-augmented-reality/>.

a deliberate blindness. He'd known the militia dealt outside the law; it ran drugs and guns like all the militias did. It even had its own mullahs and a mosque set up in this very building, but it was far from virtuous. He'd known that; so why had it been so hard for him to see that Sanobar had made a deeper pact with this international organized crime syndicate?

He began to walk with Cyrus to the stairs, but Sanobar put a hand on his arm. "Where do you think you're going?"

"Uncle said I could sit in on the negotiations."

"You stay here."

"It's all right, Namvar." Cyrus had turned a disturbing shade of grey; suddenly he put a hand up to the ear he'd inserted the communicator into. "Yes, I hear you. No, sorry." He put the hand down quickly. His eyes had that slightly unfocused look that indicated he was seeing some sort of AR display through the contacts. "I'm ready."

Namvar stood as far from the rest of the group as he could and watched the "negotiation" unfold in the brightly lit, cheerfully decorated, grocery store. Cyrus stood in the centre of a half-circle of chairs where the city councillors sat. Sanobar had miked the area so the voices came clearly through a speaker on the wall.

Cyrus cleared his throat and said, not too confidently, "You work for us now."

Half the councillors rose to their feet. "Who are you to tell us that?" one shouted.

"You can't say that," said another. "We're all miked and monitored. Everything we say is being broadcast to the internet according to the Little Brother protocol.²⁴¹ Everybody knows what you're up to by now. Even if we bowed to you, the people will simply ignore us because they know there's been a coup."

"First of all," said Cyrus, "half of you are corrupt already and the people know it. Second, though, your Little Brother protocol won't work here. All transmissions from this room are being intercepted and spoofed." Looking ill, he added, "I'm sorry, but no one outside this room will hear what's really said here."

Up on the second floor the foreign criminal standing with Sanobar banged his fist on the glass. "Don't apologize! You look like a damned weakling!"

Cyrus was holding up one hand, waiting for the shouting in his ear to die down. "But I think you're going to like this arrangement once you understand it," he said. "All we want you to do is rescind the grain-buying agreement with the farming unions."

The city fathers were suddenly quiet. After a long pause, one of them said, "That's not in our jurisdiction. The plurinational government won't stand for it."

"The plurinational government is falling apart," Cyrus pointed out. "It's just a puppet for the foreign coalition. For years it's forced you to pour city tax money into the countryside. It doesn't even go to the farmers. You know that! It goes to the militias—"

"You mean like yours? We know you work for Sanobar!"

"It feeds criminals and warlords in the countryside when it should be staying in Urlia. You are effectively paying taxes to organized crime through this arrangement."

There was muttering among the city councillors. Namvar marvelled at what Cyrus was saying because it was simply the common wisdom on the street; vertical farming had

241. The Little Brother protocol is a form of "sousveillance" or surveillance from beneath: see <http://en.wikipedia.org/wiki/Sousveillance>.

made an agricultural hinterland unnecessary, even to a city of Urlia's size. The urban population resented the government's well-intentioned attempts to prop up the rural population using Canadian GM crops. Cyrus was actually handing the councillors an argument they could use on their own constituents.

"Urlia is on the brink of anarchy," Cyrus continued. "Already people have barricaded themselves in their neighbourhoods—the Pashtun quarter, the Hindu quarter, the Ba'hai quarter. They're not paying any attention to you anymore anyway. But we can turn the situation around."

There was silence.

"Rescind the grain-buying agreement and evict all the farmers who're squatting on city land," Cyrus commanded. "You pledge to buy all of your domestically produced food from the vertical farms."

"—And *your friends* control them," an elderly councillor pointed out. "So we're entirely dependent on them for our food!"

There was a bit more colour in Cyrus's cheeks. He actually seemed to be enjoying his moment in the spotlight, even if his words were being dictated by some unseen agency of international organized crime. "That's a small price to pay for restored order, isn't it?" he said. "You choke off the rural militias, with all their petty vendettas and demands. In return you get peace and order."

"It won't work," objected the oldest councillor. "The country militias are partially funded by poppy growing. They take all the water that the farmers are supposed to get. You know that."

"Growing *anything* in the country has become unreliable," Cyrus pointed out, "whereas crops raised in one of these buildings can be guaranteed ahead of time—for quantity, purity and quality."

Namvar blinked and glanced up at the ceiling. More than 40 floors of intensive aeroponic²⁴² growing space rose above them here. The farm recycled most of its water and produced its own power. This building alone could feed 50,000 people year-round.²⁴³ What else could it produce?

"You're clever, I'll admit that," muttered the old councillor. "You'll want us to turn a blind eye while you put the rural militias out of business. But how can you even pretend to tell us there'll be peace?"

"Well, for one thing," Cyrus said, "I can absolutely guarantee that when the farmers leave the city the plague will stop."

Namvar reared back, the hairs on his neck prickling with sudden horror. He stared at Sanobar and his allies; they were watching the meeting with absorbed looks on their faces and not one of them had shown any reaction to Cyrus's statement. The councillors on the other hand looked stunned, and Cyrus himself seemed shocked at what he'd just said.

He put a tentative hand to his ear. "What? I— oh." He cleared his throat and continued, "The foreign coalition will keep the militias at bay. We will get them to broker an arrangement with the UN for their peacekeepers to stay until the militias are priced out

242. Aeroponic crops use less water than hydroponics, and vertical farms can recycle most of the water they use, making the city's vertical farms highly drought tolerant: see <http://www.aeroponics.com/>.

243. For studies and estimates of the productivity of vertical farms, see <http://www.verticalfarm.com>.

of the opium trade and have to downsize. During that time we will keep food prices low and you will keep more revenue, which you can put back into the city. Everybody wins.”

“Wait, wait—just a minute here! What did you mean,” shouted another of the councillors, “that you can guarantee the plague will stop?”

Namvar had backed away from the windows. None of the others noticed, so he kept going. His head was whirling, but he made it to the stairwell and hung his head over the banister for a minute. He thought he was going to be sick, but the feeling passed, and as he straightened up he thought about what to do.

He’d trusted Uncle Cyrus, and Cyrus had trusted Sanobar. It had all been foolishness, but you had to trust someone, or there could be no compass to life’s decisions.

He clattered down the stairs towards the back of the building where the mosque was. In order for it to remain halal, the mosque was in its own annex, separated from the main building where the food was kept. Cyrus had told Namvar that the militia had built it with the intention of creating a madrasa that would be favourable to their views, and under that pretext they had installed their own mullah. It was to this man that Namvar ran now.

The mullah, Dilawar Kermani, had just completed a funeral for one of the plague victims. He raised a tired hand to acknowledge Namvar as the young man crossed the open, carpeted interior of the space.

Their greeting was quite perfunctory because Namvar almost immediately burst out, “I cannot stay here with these people!” Kermani stood nonplussed as Namvar poured out his story about what was happening overhead. He described the foreign criminals that Sanobar had brought in, and the mullah shook his head grimly.

“I have been hearing about this for only a couple of days now. Namvar, I’m sorry I took this position; I find myself preaching to deaf ears.”

“What have you heard?”

Kermani took him to one side of the space. “The newcomers brag about using the latest technology to perfect crime. Sanobar’s driver was telling me yesterday that they have turned the Little Brother protocol on its head; they use public camera feeds and facial recognition software to detect when wealthy people are away from their homes and then they can send a moving truck to empty the entire house before they come back! A moving truck!” He shook his head again. “They track people’s movements for other purposes too—to root out people’s real allegiances, even find secret romances that they can use to blackmail people with. If they tighten their stranglehold on the city, they will be able to watch its citizens day and night and hold that knowledge over them.”

“They are about to take over the city council,” said Namvar. “We can’t remain a part of this.”

Crossing his arms, Kermani sent a rueful look at the wall separating them from the grocery store. “Unfortunately, even the deaf need the Word spoken in their presence. I cannot leave. Nor should you; right here is possibly the only place where we might still be able to make a difference.”

Namvar kicked at the floor dejectedly. “But how?”

“I have a thought.” Kermani looked up at the steel-beamed ceiling. “You’ve been keeping one of the Canadians prisoner for a week now. I hear he’s an infidel preacher.”

“He works for the Canadian Army.”

“But that’s not all he works for.” Kermani smiled. “He is one of Aephoria’s Silent Advocates, I know that for sure. And so am I.”

Namvar gave out a startled laugh. He hadn’t known Kermani for very long, but he certainly would never have pegged the older man as a citizen of an online nation. “I belong to Aephoria too!” As a cleric and one of the Silent, Kermani’s name and religious affiliation would be anonymized inside Aephoria; Namvar might have spoken to him or worked with him dozens of times online without knowing it.

“But...,” Namvar looked down again. “We can’t get to him. They’ve posted a guard on the stairs and disabled the elevator so it won’t go his floor. Only the freight lifts work, but they’re too dangerous to use.”

Kermani shook his head. “We don’t have to get to him physically. All we have to do is get close enough to get a signal.”

“But his floor’s isolated that way too. Sanobar stuck jammers to the ceiling of the floor below; there’s coverage over the entire area of the tower.”

Kermani nodded, but now his smile was genuine. “Ah, but I have an idea about that....”



