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2 November 2007
BY E-LODGEMENT

Dear Sir / Madam

Presentation on Miniaturization of Blood Pumps
International Society of Rotary Blood Pumps Conference in Sydney

Attached is a presentation being given today at a conference being held in Sydney by the International Society of Rotary Blood Pumps.

The presentation provides information regarding the Company's next generation pump, the MVAD.

Yours faithfully

David McIntyre
Chief Financial Officer &
Company Secretary

HeartWare Limited

Miniaturization of Wearless Blood Pump Technology

Jeffrey LaRose,
Charles Shambaugh
Michael Ashenuga

International Society of Rotary Blood Pumps
Sydney, Australia
2 November 2007

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Blood pump design constraints

- Therapeutic Support => capacity for patient population
- Hemodynamic Compatibility => high & low blood shear limits
- Reliability => resistance to wear out
- Implantation Method => device size & cannulation
- Efficiency => heating & battery change interval
- Economics => manufacturability

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What does "significant" miniaturization mean?

- Selected full output, wearless HeartWare® LVAD as size reference – 50 cc
- Arbitrarily define "significant" miniaturization as a minimum of 2/3 volume reduction – device volume < 17 cc's
- Maintaining requirement of full output and mechanically wearless design

Is "significant" miniaturization possible?

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Where to start?

Types of full output, wearless rotary LVADs:

- Centrifugal pumps –requires a sufficiently sized volute to convert kinetic energy into "pressure"
- Axial flow pumps – requires upstream and downstream support structures for axial and/or radial support
- Mixed flow pumps – none known

Focused on axial flow pump and removing supports as opposed to developing a very compact and efficient volute

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Miniaturizable, wearless axial flow blood pump with hybrid suspension

- **Axial constraint with strong magnetic coupling** between stator and motor magnets – small motor air gaps (minimize distance between magnetic poles and stator) and large motor embrace (maximize magnetic flux area)
- **Radial constraint with hydrodynamic forces** – new blade design (sufficient surface area for bearings) with tight control of diametrical clearance (minimize radial loading but allow sufficient surface washing)

Upstream and downstream support structures may be eliminated with passive magnetic and hydrodynamic support

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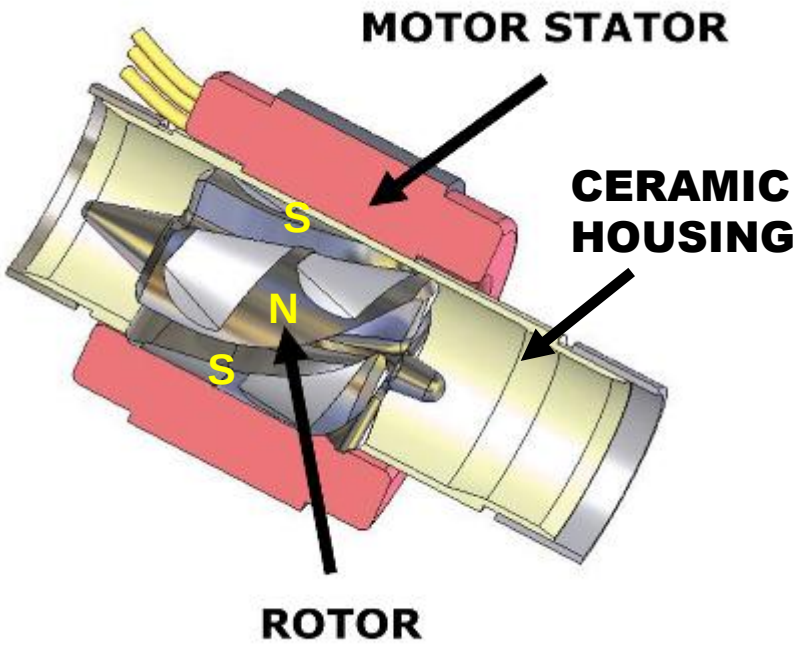
Wide-blade, axial flow blood pump

