Fixed Wing vs Rotor Wing Transport for Trauma Patients

September 2017
Atlantic Trauma and Emergency Medicine Conference
Conflict of Interest

CONFLICT OF INTEREST

No need to chase ambulances when you're the one who calls them
WHEN I BUY STUFF FOR ME

WHEN I BUY STUFF FOR THE KIDS
safety – Rotor Wing
safety – Fixed Wing
High Risk Occupations – 17 Year Average 1998-2014

- Fishers and Related Workers: 1196
- Logging Workers: 1104
- HEMS: 890
- Aircraft Pilots and Flight Engineers: 721
- Structural Iron/Steel Workers: 449
- Refuse/Recyclable collectors: 357
- Roofers: 326
- Coal Miners: 310
- Farmers and Ranchers: 310
- Electrical Power Line Workers: 257
- Truck Drivers and Sales Drivers: 257
- Taxi Drivers and Chaffeurs: 201
- Police Officers: 153
- Fire Fighters: 111
High Risk Occupations – 2008

HEMS had the highest fatality rate in 6 out of 15 years
“We are averaging an accident every 31 days”
### Canadian Statistics

#### Accidents involving Canadian-registered aircraft 2004-2013

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Taxi (703)</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Helicopter</td>
<td>4</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>3</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>
B Hospitals & Health Centres
B Hospitals, Health Centres & Airports
<table>
<thead>
<tr>
<th>W</th>
<th>RW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 hours of flight = 1 hour of maintenance</td>
<td>1 hour of flight = 3 hours of maintenance</td>
</tr>
</tbody>
</table>

So, after a patient transfer that required three flight hours, a fixed wing aircraft requires 2 hours of maintenance, while a rotor wing aircraft requires 9 hours of maintenance.
In order to provide 24/7 coverage for aircraft that are continually tasked, you need:

- 2 fixed-wing aircraft
- 4 rotor-wing aircraft
**RW Max Speed**

- 287 km/hr (max take-off weight at sea-level in standard atmospheric conditions)

**RW Max Speed**

- 531 km/hr
Range

**FW**
- 3338 kms

**RW**
- 761 kms (at long range cruise speed at 4000 ft altitude)
A growing Air B200 Range

[Map showing BA200 range]
korsky 76 Helicopter Range
V Max Altitude
35,000 ft max altitude
Pressure differential 6.6 psi
Sea-level cabin to 15,293 feet

RW Max Altitude
• 13,800 ft max altitude
Ladies and gentlemen, this is your captain speaking. There is a minor malfunction in the pressurization system, but no problem, an oxygen mask will come out of the unit above your seat automatically.
Effect on the Patient

**V Max Altitude**

At 10,000 feet altitude, a 50 mL pneumothorax would still have a volume of 50 mLs in a pressurized cabin

At 10,000 feet altitude, a 250 mL pneumothorax would still have a volume of 250 mLs in a pressurized cabin

**RW Max Altitude**

- At 10,000 feet a 50 mL pneumothorax will have expanded to 73 mLs
- At 10,000 feet a 250 mL pneumothorax will have expanded to 363 mLs
Effect on the Patient

<table>
<thead>
<tr>
<th>Pneumothorax</th>
<th>Closed pneumothorax</th>
<th>Open pneumothorax</th>
<th>Tension pneumothorax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air in pleural space</td>
<td>Air in pleural space</td>
<td>Air in pleural space increasing and unable to escape</td>
<td></td>
</tr>
</tbody>
</table>

The pleural cavity pressure is < the atmospheric pressure

The pleural cavity pressure is = the atmospheric pressure

The pleural cavity pressure is > the atmospheric pressure
New Brunswick and the Gaspe Peninsula have thunderstorm activity occurring, on average, between 10 to 20 days a year while Nova Scotia and Prince Edward Island receive only about half this number, or less.
FW – 35000 ft max

RW – 13, 800 ft max

W – Able to fly in bad weather
Operating Costs (including fuel)

\[ \begin{align*}
\text{V} & : $2.60 \text{ USD per nm} \\
& \quad (\$3.20 \text{ CAD per nm}) \\
\text{RW} & : $7.37 \text{ USD per nm} \\
& \quad (\$9.06 \text{ CAD per nm})
\end{align*} \]
Scene Landings
Scene Landings

Fairly rare

Excluded after dark (go to landing zones)

Benefit of scene landing is for sites that are within limited range of a Level 1 facility, otherwise the benefit is lost due to slower flight speed and the potential need to refuel

Restricted in bad weather

After 1100 there is a 1 hour response time
Trauma Patients Flown by ANB Air Ambulance 2015-2017
101 patients - 83 Adult, 18 Pediatric
77 were outside the range of the only available helicopter based in Halifax
Approximately 50% of these occurred after dark
Summary

**Fixed Wing**
- Easier to fly
- Less mechanically complex
- In full engine failure has ability to glide
- More reliable
- Quieter (50-70 dba)
- Less expensive
- Greater range

**Rotor Wing**
- Hard to fly
- Mechanically complex
- Glides like a rock, but can auto-rotate
- Less reliable
- Higher noise levels (89-96 dba)
- More expensive
- Shorter range
Faster – almost twice the speed of rotor
Altitude limit – 35000 ft
Can fly above or around bad weather
Pressurized aircraft
Reliable at night
Many airports available for landing sites

Rotor Wing

• Almost half the speed of fixed wing
• Altitude limit – 13800 ft
• Unable to fly above or around bad weather
• Non-pressurized aircraft
• Not typically utilized at night
• One approved Helipad next to Saint John Regional Hospital
IF HELICOPTERS ARE SO SAFE, HOW COME THERE ARE NO VINTAGE / CLASSIC HELICOPTER FLY-INS?
Conclusion

Fixed Wing

Transport

Pro

Cons
References

Sikorsky 76 Technical Information; www.sikorsky.com; February 2007

www.beechcraft.com

NB Air Ambulance Database

avCanada; www.navcanada.ca; LAKP-Atlantic; Chapter 4; 71-3.

MTC 2016 Lecture; Dr. Ira Blumen, Program Director at the University of Chicago; “The Wizard of Odds, A Statistical Analysis of HEMS Accidents and Risk”.

TV Show “ER” – season 9, episode 1, “Chaos Theory”

Quesions?