They had Brian Sokolow confined to a small portion of one of the upper floors in the vertical farm. Not that he could complain about the accommodations—he was surrounded by sweet-smelling greenery. Day and night, the ranked drums that held aeroponically grown plants rotated slowly around the organic LED tubes that gave them light and life. The whole vertical farm was filled with overlapping ticking sounds from the drums; it was like living in an old-fashioned clock shop. The drums misted their plants every now and then, and simple robots rolled past to stick long proboscis-like sensors down the drums, checking for mould or rot. He had barely seen another human being in the week he’d been here and his captors had made a half-hearted attempt at jamming his data feed to the outside world. Since his systems were surgically implanted, they would have had to cut them out with a knife, use expensive nanotech to shut down his reception, or isolate him in some underground room. He was a bit surprised that they hadn’t done one of those things, but maybe they wanted to avoid the possible PR disaster of a cut-up military padre; and rooms, even underground ones, that had no data feeds were few and far between these days, especially in a kit city like Urlia.

He wasn’t entirely cut off, having made friends with the boy who brought him the meat and fish that supplemented what he picked fresh from the drums. The lad knew a lot and was eager to talk about it, so Sokolow was aware that money, supplies and personnel were flooding into the city. In a previous time, much of the aid would have had Canadian, UN, Red Cross or Red Crescent symbols stamped on it; one of Aephoria’s founding insights was that every one of these symbols was partisan, a kind of flag. Food, medicine, and building materials arriving through Aephoria had no markings on them at all other than supply-chain tables that recipients could use to check their quality.

For all his love of Aephoria and the other new online polities, Sokolow asked most about what the Canadians were doing.

What he found was that they were making him proud—but also puzzled. Unlike the Silent, the Canadian Forces were visible in the streets and providing security for convoys

of food and medicine. They were risking their lives to keep the peace, and Lieutenant-Colonel Desai made sure everybody knew it. The puzzling part for Sokolow was what might be going on behind the scenes. Before his polite abduction by Namvar, he'd known that the colonel's people were coordinating with the Silent and the other nationalities of the coalition to map the complexities of the city's political conflicts. Through tools such as instant automatic translation, computer-assisted conversational tools and augmented cognition aids, they should be closing in on a very accurate and up-to-date picture of the true allegiances and tensions in the city. Desai had declared that the New Sweating Sickness was engineered; surely Canadian governmental and NGO groups should be zeroing in on the source of the plague to bring it rapidly under control.

Sokolow had no idea. He could only catch glimpses of the city and its skyline through the foliage, but nothing seemed to be going on. There might be riots, explosions, even all-out street fighting for all he knew. None of it carried past the tick-ticking and misting of the millions of plants—food crops interspersed with opium poppies—growing all around him.

Being cut off didn't stop him from planning. Today as he headed for the small toilet at the centre of the floor, he was musing about who would or would not show up to peace council meetings. You could negotiate until you were blue in the face, but if the right people weren't on the other side of the table, nothing would change. In a situation like this, the traditional power blocs often felt threatened when you included constituents whose authority they didn't recognize. One feature of Urlia that had been immediately obvious to Sokolow—even before he'd arrived in the city—was that the average age here was under 30,²⁴⁴ yet there wasn't a single city councillor, mullah, business or militia leader under the age of 60. They'd all been raised and trained to believe that children should respect their elders, and he knew there'd been a lot of outrage at the idea that the Coalition might want to talk to young people on the street without going through an older intermediary.

He was standing at the sink contemplating this when *ping!* The heads-up tell-tales that hovered as discreet icons around his peripheral vision suddenly woke up. His inbox went from showing zero unread messages to eight, then 15, then 50, and kept climbing. He had a decent signal!

He grinned at the ceiling. "Thank you. Not much of an office, but hey, I'm not complaining."

Lowering the lid, he sat on the toilet and began spinning messages out to virtually float in the air around him. Many were encouraging words and notes of support from parishioners and soldiers—people whose lives he'd had the privilege of touching during his brief years of service. Even without reading them, just seeing them lifted his spirits immensely. There was one private note from Desai, but none of the regular briefings he should have been receiving; no surprise there, as he was in enemy hands now. His captors had downloaded his files as soon as he'd arrived, but of course it was too late; he'd wiped the more sensitive data before Namvar's truck brought him into the parking lot below this building. No more would be forthcoming regarding military matters.

244. Asian youth bulge: see <http://www.eastwestcenter.org/fileadmin/stored/misc/FuturePop06Youth.pdf>.

News, on the other hand, was plentiful. He was just reading avidly through the first of a list of reports on the chaos of the past few days when a ringing in his head indicated an incoming phone call. He said, “Yes?”—fully prepared for it to be anyone from Lieutenant-Colonel Desai to his mother.

The voice had that slightly halting quality of real-time translation to it. “Padre Brian Sokolow? Peace be with you. By the grace of God I am Dilawar Kermani; I am the mullah here at the farms. I would very much like to speak with you, if you would be willing.”

Sokolow leaped off the toilet and pumped a fist in the air. His signal strength indicator wavered dangerously as he got closer to the door. Stepping backward and clearing his throat, he carefully sat down again. “Wa Alaykum Salam, mullah Kermani. I would be very interested to hear what you have to say.”



Lieutenant-Colonel Desai was gazing at the two Brazilian gunboats lurking in the harbour. They hovered like ghosts, visible in AR through the walls of the night market. They were nuclear powered like everything the Brazilians floated these days.

She sighed and turned back to the announcement from the city council. “They really think they can do this?”

Hazir Rumay shrugged. “They have the right people backing them. My apologies, colonel, but you’re a foreigner—and by your own admission, you’re not here to interfere with the will of the people.”

The declaration that Urlia would be cancelling its grain-buying guarantee with the farming cooperatives of the countryside amounted to the city cutting itself off from the rest of the country. This made the Canadian farming assistance initiatives useless. “They’ve dug themselves a moat,” said Desai, “and now they’re flooding it.”

Activities in the night market were shifting from disease research to reconstruction and infrastructure planning. SMART’s expanded mandate had personnel visiting the solar-powered desalination stations the previous operations had established throughout the region. Negotiations between the city and the militias had just begun to restore a stable water supply in and around Urlia; this announcement about the food-buying agreement couldn’t have come at a worse time.

There was good and bad news on the New Sweating Sickness front. The disease was extremely well understood now thanks to Arkin and an international team who’d worked round the clock to characterize it. NSS was neither a virus nor a bacterium; in fact, it wasn’t even properly alive. It was an abnormal protein—a pathogen that resulted from what was believed to be an engineered molecular prion self-assembly²⁴⁵ process triggered during the preparation of several traditional Urlian dishes. The good news was that, now that the prion causing the disease had been characterized, a counter-agent had been developed: a protein that locked onto the prion molecule and rendered it inert. Several days of treatment with this seemed to be enough to cure the condition.

245. Molecular self-assembly: see http://www.sigmaaldrich.com/etc/medialib/docs/Aldrich/Brochure/material_matters_v1n2.Par.0001.File.tmp/material_matters_v1n2.pdf.

The bad news was that the infection rate of people coming down with symptoms was increasing rapidly. Arkin's people were still having difficulty pinpointing the specific ingredients that caused the prion, though they had narrowed the list down to a half dozen. It was extremely frustrating.

"Well," said Desai with an irritated flip of the hand, "I'm entitled to my own opinion—between you and me of course." Rumay grinned.

"I know, I know," he said. "This is just a manoeuvre on the part of the gangs and militias to seize direct control of City Council. But everybody knew before that they were all through the government, so really, nothing's changed."

"Yes, but the farmers will be evicted for sure this time."

"Maybe—but you can cure them and give them water, so now they have no excuse to stay."

She gazed at him levelly. "Is that really what you think, Hazir?"

"I'm telling you what I hear," he said neutrally.

"Humph." Her forces had put their lives on the line to secure the safety of the refugee farmers, and now their host city was kicking them out. It rankled, but neither she nor anybody else—not even the Chinese and Brazilians whose ships were starting to pepper the waters of the sound—were in charge here.

"Let's talk about why you're here," she said. "I guess you've made yourself a loyal customer, eh?"

Rumay laughed. "So loyal that it asked me to be its human figurehead in this deal." He transferred electronic documents to Desai's touch desktop.²⁴⁶ "Water filtration rights in the mud flats including a plan to expand it into a complete wetland ecosystem. You'll see here," he pointed, "and here, that the deal is for grey water only, no industrial wastes. You can bet that the flats will be monitoring every drop that goes into it, and here it says that the amount taken out can only match what's gone in." He waved at the documents happily. "You can look at them—your business associates who signed it were happy to let me show it to you."

Desai reviewed the contract, marvelling at the dense legal language. "Who wrote this up?" she asked. "Surely not the mud flats themselves."

Rumay shook his head. "Its lawyer. The flats are a legal entity crusted over with a pervasive sensor net and some computer logic. They don't really think, but they can strategize—just like your SimCanada. Or, I'm sure, the many simulation systems you ran on Urlia throughout this crisis."

"Yes, of course." This blurring of the line between living agencies and natural ones still astonished Desai though she knew it shouldn't, especially in a time when semi-conscious artificial intelligences were common. Really, the flats were just one of those that had identified itself *as* the mud flats.