- ***Wide-blade, axial flow rotor*** to (1) move magnetic poles close as possible to motor stator, (2) provide large motor embrace, and (3) contain sufficient blade tip surface area for hydrodynamic thrust bearings

- ***Ceramic rotor housing*** to (1) reduce eddy current losses, (2) provide a thin, durable structural wall, and (3) allows high precision on ID for good thrust bearing performance

- ***Conventional stator design***



A "wide-blade rotor in a tube"

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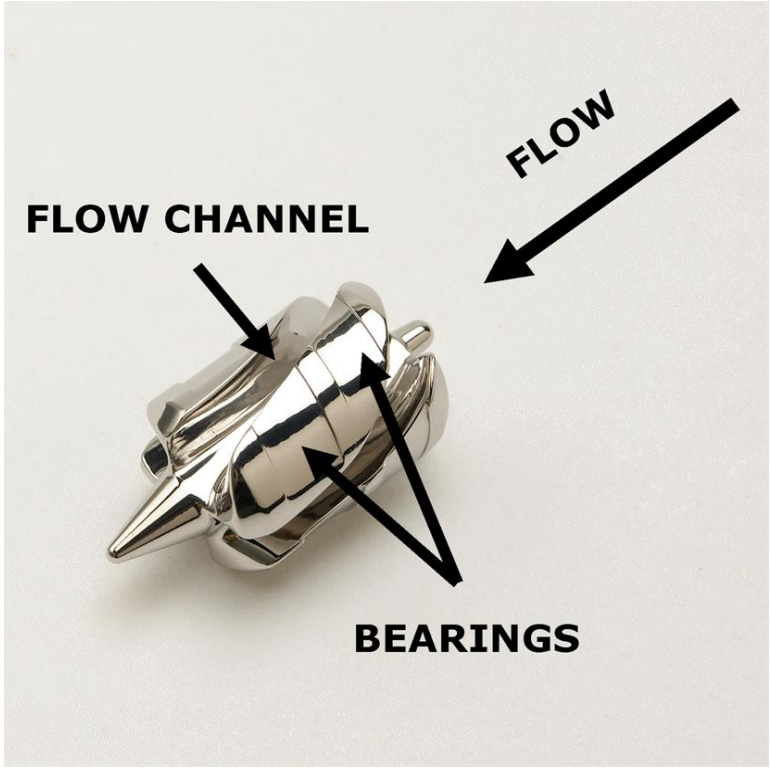
Wide-blade, axial flow rotor

- **A magnetizable, biocompatible, abrasion-resistant, platinum alloy is a significant enabling technology**
  - » *Magnetic strength comparable to rare earth magnets encased in thin titanium shell*
  - » *Machineability – rod stock for auto-feed*
  - » *Polishing – automated polishing*
  - » *Abrasion resistant - no need for protective coatings such as TiNi or DLC*
  - » *Cost – small quantity of platinum required and scrap is recycled*



No rotor subassembly required!

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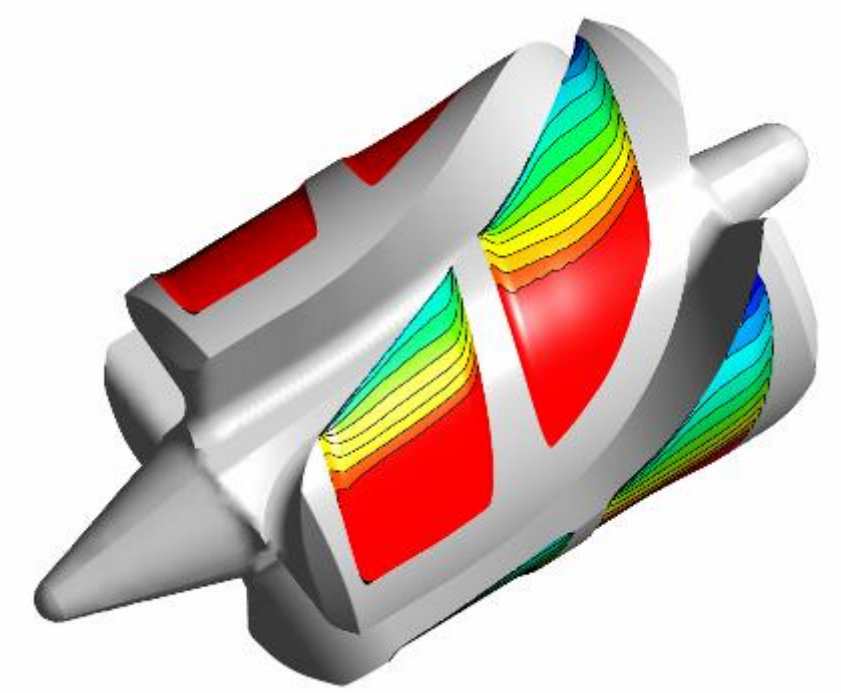
Radial support from eight hydrodynamic bearings

