A novel approach to handling mass refugee situations in the United States

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Introduction

This document outlines a low cost ICT/training approach to handling millions or tens of millions of domestic refugees in the event of a natural disaster, epidemic, industrial accident, WMD or other event. The basic building block of this response is a low cost building called the Hexayurt which can be rapidly manufactured and assembled using common materials by semi-skilled teams. We then proceed to show how these simple, high quality shelters can be distributed and sited in a way which enables the non-displaced population to seamlessly absorb the displaced people at minimal cost.

Hexayurt Properties

A hexayurt is a 166 square foot "microbuilding" assembled from one to two dozen 4' x 8' panels. These panels are typically off-the-shelf polyisocyanurate building insulation boards, as commonly found at Home Depot and other building supply outlets for around $15 ea. Harsher climates and longer term use requirements can be met by custom runs of this material. The building geometry is extremely simple: the roof is made from half-panels, and the walls are made from full panels - an entire building requires only six straight cross-panel diagonal cuts. There are no framing timbers or other structural components. The pieces are then joined using an off-the-shelf 6" wide 600lb breaking strain industrial box closure tape or a custom adhesive. The entire process - from panels in a truck to a finished building - takes about two hours the first time and more like one hour with an experienced team of five or six. The design is in the public domain so can be used by anybody.

Shelter for One Million Families

One hexayurt can house a family group of up to five people. Building and siting one million units in three days is achievable at a cost ballpark cost of under $700,000,000 ($120 per head) given preparation, training and supply chain management. The notion is to use these buildings as “guest quarters” for refugees, to be added to existing family homes that provide hospitality and infrastructure.

Manufacturing the Hexayurts

The materials cost for each hexayurt is around $200 for very basic temporary units, through to about $600 for long-term high durability units. Cutting a factory-quality hexayurt takes about two hours with a single table saw, or about 30 minutes with garage space, two saws, timber jigs and a small team to cut, move stock and finished panels. Pre-assembling the walls and roof into a folding unit takes about another 30 minutes for a second team of three to five people. A unit built this way can be assembled on site in about an hour by a team of three. Each shop requires well under $1000 of equipment and can produce around 50 units (housing for up to 250 people) per day assuming three shifts. Note that the manufacturing capacity costs are around the same as two units.

Given these figures, manufacturing one million units in two days requires 10000 shops. Equipped from scratch, this is $10,000,000 of capital investment. However most of the required equipment is already in widespread use - table saws and 2x4 - so most of these shops would not have to be set up from scratch. Indeed, in a real disaster situation, the goal would be to press all available capacity into service.

The materials themselves, at over-the-counter prices, would cost $600,000,000. Polyisocyanurate boards are in common use all over the country in the building industry, but the total volume available in the supply chain, and latency for further manufacture on an emergency basis has not yet been researched. It is likely that the various manufacturers of these products could stockpile the liquid chemicals required and step up production in a crisis. Another issue is tape - 6" wide bidirectional filament tape is widely available but not widely used. It may make sense to simply stockpile the required tape all over the country.

Staffing the Manufacturing Operation

The Red Cross training courses all over the country. Adding an "emergency shelter" training course, where volunteers are trained and certified to manufacture, site and assemble hexayurts and similar building systems, seems like a reasonable way to build local capacity. People with the certification could additionally register as having a shop with a “crew” – a staff like a volunteer fire department – who could manufacture units at a given capacity if materials were available.

To have 10,000 shops ready in the area around a disaster seems unrealistic at first. However, with the exception of the Mid West, cities cluster. A multi-year program to build local capacity could easily find

5,000 shops in most major cities. In a crisis, capacity close to the disaster is activated first. The trained staff of each shop would be augmented by other, unskilled volunteers who would pick up basic skills on the job.

Siting the Buildings

Buildings should be put up in the back yards of ordinary American families. The infrastructure requirements of one million families cannot be effectively met by large, centralized facilities. However, existing oversupply is so large that, for many Americans, providing a place to cook, shower and watch TV for a guest family in an emergency would not only be no hardship, but a welcome opportunity to participate.

However, it is unrealistic to expect this kind of meeting of overcapacity and need to happen 'on the fly' when considering mass evacuation. Therefore a national register of families willing to site American refugees in their back yards would be created: a centralized GIS database showing locations where hexayurts could be sited would be created and, in the crisis, individual evacuation maps would be prepared.

The first step is that the GIS marks off the areas which are effected in the disaster, and a first estimate of the refugee population is made. Secondly, information about local transport conditions is added: if major highways are out, they would be taken off the map. Finally, the system begins to identify the "closest" sites for hexayurt placement based on a transport-driven distance metric, rather than simply distance. These homes are contacted by an autodialer or SMS message and an automated system asks if they will be there to help receive an incoming family.

This "readiness roster" is then passed to a second system which communicates with the manufacturing shops; shops in each area are married to a set of sites and, as units come off the local production lines they are transported by pickup truck (one truck can take 5 units) to the home sites, where neighbors assemble them and wait for the refugees to arrive. I would foresee an additional "transport corps" which would help take refugees from centralized pickup points to their interim homes.

The requirement for databases with cell phone access to manage this entire process cannot be overstated. Although clearly a backup system based on paper is possible – maps printed off at a centralized location and then flown into the disaster zone and handed out to refugees – the challenges in keeping basic communications available and building robust interfaces to the planning databases are likely a lesser challenge.

Managing the Supply Chains

In order to smooth this process, every American should be issued with a debit card akin to the FEMA cards or prepaid debit cards as commonly used. These cards should ship in the "deactivated" condition. When a crisis happens, the cards should be enabled either nationally (in the event of a huge crisis) or locally – for example, turning on all the cards for a given set of zip codes. All the cards for people on the rosters as either manufacturing hexayurts, hosting refugee families, or otherwise providing services should also be enabled, with balances reflecting the expected expenses incurred by each group. For example, a manufacturing shop could easily go through $30,000 of building materials in two days and should have credit available to this task. This "pay as you go" approach to managing the supply chains has multiple benefits including empowering individual Americans to help themselves, and working smoothly with existing supply chain systems in place in building supply stores.

Because these cards are issued in peace time to individuals, and have strong identity information attached to each one, it should be possible to track fraud and abuse. It should also be possible to call an automated service and requisition additional card capacity so that, for example, an individual traveling in the disaster area can call in, activate their own card, and get out of trouble.

The Hard Case

This entire approach involves using overcapacity in the national system to cover Americans affected by disaster. However, in a bigger disaster, the national communications and electrical infrastructure may simply be unavailable. What then?

In these scenarios, local stockpiles of tools, material and information provide the only hope of effective local grass roots response. For example, schools could be nationally understood as being gathering points for planning groups, and school busses could drive their normal routes at all hours of the day and night to provide transport to these aid hubs. The Hexayurt infrastructure package for the developing world includes heating, electrical lighting and various other essential services and an upgraded version of this package could be manufactured and stockpiled for use in crisis conditions in the United States.