"So the flats are buying sewer lines and water mains from a Canadian company so it can sell water filtration to the city. Our boys are doing this at cost as part of the reconstruction effort?"

Rumay nodded. "I believe you Canadians call it 'having bragging rights.' And business is business; not everything you do has to make a profit, you know."

246. See <http://www.touchtable.com/>.

She waved at the electronic documents displayed on her desktop with a smile. “I’m sure this will make the ducks and grass very happy.”

“Who knew,” he agreed, “that the mud was also a concerned citizen?”

A shout from the far side of the market interrupted their shared laugh. Both stood to look over the low plastic-sheet partition that defined Desai’s office. There were more shouts, then a wave of excited conversation that started to spread, then cut off with the sudden sharpness of a switch being thrown.

Desai frowned. “What was that?” asked Rumay. She shook her head, but the commotion had come from the research lab where Arkin had her people. Sure enough, she heard footfalls coming from that direction—someone running towards her.

Running. Not simply texting her or opening a conference link through secure AR. “Hazir, I’m afraid I’m going to have to cut our meeting short,” she said, as Arkin herself appeared outside the cubicle. She was practically dancing from foot to foot. There was no more noise coming from the lab; clearly, she or someone had switched on the sound dampeners there.

“I understand,” said Rumay, standing and bowing. He was clearly mighty curious, but simply shook Arkin’s hand on the way by, thanking her for being one of those who had rescued him and Desai on the day of the rocket attack.

As Rumay walked away, glancing back frequently, Arkin practically leaped in to loom over the desk. “We found it!” She was waving an old-fashioned tablet computer; after the cyberattack Desai had moved much of ops over to a newer system that had been developed after an open, collaborative analysis²⁴⁷ of the attack.

She steepled her hands and looked up at Arkin. “Cathy. You found what?”

“How the New Sweating Sickness is being spread.”

Desai sat back in relief, and waved for her to sit too. “I knew you’d do it. That’s very, very good news.”

“You may not think so when I tell you what it is.”

“Why?”

“Because this also tells us who’s behind the outbreak. And when the people find out, we’re likely to have a bloodbath on our hands.”



Later that morning, Sergeant Harman paused to discuss a tactical situation with her counterpart from the Brazilian army. “My people are growing tired of this,” said Sergeant Bernardes. Together they had been securing the main freeway through Urlia’s half-built suburbs. To Harman, they were a bizarre mixture of anonymous, printed buildings in the Chinese style, and shanties and squats. Many of the machine-built homes were roofless or windowless and had been subdivided to accommodate several families. What would have been front lawns in America were small subdivisions themselves, comprised of sheet metal and plywood huts with narrow paths running between them. It was here that most of the refugee farmers had settled and it was also here that the greatest number of NSS cases had been seen. The freeway was supposed to be secure, but there was a persistent

247. Open-source analysis of competing hypotheses: see <http://competinghypotheses.org/>.

problem of local gangs popping out to charge tolls when the police were elsewhere. They even did this to the aid workers' vehicles, including ambulances. Desai had ordered these impromptu tolls shut down.

Harman scanned the visible chaos with her binoculars; simultaneously a small flight of micro-UAVs was lofting over the running figures counting people and guns. She and Bernardes stood atop two armoured personnel carriers some 20 metres from one another.

She glanced at Bernardes who was frowning in distaste at the crowd. "What do you mean you're tired?"

"Your people have been trying to 'understand the situation' ever since you got here," Bernardes pointed out. "We don't need to understand this place; we just need to simplify it."

"Meaning what?"

"The more freedom you give these people, the more they fracture into warring camps. We need to take control of everything: the farms, the water, the power, the traffic lights. Impose our own curfew, take away their guns. Simplify. Isn't that what armies do?"

Harman didn't point out the obvious—that there were only two armies in the region with the numbers to be able to enforce such a peace. Bernardes's "simplification" was occupation, and that could only be backed up by a full-fledged invasion force.

She turned her gaze back to the riot. "We work with what we've got." That, as it happened, was a lot; the portable tactical AI's analysis was finished and suddenly her view of the freeway—already significantly overlaid by augmented reality tags—dissolved into a tactical landscape. Combatants turned red, her people and the Brazilians blue, fleeing civilians white. The UAVs were now tracking every rifle and pistol they'd spotted.

"Leaders identified," said the tactical AI. Arrows pointed out of the sky at half a dozen of the running figures. Harman remembered reading about military historian S.L.A. Marshall's controversial claim that most of the men in World War II attacks hadn't fired a shot²⁴⁸ and being amazed by the possibility of just how few soldiers had, historically, ever fired their weapons in an assault. Modern armies certainly didn't work that way—and were far more lethal as a result.

This, though, wasn't an army she was watching. Or was it? "Are those the police?" The Urlia police had stopped cooperating with the coalition after the City Council declared its intention to oust the farmers. What she saw now were numerous figures in riot gear on one side, moving in a broad fan through the half-built streets. A disorganized but armed rabble was retreating from them; many were simply running, but a few were firing back.

"The Urlia police are routing the refugees," said the AI. "We intercepted a transmission a few minutes ago; the police have been ordered to drive the farmers out of the city."

Harman exchanged a glance with Bernardes. "The choice," said Bernardes, "looks simple."

"But if we take on the police—"

"A rural militia force is closing on your position from the north," said the AI. "Seventy percent of our simulations show a direct clash with the police leading to 50 to 100 casualties. We have an intervention plan."

Harman glanced back at her section. They were doing a final check on the combat

248. John Whiteclay Chambers, *S. L. A. Marshall's Men Against Fire: New Evidence Regarding Fire Ratios, Parameters*, Autumn 2003, 113–121. See <http://www.carlisle.army.mil/usawc/parameters/Articles/03autumn/chambers.pdf>.

robots.²⁴⁹ She wasn't afraid of the fight itself, either for herself or them, but the consequences of letting the alliance with local authorities completely unravel were dire. The neat divisions of friend and foe the tactical AI was presenting right now might not survive the morning, and in that case, Bernardes's "simplification" might be the only way out of this mess.

"Sergeant Harman, CO authorizes use of non-lethal force in order to disperse the crowd. You are not authorized to damage the following infrastructure...." She watched her AR display as the tactical AI tagged the various features of the scene that corresponded with the orders, then looked to Bernardes who was nodding as he received a similar order. The plan was meanwhile presenting itself as a series of numbered transparent blocks descending from the sky to carve up the cityscape. Each block contained an objective and waypoints, carving up both space and time to show how the enemy could be divided and contained. Potential enemy combatants had already been given weights according to their weaponry and apparent importance. The UAVs were persistent watching eyes—tracking who looked to whom for support or orders. The AI and its relatives in the UAVs circling high overhead were hacking local network chatter to do much the same. In seconds Harman knew who had to be neutralized to suck the momentum out of the snowballing situation.

"Launch the dogs." Soldiers jumped away from the robots, six of which began loping in the direction of the riot. Headless olive-green animal shapes about the size of Great Danes,²⁵⁰ the "dogs" were mounted with Active Denial Systems; in the case of the Canadians it was sound cannon,²⁵¹ but the eight Brazilian robots were not so polite, being fitted with microwave pain rays.²⁵² They were a kind of macabre miracle to watch in action, for wherever they turned the flat squares mounted on flexible supports on their backs, people simply turned and ran. Now they arrowed into the crowd, and using herding algorithms²⁵³ learned from working sheepdogs began to disperse the crowds. It took the Urdia riot police a few seconds to realize that the dogs were not on their side—they opened fire, but the dogs had begun spewing purple smoke and making effective evasive manoeuvres.

The rural militia had no defence and began collapsing before its members even reached the fighting. The police fared better once their own systems came online—and once they realized that the coalition was no longer neutral. Still, everything looked controllable until Harman's strategic overlay—an inverted map of the city hanging, or so it appeared, in the sky far above the city—began turning red. The neatly carved-up sectors of the city, which had been coloured according to the military-civilian councils that had been keeping peace in each one, were all flipping over to yellow, orange, and even red.

Suddenly, Harman received a message, "Sergeant, your tactical situation is being re-evaluated through simulation. Make for the safe position indicated on your AR display and wait for new orders."

249. Autonomous robots in the fog of war: see <http://spectrum.ieee.org/robotics/military-robots/autonomous-robots-in-the-fog-of-war/0>.

250. Boston Dynamics BigDog: see http://www.bostondynamics.com/robot_bigdog.html.

251. Long-range acoustic device (LRAD): see <http://defense-update.com/products/l/LRAD.htm>.

252. Active denial system: see http://jnlwp.defense.gov/pressroom/faq_p2.html.

253. Herding algorithm in real time: see <http://vis.ucsd.edu/~dknoblau/project-herding-algorithm-in-real-time.html>.

Harman looked around and over the pall of IR blocking purple smoke and through the buildings themselves. Bernardes was already pulling his section out of the neighbourhood and was on his way to the port lands. There, a single strip of blue indicated the new tactical waypoint: in the warehouse district that nestled under the high concrete walls of the city's vertical farms.