- **Dual hydrodynamic thrust bearings for enhanced rotor dynamic stability** provides support fore and aft of the center of mass
- Bearings are "flow aligned" to maximize performance
- Bearings are cut into material to provide "shrouds" to minimize end leakage



Self restoring, passive suspension system

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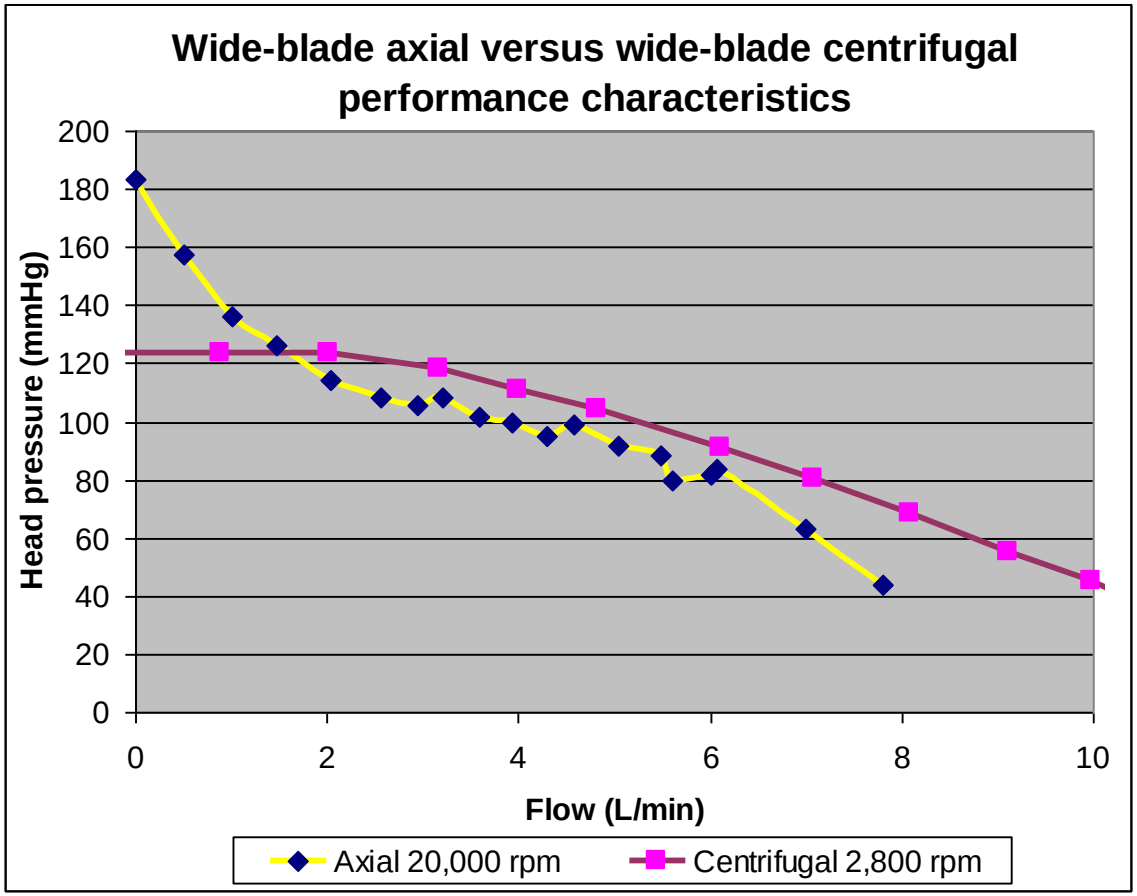
Performance

