Title: Empowering the Indigenous Church through Appropriate Technologies: Enabling Simple, Low-cost Flight through a University-NGO Partnership

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Abstract:

Effective transportation enables communication, commerce, and critical services such as medical care. In rugged jungle areas beyond roads, hiking a few miles requires a long day of grueling exertion. In contrast, a 30 MPH powered parachute accomplishes this travel in minutes with greater payload than possible on the trail. The Indigenous Peoples Technology and Education Center[1] (I-TEC) works to empower the indigenous church to fulfill the great commission. I-TEC was founded by Steve Saint, son of legendary martyr Nate Saint, to assist indigenous peoples like the Waodani Indians he grew up with. I-TEC's past projects include visual training modules, backpack dental chairs[2] (now in use in dozens of countries), and powered-parachutes for transportation in frontier areas. Placing flight into the hands of a tribe perceived to be stone-age may appear ludicrous, but the Waodani have safely maintained and operated their own powered parachute for hundreds of flights over the last several years. Compared to conventional "bush planes," powered parachutes provide ultra-stable flight characteristics, simple controls (up-down and left-right), and extremely short landing distances.

Beginning in 2005, LeTourneau University senior design projects[3] began assisting I-TEC with the design of a next-generation powered parachute[4] for indigenous peoples, which combines both ground and air capabilities with a drastically increased payload and passenger capacity. The first-year LeTourneau senior design team designed, built, and ground-tested an entire concept vehicle. The second-year project focused on a mast system to eliminate ground contact by the ram-air parachute-wing and reducing take-off distance. A student design team member who interned with I-TEC over the summer is named as an inventor on the patent application for the revolutionary single-pole carbon-fiber mast design. I-TEC's latest driving-flying powered parachute design recently received FFA clearance for flight testing. The projects been occasion for students visited I-TEC's hangar in Florida, for Steve Saint visiting campus multiple times, and for numerous phone conferences between students teams and I-TEC personnel. The ongoing relationship between LeTourneau and I-TEC has proven an extremely effective vehicle to involve students in global thinking, missions thinking, and viewing themselves as potential world-changers.

Understanding the context in which the I-TEC powered parachutes will be used poses a major challenge to these student design projects. This is not surprising, since international humanitarian organizations are routinely confronted with needs in environments not commonly encountered by main-stream engineering practice which are in environments unfamiliar or "frontier" to engineers in industrialized nations. In order to properly understand the context of use, the student design teams have applied a relatively new design method created specifically for this type of *frontier design* project, a project beyond the experience and expertise of the designers. This "Contextual Needs Assessment[5]" method guides customer interviews to elicit and organize as much contextual information as possible. The

results of applying the frontier needs assessment method continue to be profoundly important for correct need definition and design decisions.

This paper establishes the case for powered parachutes as an "appropriate technology" for indigenous peoples in certain areas, traces the history and current status of the I-TEC powered parachute design project, and highlights the role of the LeTourneau senior design projects in assisting with this effort. The contextual needs assessment procedure and results will also be presented.

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[1] www.itecusa.org
[2] http://www.itecusa.org/pds.htm
[3] www.letu.edu/ppc
[4] http://www.itecusa.org/itec_005.htm
[5] Green, M.G., Enabling Design in Frontier Contexts: A Contextual Needs Assessment Method with Humanitarian Applications, PhD Dissertation in Mechanical Engineering, 2005, University of Texas, Austin.