Namvar stood on the 44th floor of the vertical farm and watched the streets empty of people. It came to him that, young as it was, he had nonetheless grown up in this city. Cyrus always laughed at the idea that Urlia was a real city—it was a camp, he said, with concrete. The Chinese had built 200 kit cities in the last few decades, all as shiny, new and anonymous as Urlia; why should he expect that this one stumbling metropolis on the shore of the ocean should be any different? Yet now, as he saw the kids running inside, as he watched the neighbourhood defenders gather in knots on the street corners, all shouting and pointing, and as he noticed driverless vehicles ominously circling the city's multiple cores beginning to outnumber cars with passengers on the freeway—Namvar began to grieve for his home.

The coalition had lost control. So had the city council and the militias. What remained was a force that had connections into every neighbourhood,²⁵⁴ every business, in a way that the legal authorities never could. That force had played its hand, issuing commands for betrayals big and small throughout the city.

Urlia was now in the hands of the global mafia and nobody would be able to save it.

He walked back through the whispering greenery of the farm, trailing one hand idly through the leaves. So strange to be surrounded by so much life in a time of famine and drought, he thought. Then again, the hyper-mafia owned this building now too.

He sat down in one of the workers' lounges deep behind the layers of ticking aeroponic machinery. Closing his eyes, he left it all behind for the one chance that still remained: the peace council.

The council was happening in Aephoria. Even here in their stronghold, Sanobar and his mafia allies couldn't quite filter out the satellite signals, nor could they shoot them down. As long as he had a secure uplink, Namvar could visit the online nation—and now that he'd discovered the hotspot in the washroom on his floor, so too could Brian Sokolow walk, albeit virtually, out of his own captivity and into the council to speak.

What Namvar saw now lifted his spirits. The virtual table where he sat was just one of dozens all nestled together like the gears of a watch. The visual metaphor made clear what the responsibilities of each table were. Each fed its results to the others, packets of consensus or contention passing between them, rippling outward in widening circles as discussions among neighbourhood leaders led to invitations to their neighbours, which led to agreements about who could trust whom.

Sokolow's avatar stood up as Namvar appeared. "Namvar, you're just in time," he said, and surprisingly, his voice sounded as fresh as he looked. Dilawar Kermani sat with him and a number of other mullahs from the city's madrassas and militias.

254. Organized crime: see <http://www.unodc.org/unodc/en/organized-crime/index.html>.

“It looks bad,” Namvar said. “There’s fighting on the highway.”

“Maybe not if we act now,” said Kermani. He nodded sharply at Sokolow. “Shall we put it to the final vote?” There were nods up and down the table. Kermani’s avatar stood up.

“By the grace of God, we are gathered here to decide whether to take our considered opinions to our people using the device that the international coalition and its SMART team has given us. All in favour?”

Avatars stood up in a silent, coordinated wave that wafted out from this central point. Namvar had stood too, and as he saw that the vote was a landslide he said, “I must see this,” and prepared to leave Aephoria.

Sokolow laughed, but then said, “You know, I have to as well. I’ll be right back.” Sokolow disappeared—leaving the uplink entirely. Namvar pictured him bursting out of the bathroom and batting his way through the greenery downstairs. With that image in mind, Namvar too stood up, turning the immersive connection to Aephoria into a set of telltales in his peripheral vision, and ran to the transparent outer wall. At first there was nothing to see; he supposed it would take some time for the ripple of consensus to reach the North Africans and they would have to clear the act with the coalition leaders. Why, it might actually take an hour he thought.

A white, transparent shaft of light stood up suddenly out of the city. It was entirely virtual—visible only in augmented reality—but there it had the same authority as street signs and emergency messages. The virtual tower had appeared in every AR overlay in the city, and soon it would be joined by real signs for those few citizens still outside of the AR network.²⁵⁵

Another gleaming, perfect tower appeared in another corner of the city, then another, and another. Seemingly from nowhere, a second version of Urlia, drawn in light, came into being a hundred metres above the real one. The towers were labelled for the constituencies and powers that made them up: the neighbourhood militias, the madrassas, city councils, municipal utilities, commercial associations, international interests. All were connected by a network of relationships drawn in labelled lines that showed the flow of influence between them. This was the hard-won systems model of the city that the North Africans had patiently compiled through their surveys, AI modelling and statistics. Like SimCanada, it showed how the city actually worked—and like SimCanada, anybody looking at it could tweak the influences and run the model forward or back in time to see what happened.

A second layer of numbers hung like clouds above the virtual towers; these numbers were rupees, the estimated value of the goods and services flowing through the model. Captions at this level explained that anyone who came up with an improvement to the flows in the overall model would receive a bounty in real money²⁵⁶ proportional to the scale of their improvement.

Hanging over this intricate game²⁵⁷ were gigantic words that formed the first framing question for the model:

WHAT KIND OF URLIA DO YOU WANT FOR YOUR CHILDREN?

255. See Your Impact: see <http://seeyourimpact.org/>.

256. Gaming for profit: see <http://www.scientificamerican.com/article.cfm?id=real-money-from-virtual-worlds>.

257. Gamification: see http://www.computerworld.com/s/article/9223627/Gamification_goes_mainstream.

What steps might be needed in the world of 2040 to ensure the security and integrity of information? Can there be such a thing as a completely secure information system? What backups might be required?

Given the increasingly wired and interconnected world in which the crisis occurs, what role does human action play in establishing trust in conveyed messages?

As the crisis subsides and Urlians turn toward a consideration of their future, what might they see as the preconditions required to ensure a more stable and healthy society? What steps might be required in moving toward this goal?

Throughout the crisis the network serves as a powerful coordination and decision support tool able to change the tasking and/or ROE of a multinational (Canada–Brazil) two-section patrol that is in contact. Yet it is clear that it can also be compromised. What sort of challenges (including trust issues) would be posed by such compromises to the backbone of the network? What sorts of “work-arounds” might be necessary?

Coalition missions have long been challenged by the existence of nationally mandated and significantly different ROE. This mission—decades in the future—is no exception. How might the differences or the challenges of different national ROE within a given theatre be reduced?

Robots offer solutions to many modern-day problems associated with ISR, force protection and logistics. What role should combat robots play in future operations? What are the risks, opportunities and benefits of arming robots? Are lethal military ground robots inevitable? How much autonomy should these robots have?

As the world in which the crisis occurs makes clear, distributed decision-making is greatly enabled by pervasive networking. Decision-makers can connect to the information they need on demand, which in turn enables true mission command. However, pervasive networking also implies the ability to reach any person in an instant, regardless of location, thereby facilitating more centralized decision-making. When might one or the other model be most desirable?

Urban littoral Asia is the setting for this scenario. Is an urban littoral setting the most likely potential zone for future conflict? Why or why not?

In a future in which organized crime groups have a level of influence and financial capacity approaching that of some nation states, can military and law enforcement agencies remain as separate as they are now? Will such a future force a more comprehensive approach that makes us challenge our current views regarding organizational roles and responsibilities?

Few of the members of the City Council seemed aware that something had changed. As the vast AR lettering appeared in the skies overhead, Council was in full session to debate other matters. Desai and her compatriots from the other nations of the coalition sat in the gallery above the round chamber; yesterday she had sat through an hour of wrangling over the details of the City's new plan to deal with the new riots and ongoing trust issues between the diverse members of the community. Their proposed solution was brutally simple: kick out the refugee farmers and stop paying the matching funds to the agricultural unions.

This proposal was far from universally supported. Many of the councillors had roots in the countryside; many more were moved by the humanitarian crisis and worried vocally that more people would die if they were pushed, with no financial support, back into the city's drought-ravaged outskirts. Nonetheless, the mayor had a majority of votes and the motion finally carried.

Desai glanced at the Brazilian and Indian commanders flanking her. "This could be over in five minutes if they'd let us speak," said the Brazilian commander.

Desai shrugged. The coalition representatives hadn't been able to contribute to the debate; all their potential sponsors on the council had been intimidated into silence, doubtless by the criminals Desai now knew were behind the power grab. "It doesn't matter," she said now. "I've given them some rope to hang themselves with. They should be picking it up—just—about—"

"Next order of business is to ratify the end of the military presence as part of the foreign aid mission to the city," announced the chairman.

"—now."

"Mister Chairman, these foreign powers must be held responsible for their criminal acts over the past days!" shouted a junior councillor. "I've just been informed that they've interrupted the distribution of food to the poorer neighbourhoods. Do we need any further proof that they intend to hoard it and sell it to the highest bidder?"

Other councillors joined in the shouting and several stood up to point at Desai and her colleagues. She sat stone-faced waiting for the other shoe to drop.

The commanders had debated long and hard about how to handle this situation. The local authorities had to be part of the solution, but they had been tricked and bullied into cutting the coalition out of their decision-making. They'd allowed the Aspirational City to be built in augmented reality, true, but that was only because they didn't understand what it was going to do to their power base. Desai believed that if she had presented their findings about the New Sweating Sickness to the local emergency committee, the councillors and mayor would have bought time until those responsible could escape.

She'd lost her direct links to the police, but the head of the police was here in the room, as were representatives from the plurinational government that was supposed to have ultimate authority in Urlia.