- Wide-blade axial flow pump without upstream and downstream flow structures has similar performance characteristics as a centrifugal device
- Frank Starling mechanism will be similar to centrifugal devices
- Better resistance to retrograde flow than centrifugal devices



Behaves like a centrifugal pump!

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Implantation method

- Current LVAD implantation methods:
  - *intra-ventricular*
  - *pericardial (HeartWare® LVAD)*
  - *Abdominal*
- New methods are being developed:
  - *intra-aortic*
  - *mini-thoracotomy*
  - *subcutaneous*

New technology platform is flexible for a variety of cannulation methods

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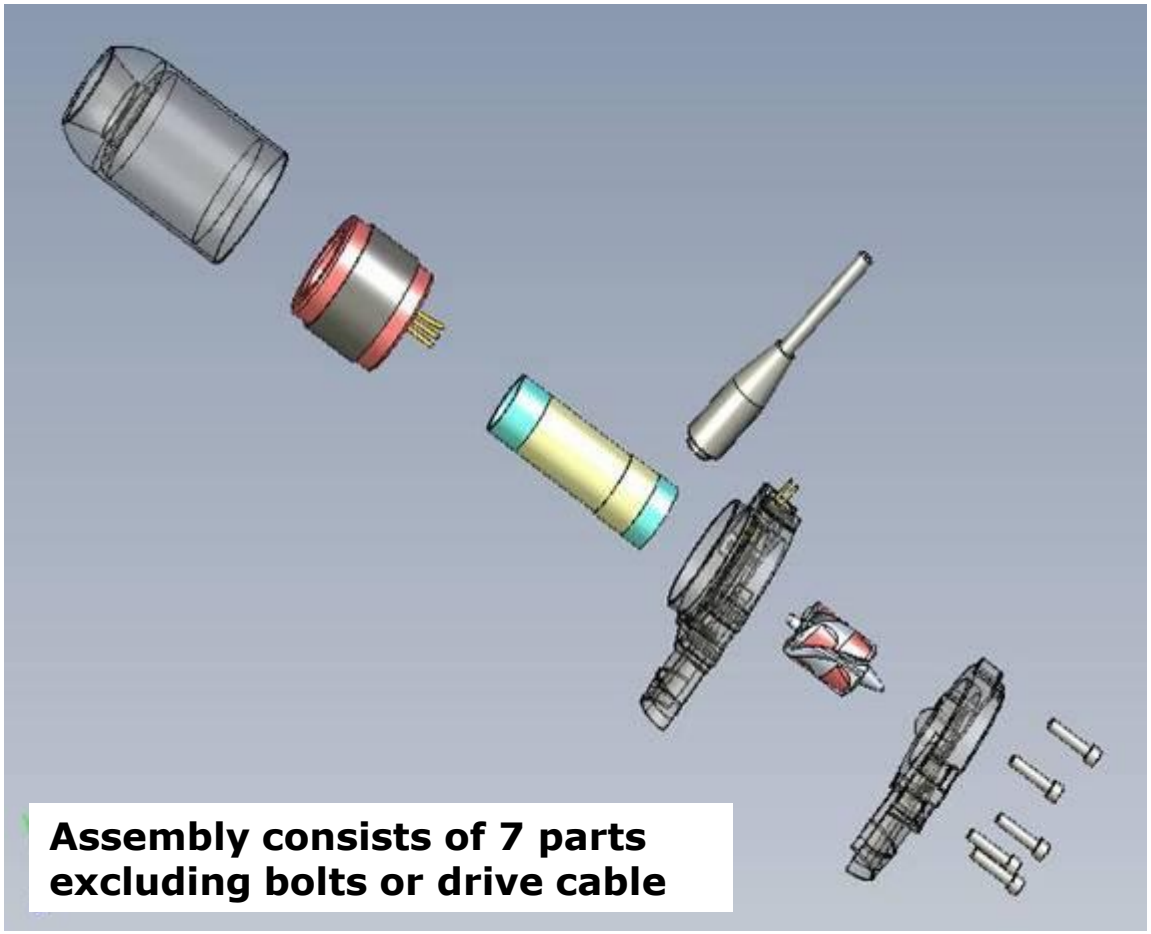
Manufacturing simplicity

