Flight into the heart

Flying and Cardiac Surgery
What can we learn?

Gil Bolotin MD, PhD
Flying and Cardiac Surgery

Flying and Cardiac Surgery

- My background
- A little bit about flying
- Some secrets of the Israeli Air-force
- Implication to cardiac surgery
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1. Age 18, joining the army


Piper Super Cub
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Fouga/Zukit
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To become a pilot

🌐 The first lesson, to stay with your feet on the ground
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1980 – 1984 - IAF: Jet pilot and dogfights instructor
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Phantom (25 years)
### 2. Gil Bolotin – Medical school and training

<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985 - 1992</td>
<td>Medical school, Jerusalem</td>
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<tr>
<td>1993 - 2000</td>
<td>Cardiothoracic Training, Haifa</td>
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<tr>
<td>1995 - 2001</td>
<td>Heart failure research PhD, NL</td>
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<tr>
<td>2000 - 2002</td>
<td>Cardiothoracic Attending T-A</td>
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<tr>
<td>2002-2004</td>
<td>Cardiothoracic Fellowship, USA</td>
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<td>2005-2006</td>
<td>Cardiothoracic Attending, T-A</td>
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<tr>
<td>2006-2007</td>
<td>Visiting professor, NL</td>
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<tr>
<td>2007-2010</td>
<td>Chief, Cardiac Surgery, Haifa</td>
</tr>
<tr>
<td>2010-Present</td>
<td>Chief, Cardiac Surgery, Haifa</td>
</tr>
</tbody>
</table>

**Active pilot (IAF reserve)**

**Flying instructor (IAF reserve)**
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Are there similarities?

- Two demanding professions
- Life and death
- A lot of stress
- You are alone in the cockpit
- The time factor
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Are there similarities?
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A little bit about flying

- Take off
- Flying fast and low
- Positive G (G suit)
- Zero G
- Negative G
- Formation
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A little bit more about flying

- Dog fights
- Pilots like it
- Those who are good love it
- Intellectual and physical challenge
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3. How to choose and how to train a surgeon/pilot

Medical school or training

- Grades
- Recommendations
- Interviews

- Should we check his/her psychological fitness?
- Should we check his/her hand dexterity?

Can we predict who will be a good surgeon?

What are the qualities of a good surgeon/pilot?
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The qualities of good surgeon/pilot

<table>
<thead>
<tr>
<th>Pilot (leader)</th>
<th>Surgeon (senior)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good hands</td>
<td>Good hands</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Calm under stress</td>
<td>Calm under stress</td>
</tr>
<tr>
<td>Leadership</td>
<td>Leadership</td>
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</tbody>
</table>
# Flying and Cardiac Surgery

The qualities of good surgeon/pilot

<table>
<thead>
<tr>
<th>Pilot (leader)</th>
<th>Surgeon (senior)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention to details</td>
<td>Attention to details</td>
</tr>
<tr>
<td>To be organized</td>
<td>To be organized</td>
</tr>
<tr>
<td>To think ahead</td>
<td>To think ahead</td>
</tr>
<tr>
<td>Fast when needed</td>
<td>Fast when needed</td>
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</table>
Flying and Cardiac Surgery

The qualities of good surgeon/pilot

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<tr>
<th>Pilot (leader)</th>
<th>Surgeon (senior)</th>
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<tr>
<td>3D understanding</td>
<td>3D understanding</td>
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<tr>
<td>To be brave?</td>
<td>To be brave?</td>
</tr>
<tr>
<td>Decisions</td>
<td>Decisions</td>
</tr>
<tr>
<td>Common sense</td>
<td>Common sense</td>
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</table>
How to choose a pilot – before training

- Grades
- IQ test
- Technical skill:
  - Hands
  - Mechanical understanding
- Psychological tests
- Interview with psychologist
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How to choose a pilot – during training

- 20/400
- Two years of teaching and testing
- Psychometrics
- Flying a super cub for 10 hours
  - Teaching/testing
  - “Brain shrinking” when the engine works
  - In the air…
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How to choose a surgeon – Should we apply?

- The frustrated surgeon/pilot
- License to kill

How to choose a surgeon – Can we apply?

- Technical skills
- Psychologically
- First year?
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To teach flying

To teach dogfights

To let them fly

To let them make the mistakes

To let them recover or fix them

Not to kill themselves, me…

The patient!
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What can we learn about training

- Must be safe
- Should be planned
- Should be discussed
- Must be personalized
- Using simulators
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4. Briefing and debriefing

- Briefing and debriefing
- Preparing a briefing
- All squadron and just the formation
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Flying and Cardiac Surgery

4. Briefing and debriefing

- Culture of debriefing
- To be open to criticism
- Having the data – video, numeric, results
- To learn from your and others’ mistakes
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Can we apply briefing and debriefing?

- Briefing
- Improving data collection – Camera in ER
- Formal debriefing
- Difficulties to deal with death
- Competition
- Malpractice fear

Near-accident should be applied

To build the culture
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Preparing a mission

- Data - intelligence
- Possible changes
- Bail out
- Be ready for chaos
- Can we apply?
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During the mission

- Last chance
  - Time out
- To update all team – support, ground control
  - To update anesthesia – to be ready
- To focus everybody in the right moments
  - Anesthesia teaching in the critical stage
- To be quiet in the critical moments
  - Don’t talk while knotting 7/0
- The way home – ends in the ground
  - Post stress mistakes
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Can we learn from dog fights?

“Rather perform a mediocre exercise decisively than a brilliant one hesitatingly”

(Air Marshal William Avery Bishop, Royal Air Force, 1894-1956)

To win you have to see
See them before they see you
5. Accidents!

- Young pilot syndrome
- Dangerous pilots
- To be calm, but not too calm
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What can we learn about sleeping and mistakes

- 1980: 15% mortality within five years
- Data collection and research – 50% tired
- Enforcing sleeping rules (not just rules)
- Residents, what about attendings?
- The night before transplant
  - Sleeping during war
- The time we start in the morning
  - The flight to the base…
Flight into the heart

A View on Cardiac Surgery from Above
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Can we learn?

Yes, we can!

Gil Bolotin MD, PhD
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What else?
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Communication
With your copilot – Assistant, PA
With ground control – Anesthesia
With other support planes – Perfusions
With other pilots – Your colleagues
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What else?

- New technologies:
  - Pilot/surgeon involvements in development
  - Pilot/surgeon involvements in the decision
  - The radio and the monitor…

- The first line in the check list: general look

- Sport

- Technologies from airplanes industry

- Superstitious:
  - Three accidents - three dissections
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- Age 18: pilot training course
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Parachuting and more
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Phantom
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My career

Phantom
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Phantom
McDonnell Douglas F-4E Phantom

TYPE: Two-place fighter-bomber
Born: United States, 1956

DIMENSIONS:
Wingspan: 11.77 m. Length: 19.3 m.

PERFORMANCE:
Max. speed: 2,306 kph / Mach 2.12
Service ceiling: 58,750 ft / 17,907 m.

WEIGHTS:
Empty weight: 14,448 kg
Normal loaded: 26,309 kg
Max. loaded: 28,030 kg