More importantly, the corrupt councillors whose actions indicated that they knew the source of the plague were here too. Distribution of the tainted food had to be stopped, but it was not yet time for the coalition to reveal that they knew where it was coming from.

Jamal Ludhi stood up right on cue. "Well, they're here now," he shouted. "I say we call them to account for their actions!"

There was a hearty cheer of assent, though Desai made note that certain councillors had suddenly fallen silent and were glancing about.

"Mister Chairman, I move that we demand an answer from Commander Desai for the theft of our food!" Ludhi continued. The response was an immediate cheer and, after a nod from the mayor, the chairman let the motion go through to vote. Moments later two burly policemen appeared to escort Desai down to the floor.

As she crossed the floor she had a good view of the gallery next to the one she had been sitting in. A wall had blocked her sightlines up top, but now she could clearly see the foreign faces in that other part of the gallery. Some of them had been identified, several were unknown, but their anonymity wouldn't help them today.

They were grinning. Good. They must think they'd won. Desai checked the coalition's overlay—fully secured now after the embarrassing data attack that had temporarily left the coalition vulnerable—and saw that all her people were in place. Her attention too focused for nervousness, she mounted the podium.

Jamal Ludhi stood again. "Commander Desai, could you please tell us why your troops have been intercepting and confiscating our food shipments?" He half-smiled and sat down, crossing his arms. His role in the plan was over.

"I can certainly explain," she said, and her words were instantly translated into the half-dozen languages used in council—and doubtless into several more for the gallery visitors. "We stopped those shipments because they were poisoned with an engineered molecular agent, known as a prion, which is the cause of the New Sweating Sickness."²⁵⁸

There was instant pandemonium, but through it she watched the suspect councillors. Three immediately bolted for the doors while two more sat silently and another was craning his neck to look back at the gallery.

Desai held up her hand and said, "It took us a while to find the source because you need to consume several different foods for the precursor chemicals to combine to form the prion. But all of the foods come from the same source, and therefore we believe we know who is responsible for the mass poisoning. Some of those responsible may be here in this chamber. Of course I have no authority to force anyone to remain here against their will, but I would like to ask you all to take note of anyone who tries to leave."

The people in the visitors' gallery next to the coalition's all stood as one and made to leave. The councillors who'd been heading for the exits paused; two kept going on out the doors and the third gave a nervous laugh and said, "My bladder, you know." But he didn't try to leave.

258. You are what you eat: see <http://blogs.discovermagazine.com/80beats/2011/09/21/what-you-eat-affects-your-genes-rna-from-rice-can-survive-digestion-and-alter-gene-expression/>.

The several guards posted at the doors—normally bored with city council security work—had been watching all of this movement with interest. They were talking now, as if to no one, speaking through their AR links to their commanders, no doubt.

“When did you learn this?” “Why haven’t you told us before now?” “How long have you known?”

“The link wasn’t clear until yesterday,” she said. “We have an effective treatment already, but we were forced to hold off on announcing our findings until we knew exactly where the contamination was coming from. That’s why we stopped the flow of food, and now we know.”

They were silent now, except for some sort of commotion around the gallery exit. The other leaders of the coalition force had risen and were going to intervene in what looked like some sort of fight up there.

The mayor had recovered enough poise to step up to the podium next to Desai. “Who is behind this?”

“The prion was manufactured in the vertical farms,” she announced.

“We will gladly turn our evidence over,” she added. “I’d prefer not to name any suspects in a public forum. We don’t want reprisals or revenge to happen outside of due process. We are taking steps to make the evidence available immediately through the International Criminal Court via the World Health Organization.”

“Thank you,” said the mayor, but with a glance up at the gallery he added, “I think you’ve answered my question.”



Brian Sokolow had emerged from the bathroom—instantly becoming cut off from Aephoria—and now he watched from his constrained vantage point high in the tower as thousands of citizens emerged into the streets. Had he been able to get to the transparent floor-to-ceiling wall that separated his floor from the boiling heat of the afternoon, he would have seen Urlia etched for him in light and texture, its details wavering from the thermals that blasted up from the street. He could only see the AR overlay of the aspirational city from his refuge in the toilet; from there he’d seen the model Urlia being pushed and pulled by countless anonymous hands, as arguments and proposals in the model’s forums turned into commands that ran the model forward and backward in time. Already, concrete agreements were appearing, ideas for change developing. Here, with only the partially visible physical city laid out below him, none of that was directly visible, yet surely the glimpses of people pouring onto the streets must represent the change that was radiating out from the peace councils and the new mechanism for change that the people had just been given.

Sokolow suddenly heard an odd sound; he glanced up and saw that three perfectly round holes had appeared in the plastic-like wall.

Wait a second—were those bullet holes?

He dove for the floor as more holes appeared in the ETFE Teflon wall and this time he heard the ricochets as the bullets hit the ceiling and slammed into the plant drums. He looked that way and blinked at a very strange sight:

The plants that poked out of the slowly rotating aeroponics drums were turning black. Like some sort of macabre fast-forward movie, the fronds were curling and withering as he watched. For a few seconds he just stared in fascination—maybe it was too many years of watching virtual realities unfold around him that kept him from realizing the danger—and then the fine mist of sulphuric acid pouring out of the aeroponics supply reached his nose.



“I think they knew we were coming,” Sergeant Harman hunkered down beside her vehicle as another line of machine-gun fire meandered across the concrete. It was coming from the top of the vertical farms’ high concrete walls. Her team’s weapons detection system²⁵⁹ had warned them seconds before the adversaries up there opened fire; as it was, a bullet had bounced off Harman’s calf. Luckily her liquid armour²⁶⁰ had absorbed the impact.

She and Bernardes had quickly disengaged from the unfolding riot upon receipt of new orders and had driven immediately to the vertical farms. Apparently this was the source of the disease outbreak and was also where the chaplain, Sokolow, was being held prisoner. Harman’s and Bernardes’s teams—and a squadron of armed UAVs—were the first on the scene. She knew other coalition forces should be on their way.

Coinciding with an auditory cue, “Your tacticals are being updated,” a flood of information flashed on Harman’s AR rig including both overt data and unconscious cues. The situation had changed—suddenly—and now it was clear that her team and Bernardes’s were trapped between hostiles inside the vertical farms and militias approaching from the city. Some of the militias were targeting the other coalition forces that were converging on the vertical farms; for the moment, Harman and Bernardes were on their own.

There was more. Running battles had erupted downtown as people in the employ of an organized crime ring found themselves exposed to their neighbours. It had something to do with the disease outbreak, but Harman didn’t have time to take that part of the story in. “The incoming force is going to try to join their pals in the farms,” she told her team. “Once inside they can settle in for a siege—Hell, they’ve got their own food supply and solar power.” If there was one thing she’d learned since arriving in Urlia, it was that the city would starve without the farms. “We need to keep them out.”

Bernardes laughed humourlessly. “This is an Alesia scenario.”²⁶¹

One of Harman’s soldiers, Seeley Jackson, barked a laugh. “Great. Now all we need is 60,000 men.”

The tactical AI had presented a broad set of options to Harman, including one she immediately liked. She initiated a request through the command network for the civilian police to give her emergency override on all unoccupied cars in the neighbourhood. The

259. See <http://www.dtic.mil/ndia/2008POST/Wed2/LeoVolfson/NDIABrief.pdf>.

260. Future liquid armour: see http://www.udel.edu/researchmagazine/issue/vol2_no2_security/superhero_technology.html.

261. Roman infantry tactics: see http://en.wikipedia.org/wiki/Roman_infantry_tactics.

Harman had been about to block the road entirely just below the overpass, but now she pulled her cars aside as the attacking trucks, cars, vans and ATVs roared past.

"They're too spread out," she noted.

"Then we'll cut them in half." Using aerostat²⁶⁴ feeds, Harman watched as the lead vehicles reached the top of the overpass and began descending. They were about a kilometre from her position now. Behind them, a flock of Canadian UAVs was descending to isolate the stragglers.

Suddenly the vans at the very centre of the overpass all lurched to the right and simultaneously dissolved into whirlwinds of scrap. The vehicles behind them slammed on their brakes and piled together, one bounding over the guardrail and 20 metres to the street below.

"Railgun?"²⁶⁵ Harman asked.

"Yes," said Bernardes. "Railgun."



A mist of acid had forced Sokolow to close his eyes. He'd dropped to the floor and was crawling now, hoping it was still in the right direction.

Suddenly a Hello-Kitty icon popped up in his AR visual field, waving in a friendly way. He almost laughed, but that would have meant breathing, which didn't seem to be an option right now. Another different symbol appeared and then a flood of them as his AR system connected to the outside world. He must be at the washroom.

He groped for the door and when he found it he swept it open and collapsed inside. The burning continued, but he'd noticed long ago that this little room had its own ventilation system because it smelled significantly different (if not better) in here than it did on the growing floor. He made it to his knees, grabbed the sides of the sink and stood to put both taps on full.

His esophagus felt like the time he'd had strep throat and he couldn't stop coughing—but he could text using AR's haptic interface, so as he ran water over his blistering hands and splashed at his face he sent a message to Coalition Command:

GANG IN V-FARMS PURGING SYSTEM WITH SULPHURIC ACID. KILLING ALL PLANTS.