- No new manufacturing technology development required
- Tight tolerance between ceramic rotor housing ID and rotor OD is easy to control on circular parts
- No alignment or pre-load force adjustment required



Assembly consists of 7 parts excluding bolts or drive cable

Rotor "drops" into tube

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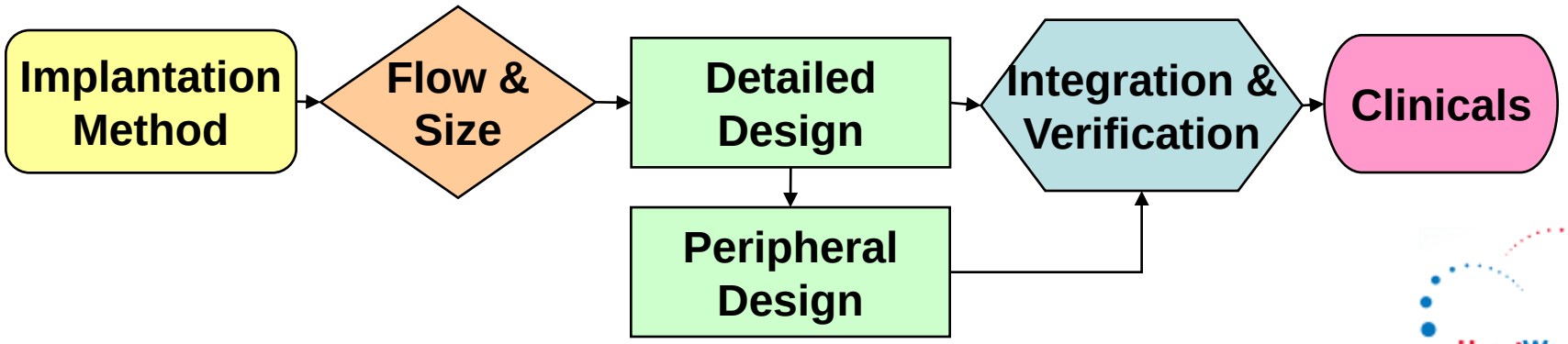
Development status

- ***Working on implantation methodology*** to take advantage of miniaturized pump technology
- Once implantation method and associated patient population selected, focused design effort will commence
- Intention is to modify existing HeartWare® LVAD peripherals for use with new platform

DESIGN PROCESS:



Is “significant” miniaturization possible?

The HeartWare® wide-blade axial flow pump:

- **Therapeutic Support** => **Yes**, performs similar to centrifugal
- **Hemodynamic Compatibility** => **Yes**, lightly loaded bearings and straight through design result in good hemodynamics
- **Reliability** => **Yes**, mechanically wearless and simple construction results in good reliability
- **Implantation Method** => **Yes**, small size enables less invasive cannulation
- **Efficiency** => **Yes**, strong motor and good hydraulic efficiency results in high system efficiency
- **Economics** => **Yes**, simple construction with new rotor material

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Significant miniaturization is possible!

- ***New pump technology allows significant miniaturization*** by removing upstream and downstream flow structures without capacity loss
- ***New rotor material*** enables strong electromagnetic coupling and greatly simplifies manufacturing
- ***Minimally invasive implantation methods are being developed***

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