Harman gritted her teeth. The enemy convoy had been split in two, but the lead half was only a block away from the farms now. They were firing ahead of themselves with smart bullets,²⁶⁶ which were veering over the rooftops of the warehouses and exploding in mid-air, driving Harman's and Bernardes's teams into deeper cover. They'd unleashed their

264. High-altitude airships such as Lockheed Martin's P-791: see <http://www.lockheedmartin.com/us/products/p-791.html>.

265. Navy Sets New World Record with Electromagnetic Railgun Demonstration: see http://www.navy.mil/search/display.asp?story_id=57690.

266. US Army XM25: see http://www.army.mil/article/66968/XM25_feedback_demonstrates_lethality/ and https://share.sandia.gov/news/resources/news_releases/bullet/.

EMP weapon at the whole street and disabled all of the cars she'd been sending at them. Of course, a dense triple-row of vehicles blocked their entrance to the farms, but the solution to that had already appeared; an exoskeleton²⁶⁷ in autonomous mode, essentially a big loading robot, had just thudded its way around the corner of the concrete security wall and was picking up cars and throwing them out of the way.

Sergeant Harman once again received a tactical overlay update with a new objective. She and Bernardes had just been lining up a firing solution to take out the loading exo-bot, but now things had changed. Securing bio-tech evidence inside the farm had become top priority. This was going to be difficult since there was at least one coalition hostage in there, though the AR overlay showed him safe in an interior room for now.

"Bernardes, leave the exo-bot alone. We need to get in those gates ourselves." While Bernardes cursed, Harman watched the detail on and in the vertical farms start to become wonderfully clear in her overlay. The surveillance UAVs, particularly the big blimps, had come to circle the complex and were using a range of sensing technologies ranging from T-Ray waves²⁶⁸ to Doppler radar²⁶⁹ to locate humans and discriminate between combatants and the unarmed. She had an excellent view of the top of the wall where a number of men stood with machine guns and anti-tank weapons.

"Bernardes, I'm going to send the dogs up the wall." She gave the order and several crowd control mechanical hounds loped out of the alley where they'd been hiding. Harman's team turned their rifles toward the top of the wall, firing rounds tuned to explode two metres above it. With this interdiction in place and the dogs employing their active denial effects straight up, the defenders were forced to hunker down or run. The dogs' gecko-inspired traction²⁷⁰ let them practically run up the vertical concrete wall and in seconds they were at the top and waving their denial systems back and forth to clear the surface. A second line of defenders deeper inside began firing at them, but they'd given Harman and her team a free hand. Harman's and Bernardes's sections raced out, and using the augmented strength of their own military exoskeletons, began hauling disabled cars away from the tall metal gate. When the enemy exo-bot saw this, it turned in a threatening way, and six guns were suddenly aimed at it. Somewhere inside the vertical farm its operator balanced his orders; clear the entrance for the incoming convoy—which the Canadians and Brazilians were suddenly helping him to do—or attack the sections. The exo-bot turned back to hauling cars.

The convoy opened fire, but the coalition soldiers were already on their way back to their vehicles. The convoy had to manoeuvre around the dead cars Harman had left in their way, but their field of fire was opening up again and they had enough firepower to destroy Harman's vehicles if they got a clear shot. While they closed in, the dogs were running down the inside wall of the compound, scattering defenders with every sweep of their emitters.

267. Robotic suit that amplifies human strength: see <http://www.scientificamerican.com/article.cfm?id=real-life-iron-man-exoskeleton>.

268. Terahertz detectors: see <http://www.wired.com/wiredscience/2010/07/terahertz-detection/> and http://www.robotictrends.com/research_academics/article/t_ray_technology_could_lead_to_powerful_sensors_for_robotic_medical_devices.

269. Seeing through walls: see <http://web.mit.edu/newsoffice/2011/ll-seeing-through-walls-1018.html>.

270. Gecko-inspired tank robot climbs walls: see <http://www.canadianmanufacturing.com/design-engineering/news/gecko-inspired-tank-robot-climbs-walls-video-46082>.

One of the dogs made it to the gatehouse and stood up on its hind legs to blast the interior with microwaves. The two men inside dove for the floor and the dog climbed over them. As Harman slammed the door to her vehicle, one of her section members took over the dog by telepresence²⁷¹ and used its camera eyes and hand-like front paw to find and press the right button.

The vehicle lurched forward into the convoy's firing zone. Just as Harman tensed for an attack, however, she saw the entire second-floor wall of the warehouse next to the street bow outwards and fall with majestic grace onto the convoy's lead vehicles.

"Railgun?" she asked Bernardes.

"Our ships don't have direct line of sight to the street, but they do to the building," confirmed the Brazilian section leader. "Don't worry; it was empty."

In a thunderhead of swirling dust, the coalition vehicles poured into the compound. Everywhere that a rifle muzzle or enemy's head appeared, the dogs instantly interdicted. The vehicles' active defence systems²⁷² took out several grenades in mid-flight and then they reached the loading docks and blew down their doors. Microwaves, noise and smart bullets made that an untenable position and Bernardes's men quickly secured it. Harman's overlay showed her the places where evidence might be secured: the quality control labs, the nursery, active floors and short-term storage. Some of these contained knots of people, but the enemy were disorganized now and lacked her team's discipline. Also, they clearly expected her section to be coming after them; the UAV's penetrating radar showed them barricading themselves into interior rooms. She wasn't here for them—not yet anyway.

"Let's secure the hostage—and the evidence," she told her section, and they moved into the complex's interior.



There was a polite knock on the bathroom door. Brian Sokolow sat on the toilet; he'd found it easier to take the cover off of its tank and simply dunk handfuls of water over himself. He could see a little now; the icons and text of his overlay were crystal clear, but for perhaps the first time he was contemplating what life might be like if they were all he could see. He didn't like the thought.

"Come in," he rasped. This might well be his executioner, he knew, but if it was, there was nothing he could do about it. The best he could do was complain that his work was being interrupted, as Archimedes had to the Roman soldier who'd come to kill him.²⁷³

The door handle rotated and the door opened, but what poked around it was nothing human, and as blurred and distorted by pain as his vision was, the sight made Sokolow shout. It was a black flat square mounted on a flexible neck, which in turn connected to a large dog-like body. One of the thing's front limbs was extended to hold the doorknob.

It held still for a second and Sokolow finally made out the Canadian Forces crest on its flank. He slumped back. "Ah," he said. "Rescue."

"The air is bad out here," the dog said—or rather, somebody spoke through it. "You can ride on my back, but we must get off of this floor immediately."

271. Telepresence robotics: see <http://news.discovery.com/tech/telepresence-robot-navigoid-111228.html>.

272. Reactive armour: see <http://www.economist.com/node/18750636>.

273. Death of Archimedes: see <http://www.math.nyu.edu/~corres/Archimedes/Death/Histories.html>.

“Amen to that,” said Sokolow. He climbed on its back, feeling like some kid at a pony ride, and as he held his breath and his eyes shut, it trotted through the sulphurous cloud and made the two left turns that Sokolow knew would lead them to an interior stairwell.

Through the pain, Sokolow’s thoughts turned to the brilliant young researchers he had once met at DRDC’s laboratories in Toronto who were working on biomedical nanotechnologies.²⁷⁴ He recalled marvelling at the prospect that such technologies could repair severe battlefield trauma—though he never imagined that he might come to need such intervention.

They banged through doors that had been locked to him for days, and as they shut again behind him, he heard someone say, “You can open your eyes now.”

He blinked at the sight of Namvar and the local mullah Kermani standing on the concrete steps.

Namvar extended his hands and said, “We can help you home now.”

DISCUSSION

Given the level of suspicion generated in the crisis between locals and foreigners, how might they best work together to help ensure a better Urlian future? (e.g. in terms of foreign nations and organizations assisting Urlians, and in terms of Urlian relations with foreign entities as well).

As the crisis nears its climax, the Commander announces that she is delivering evidence of criminal activities to the ICC (International Criminal Court) and the WHO (World Health Organization) and not to the local or national police forces. What other options might be available to a commander who is unable to trust foreign (including host nation) police forces?

Given the scenario presented, where is the CHERT commander best positioned to positively influence the operation? Might it be with local leaders in the local city council chambers, with her soldiers engaging the adversary or somewhere else?

In this chapter, soldiers are able to minimize collateral damage using capabilities that allow them to “see” into the interior of urban structures and engage with energy weapons, non-lethal weapons, and smart bullets. What mix of weapon systems might the CF require in the future to neutralize adversaries while protecting civilian populations in dense urban environments?

Combined operations often involve challenges arising from conflicting degrees of situational awareness, competing national agendas and even disparate rules of engagement. In this story, ROEs and tactical overlays are distributed, and redistributed in an instant across the coalition. What sorts of technology might be required to achieve similar degrees of situational awareness and understanding across a multinational force?

274. Biomedical Nanotechnologies: see http://www.onboard-technology.com/pdf_settembre2005/090512.pdf.

“If you had to say what you were proudest of right now, what would it be?”

Hazir Rumay sat with Lieutenant-Colonel Desai at a rooftop café overlooking the Indian Ocean. The sun was blocked by one of the vast white sails that thrust above the skyline, but otherwise the sky was blue and clear. There was enough fresh water from the mud flats to run some outdoor air conditioning in places like this. It was expensive, but Rumay’s colleagues were eager to show that Urlia was back in business.

“Proudest of?” she mused. “Right now?” She swirled her tea in its glass, watching the water beading on its side. “I’d have to say,” she said at last, “it’s that nobody knows what’s going on.”

Rumay sat forward. He’d been relaxed and contemplative himself and this was the last answer he’d expected. “What do you mean?”

She waved at the vista of the bustling port. “It’s a dangerous illusion to think that you know what’s going on. It compromises your ability to make sound decisions. I think the people here have begun to understand that whatever understanding they have of their city and its situation, it can only be partial. Which doesn’t mean that the city is not understood—just that no single person can do it.”

“Ah,” he said, “this ‘collective intelligence’ thing.”²⁷⁵ I’m not sure I trust it.”

“It’s really distributed cognition,”²⁷⁶ she said. “Like those ships.” She pointed to the ocean where sails dotted the blue. “Old-style navigation, before GPS, used to be a team effort. No one person had all the information or instruments to do shoreline navigation. Rather, knowledge and cognition was distributed across objects, individuals, artefacts and tools in the environment. It wasn’t just the collection of data that was distributed among them; they performed different *cognitive* tasks. Distributed cognition.”²⁷⁷

“Well, when I was a boy, we sometimes watched Western movies about computers taking over the world,” said Rumay. “Skynet. Remember Skynet? Or the Borg? Computers were supposed to become smarter than us and then start doing our decision-making for us. Sometimes I wonder if that’s what’s happening here.”²⁷⁸

She shook her head. “Back when they made those movies, they were not thinking of decision-making as a distributed process. So they couldn’t see that computers could

275. Collective intelligence: see <http://www.collectiveintelligence.net/>.

276. Distributed cognition theories: see <http://www.learning-theories.com/distributed-cognition-dcog.html>.

277. The theory of distributed cognition was introduced by Edwin Hutchins in his influential book *Cognition in the Wild* (MIT Press, 1995): see <http://mitpress.mit.edu/catalog/item/default.asp?tttype=2&tid=6047>.

278. Smarter than human intelligence: see <http://singinst.org/overview/whatisthesingularity/>.

augment human decision-making without replacing it. I mean, that's what voting is, right? A distributed decision-making process. We've just taken that and perfected it."²⁷⁹

"Thus," he said, "that?" He waved at the sky where the influence maps of the Aspirational City hung in a blazing wheel over the real Urlia—if you looked for it in the right AR overlay.

Now that the city government was restored, the gunboats had left the port, and as the circles of consensus and strategic plans widened out from the initial councils like ripples in a pond, SMART found its mission was over. Not everybody had won; the farmers still faced an uncertain future as the market for their products dried up. It was glaringly obvious now that no single entity could be allowed to control the vertical farms—but it was equally clear that the city would starve without them.

The Aspirational City,²⁸⁰ a view of Urlia as it *might* be, had become the forum for the city's citizens to work out their differences. It was the invisible made visible, coupled with sophisticated dialogic decision-making processes—a new model for 21st century governance.²⁸¹ Nobody yet knew what to make of it, but violence was abating, the neighbourhood militias were finding themselves less necessary and entrepreneurs loved it. Aephoria had made inroads to the local culture as well, though many people were still suspicious of a virtual nation that hid its ultimate affiliation and made its virtues visible only through charitable action. Brian Sokolow was a tireless advocate for this way, though, and people did not forget that he had helped bring the current peace about.

Back home the Urlia committee was being dissolved. The final troop pullout was tomorrow; today was Desai's last opportunity to do exit interviews. She'd scheduled Rumay's as the last, and he wasn't strictly speaking, one of her priorities. There were hints, though, that Rumay should be watched closely, for he was exploring a new kind of relationship; he'd gone into business with the mud flats, partnering with a non-human entity to work on ecosystem rebuilding.

In the end, Desai's strategic reasons for being here didn't matter; she liked Rumay and she had a little time—so here she was.

"No one knows what's going on," she said again. "But together, we all do. Complexity can be managed, but your rampaging computers could never do it any more than a single human dictator could. You need perception, analysis and decision-making to be fully distributed in a complex situation or else you can't manage it."

"But that's simply not true!" Rumay sat up straight and frowned at her. "You yourself made crucial decisions that changed everything. You are trying to hide your contribution, colonel."

"Ah," she shrugged. "Maybe a bit. The decisions ultimately had to be made by the people, and I was only one of many at the centre of the network. But you know, democracies would sometimes vote in a dictator in times of crisis to simplify the chain of command and make everything clearer for a while. There was a little of that in Urlia, I'll admit." You could swap a dysfunctional system for a working one, at least temporarily—and the

279. MIT Centre for Collective Intelligence CoLab: see <http://climatecolab.org/web/guest;jsessionid=C598C555351858244AA62ADDA1744AE9>.

280. Group influences: see http://www.sykronix.com/tsoc/courses/cb/cb_grp.htm.

281. Collaborative decision management (CDM): see <http://www.purustech.com/wp-content/uploads/2011/01/cdmwhitepaper.pdf>.

comprehensive approach did that. “Ultimately, though, it’s about understanding—not control.” She nodded again at the city. “Urlia’s back to what it was—a maze of competing interests, ethnic groups, languages, power blocs... Only this time—it’s working.”

“For now,” said Rumay.

“Now is all we really have,” said Desai. And together they turned to watch the patterns of the city unfold.

— END —

DISCUSSION

In this chapter we see evidence of a lack of trust in the integrity of the network among Urlian residents. We also see mention of the potentially good value of a dictator during short emergencies. How can human trust in the network best be achieved, and how can the appointment of dictators (and the influence of crime syndicates) best be avoided? To what extent might it be possible to guarantee that the network will remain immune from tampering or co-optation for negative purposes?

What advantages and disadvantages accompany the use of collective intelligence tools? (e.g. for decision-making, for development of democratic governance, etc.)

What are the strengths and weaknesses of a comprehensive approach to operations? How—if at all—can weaknesses be minimized?

Can Urlians develop an effective local comprehensive approach? What are the obstacles that would face Urlia in doing so?

What does the security environment of 2040 suggest about risk in policy and in operations? What are its implications for effective leadership?

“PEACE CANNOT BE KEPT BY FORCE;
IT CAN ONLY BE ACHIEVED BY UNDERSTANDING.”

— *Albert Einstein*

APPENDIX

THE COMPREHENSIVE APPROACH

In a world where conflict often involves a myriad of ethnic, religious, ideological and material drivers, an ability to bring to bear all instruments of national and coalition power and influence (e.g. diplomatic, informational, military, economic – DIME) on a problem in a timely, coordinated fashion is essential to achieving effective results. So too is an ability to address and, if possible, constructively engage the views and reactions of the public—both domestic and international as well as the media—in support of operations.

Canadian Forces (CF) acknowledgement of the need to interact with other entities (both official and non-official) and, if and when possible, practice a more coordinated and holistic approach to operations is ever more evident and pressing. Accordingly, Department of National Defence (DND) leadership—both civilian and military—are increasingly calling for the adoption of a force that takes a “comprehensive approach” to operations.

Yet what precisely is a comprehensive approach? Why is this important in the emerging security environment? And how can such a capability be achieved?

The comprehensive approach derives heavily from “whole of government” and 3D+C (i.e. defence, diplomacy, development and commerce) philosophies articulated and advanced at the national level in recent international and defence policy statements. These philosophies call for bringing previously separate agencies into closer collaboration in achieving policy objectives. In fact, a comprehensive approach aims to operationalize the goal that these philosophies identify. Indeed, it involves developing a capacity to interact with such players in a cooperative, constructive manner.

Military interest in the approach reflects a growing belief in the importance of achieving greater interoperability and collaboration among key players in the operational arena as well as in the development of the requisite networking capabilities and skills essential to achieving one’s objectives. Yet even more fundamentally, it stems from a growing consensus that outward-focused, integrated and multidisciplinary approaches to security threats and challenges must be the norm given the complex problems and challenges posed by an increasingly multidimensional security environment.

Movement toward such an approach is already underway. Especially noteworthy are Canadian Army initiatives aimed at developing a force that is more joint, interagency, multinational and public (JIMP)-enabled.

To be “JIMP-enabled” entails the adoption of an approach to operations based on a belief in the requirement to adopt a comprehensive approach to problem solving that involves the holistic consideration—and ideally the coordination and cooperation—of all relevant players that inhabit the broad environment in which military operations take place. It demands a willingness to actively engage other players in a cooperative, collaborative relationship, an awareness of the potential impact that an organization's actions have on other players and on the likelihood of achieving strategic objectives, and the development of capabilities that support and promote such action and awareness (e.g. in areas such as personnel, leadership and individual training; infrastructure, environment and organization; information management and technology, etc.).

In essence, the JIMP-enabled concept offers one means of constructing a CF-wide comprehensive approach to operations. Indeed it does so from a distinct land operations perspective—calling for the need to interact with both the organizations and agencies of governments as well as private groups, publics and non-governmental organizations and agencies.

To these ends, investigation of what the land element requires to become more JIMP-capable is underway. And while investigations are at an early stage, a number of needs are clear over six broad areas:

Personnel, Leadership and Individual Training

- ♦ The JIMP concept must become pervasive throughout the Army and receive active endorsement from Army leadership.
- ♦ JIMP-oriented education, training and professional development programmes must be established.

Research and Development and Operational Research

- ♦ Allied approaches—and past CF practice—must be investigated (e.g. development of the comprehensive approach in other nations, study of PRT experiences, examination of Army lessons learned).
- ♦ R&D and operational research participation must be effectively harnessed to address JIMP issues (e.g. “swift trust” experimentation).

Infrastructure, Environment and Organization

- ♦ Minor increases to force size and composition (in line and staff structures) must be considered and if required, undertaken.
- ♦ The Army must increase the role and profile of liaison officers.
- ♦ Exploration of the possibilities for non-military personnel (agencies and publics becoming permanent and non-permanent fixtures to military structures must be undertaken.

Concepts, Doctrine and Collective Training

- ♦ The continental staff system and CIMIC doctrine must be leveraged to develop the JIMP concept.
- ♦ The JIMP concept must be embedded within the Canadian Army.
- ♦ It must become a central component of collective training.

Information Management and Information Technology

- ♦ Communication and networking underpin the JIMP concept and as such must be enhanced.

Equipment and Support

- ♦ Connectivity must be pursued as a key JIMP enabler.
- ♦ Equipments, processes and procedures required for facilitating JIMP connectivity must be investigated.

Especially important is the need to reach out to those other players that make up the JIMP environment, actively engaging them in exploration of the possibilities that exist for collaboration and cooperation, the best ways of achieving it and how best the Army and the CF as a whole can aid in facilitating it.

To be sure, all such efforts aimed at operationalizing a comprehensive approach may encounter obstacles. Given the diversity of organizations and agencies that characterize the security environment—each with its own culture, mindset, biases and capabilities—bottlenecks and resistance are bound to arise. The need to connect with publics in a clear, constructive manner will be equally, if not more, challenging. Doubts may even surround the inherent wisdom and utility of such an approach itself—with concerns ranging from scepticism as to whether it can yield truly measurable and meaningful results, to fears over the potential negative reactions that could possibly flow from military-led efforts to promote it.

Yet while worth heeding, such obstacles need not come to pass. Pursued carefully and creatively, efforts to adopt a comprehensive approach to operations hold considerable promise—offering a much needed and viable response to the emerging security environment and the challenges that it is likely to pose in the years ahead. The ultimate result could well be a force capable of ensuring that prospects for interaction between the CF and various other agencies and organizations not only increases, but that such interaction is also more cooperative, constructive and useful—not only to the military but to all those involved.

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Military leaders have acknowledged the strategic merit of building rapport and establishing cooperation with the religious segment of society as critical to the accomplishment of mission mandates. Under the authority of commanders, chaplains can contribute to meeting operational objectives through engaging religious leaders and their faith group communities.

Religious leader engagement (RLE) is a new capability concept under development. Religious leader engagement factors well into operational initiatives as a subset of key leader engagement (KLE), resonating with the emphasis of civic engagement within theatres of operation. In recent years the joint, interagency, multinational and public (JIMP) construct has emerged as the principal strategic lens through which to view the complexities of the operational environment known as the comprehensive approach. Based upon JIMP, the Army descriptor of the comprehensive approach environment, RLE sees chaplains engaging leaders of religious communities within the “public space” of indigenous populations.

The primary defining characteristic of terrorist activity today is the religious imperative. Since the early 1990s the only phenomenon to outdistance the increase in numbers of terrorist groups has been the steady growth in the percentage of these groups that hold to religious extremism as their driving force.

Today’s unprecedented co-optation of religion as a means of deepening existing cultural and political fault lines, aids in fuelling the justification of militancy and terrorism, embracing violence as a divine duty or sacramental act. Holding to markedly different notions of legitimization and justification than their secular counterparts, these organizations indulge without compunction in greater bloodshed and destruction than terrorist groups with solely a political agenda.

Adding to the mix are religious authorities, who, according to Pauletta Otis, “with their incendiary language, contribute to the congealing of adversarial identity markers, exacerbating the polarization of communities even more.”²⁸² In such instances, the impressionable and uninformed come to experience religion as a combination of misinterpreted sacred texts imparted via clerics claiming to speak for the divine. Such sacralizing—a veneer of religiously sanctioned dictums to rationalize aggression—becomes a powerful inducement to engage in violence against rival ethno-religious groups.

In recent decades religious violence has become particularly aggressive and relentless mainly due to a strategy of elevating religious images to the realm of divine struggle, thus creating in the minds of ardent followers the spectre of cosmic war. Harnessing such emotive themes is the mainstay for many waging worldly political battles. Today, extreme religious expression has given terrorism remarkable power through spiritualizing

282. “Religion and War in the Twenty-first Century,” in R. A. Seiple and D. R. Hoover (eds.), *Religion and Security: The New Nexus in International Relations* (Lanham: Rowan and Littlefield, 2004), 20.

violence. Indeed, recent experience suggests that parties driven by ethno-nationalist/separatist, religious and quasi-religious beliefs and causes may undertake and prosecute conflict with a degree of purpose and intensity that confounds material-based and generally Western notions of rational action.

Paradoxically, although exploitive leaders frequently appeal to religious identity to stir ethnic and tribal division, religion may also be invoked as a means of transcending differences and unifying rival tribes. In this vein, there is a growing body of literature emerging around religious and strategic peacebuilding.

It is not inconsequential that a number of the organizations calling for greater religious involvement in resolving conflict are secular in orientation. One such example bears mentioning. In their recent publication, *Religion, Conflict & Peacebuilding*, United States Agency for International Development states, “inattention to religious identities or to the views and aspirations of religious leaders may result in mischaracterizations about what the conflict is actually about or how likely it is to become violent.”²⁸³ The document further underscores the undeniable influence religious leaders have within their communities as well as the integrity and authenticity of religious themes and organizations in the midst of conflict.

The Canadian Army’s newly released counter-insurgency operations manual states, “In all cases, the indigenous population is the primary centre of gravity because no insurgency can survive amidst the hostile terrain of an unreceptive public.”²⁸⁴ It is no coincidence that charismatic religious leaders are categorized as having the capacity to shape moral opinion in the public domain—significant centres of gravity within local populations. In societies where western influence is limited, religious communities remain prominent in community life, and in some instances, in government.

RLE stands as an enhanced capability for chaplains. Religious leaders in their own right, more than any other contingent member, have a natural rapport with their local counterparts. Civic engagement among more tolerant religious leaders and their faith group communities offers a means of accessing a large sector of society that may be apprehensive of “Western” approaches.

Those of tolerant voice are faith group leaders—community leaders—often desirous of moving beyond conflict. Known as “middle-range actors,” they enjoy the confidence of the grassroots while moving freely at higher levels of leadership within their own communities.

Chaplain Branch leadership is presently implementing training that will prepare deploying chaplains to engage religious leaders and their communities on a number of levels. In concurrence with command directives and mission goals, future operations will see chaplains networking among local religious leaders more intentionally, establishing communication and engendering trust.

Religious area analysis will be one of the skills chaplains will bring to theatres of operation, affording commanders greater insight into the religious life of their area of operations. As members of key leader engagement teams, chaplains will converse with the religious leaders present. Such authentic engagement facilitates dialogue where, over time, genuine needs of the surrounding communities may be identified leading to more

283. Office of Conflict Management and Mitigation, Bureau for Democracy, Conflict, and Humanitarian Assistance, United States Agency for International Development, September 2009, 3.

284. B-GL-323-004/FP-003, *Land Force Counter-insurgency Operations* (13 December 2008), 5-16.

intentional partnering with CIMIC or other government departments/agencies, NGOs, etc. Such programme development serves as a crucial link in the security-development nexus.

In time, more seasoned chaplains will be equipped to initiate peacebuilding activities. Chaplains have been known to facilitate inter-communal dialogue across ethnic boundaries. Interfaith events and, in some instances, collaborative activities in development have resulted, creating greater cooperation and the easing of tensions. It is the repeated acts of cooperation in achieving common instrumental goals that sees greater trust emerge, an indispensable element of reconciliation. Such cooperation among local religious leaders and their communities over the long-term may function as “shock absorbers,” preventing the manipulation or abuse of religion to escalate conflict or tensions.

The peacebuilding activities of chaplains among estranged religious communities may be described as conflict transformation. Discerning superordinate goals—achieving together what could not be accomplished alone—pertaining to community needs goes to the heart of joint activities. Continual consultation with command is imperative with such initiatives. Selecting the appropriate shared project is critical if such inter-communal cooperation is to be transformative. Programme parameters and funding capabilities must fall within mission objectives, affording both continuity and long-term sustainability if such initiatives are to be effectual and credible.

Through inter-communal cooperation of this nature, an identity more inclusive of the other has occasion to take root, precipitating greater integration among communities. In such an atmosphere, conflict is transcended, new narratives are written and the healing of memory begins.

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