HELIPORT DESIGN

with particular reference to

PPR and Hospital Heliports

WORKSHOP # 1

HELIPORT DESIGN
ADVISORY CIRCULAR 150/5390-2C

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HAI Heliport Design AC Focal Point
Advisor - Infrastructure Development, AHS
Leverton Associates International
Don’t Panic – I will NOT be showing all the Charts!!!
Extra Charts included to cover questions!

New AC 150/5390-2C (2012) = AC-2C
[DATED April 2012 but not ISSUED until June 2012]

AC 150/5390-2A (1994) = AC-2A
SCOPE OF AC-2C

• AC-2C (like AC-2B and AC-2A) gives guidance for Heliports only ** i.e. it does not cover Offshore Helidecks.

NOTE 1: ICAO ANNEX 14 Volume II – HELIPORTS, covers all heliports and a helideck is considered a heliport on a floating or fixed offshore structure. ANNEX 14: Tranche 1 issued in 2009/Tranche 2 in 2013/Tranche 3 ????.

NOTE 2: An FAA representative in August 2004 stated it “will (??) issue helideck design requirements when review/update of the ICAO Annex 14 is completed in 2006/2007.” However since this time the FAA have not repeated this and have not shown any interest in addressing helidecks. API RP 2L (Helideck Design Guide) – used in the US GOM - is currently being updated.

** AC-2C, like previous versions, cover ‘Helicopter Facilities at Airports’: NOT addressed in this presentation.

Advisory Circular

U.S. Department of Transportation

FAC-233

Table of Contents

1. Purpose: This circular establishes the minimum performance standards for heliports. It applies to all airports and must be met by all operators. Operators must also comply with applicable Federal Aviation Administration (FAA) regulations.

2. Application: This circular applies to all airports and must be met by all operators. Operators must also comply with applicable Federal Aviation Administration (FAA) regulations.

3. Effective Date: This circular takes effect on January 1, 2004.

4. Purpose: This circular establishes the minimum performance standards for heliports. It applies to all airports and must be met by all operators. Operators must also comply with applicable Federal Aviation Administration (FAA) regulations.

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AC 150/5390-2C (2012)

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Heliport Design AC Workshop - HeliExpo 2013
AC 150/5390-2C – new layout

Change of format – Single Column / Figures in with the text rather than at the end of each chapter: some figures include color.

**Advisory Circular**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Heliport Design</th>
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<tbody>
<tr>
<td>Date</td>
<td>4/28/2012</td>
</tr>
<tr>
<td>AC No.</td>
<td>150/5390-2B</td>
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#### PRINCIPLE CHANGES

1. **Clarify** the term “helicopter traffic” overall language.
2. **Add** definitions for design load forecasts and dynamic load factors.
3. **Add** guidelines for dynamic load factors.
4. **Add** guidelines for dynamic load factors.
5. **Add** guidelines for dynamic load factors.
6. **Add** guidelines for dynamic load factors.
7. **Add** guidelines for dynamic load factors.
8. **Add** guidelines for dynamic load factors.
9. **Add** guidelines for dynamic load factors.
10. **Add** guidelines for dynamic load factors.

### AC 150/5390-2C (2012)

**Advisory Circular**

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9. **Add** guidelines for dynamic load factors.
10. **Add** guidelines for dynamic load factors.
Note: AC-2C has numerous text changes from Draft AC-2C: some are significant and will be discussed but many (I would suggest) make no difference and it is not clear why they are made! Also the paragraph numbers in AC-2C have been changed from those in Draft AC-2C.

In addition (again I would suggest) locating the figures and tables in with the text, rather than at the end of each chapter, makes it much more difficult to read/use than AC-2B.
After 2 years work by FAA and HAI on updating a limited number of sections in AC-2B (summarized by the FAA at the 2011 HeliExpo), the FAA issued without any advanced notice a completely revised (new) Draft AC 150/5390-2C in May 2011!!

….. Industry/HAI held a ‘Forum’ to discuss concerns with proposed AC-2C on 12-14 July 2012 – FAA attended the meeting. HAI made initial comments to FAA in late July 2011 and submitted detailed comment on 31 October 2011 – FAA ‘feedback’ on some issues given at a meeting on 9 Dec 2011 but not on most issues.

….. FAA Airports Division representatives were unable to attend HeliExpo 2012 or 2013 to discuss the AC!
FAA issued (new) AC 150/390-2C in May 2012 … it is however dated 24 April 2012!

HAI still had (have) major concerns with final AC-2C – FAA ignored majority of changes submitted by HAI in October 2011.

….. HAI requested meeting with FAA to discuss concerns with AC-2C…… after various delays, meeting held on 20 November 2012 at the FAA. HAI outline its ’12 major concerns’ … no direct feed back to date.

….. FAA Airports Division representatives were unable to attend HeliExpo 2013 to discuss the AC!
• MAIN FOCUS WILL BE ON DIFFERENCE BETWEEN AC-2C AND AC-2B AS RELATED TO:-

PRIVATE USE (PPR) HELIPORTS
(CHAPTER 2 - GENERAL AVIATION HELIPORTS)

HOSPITAL HELIPORTS (CHAPTER 4).

• TRANSPORT HELIPORTS (CHAPTER 3) – NOT ADDRESSED IN DEPTH.

NOTE: IN AC-2B and AC-2C ‘PRIVATE USE’ IS DESIGNATED AS ‘PPR’
i.e. PRIOR PERMISSION REQUIRED.

IN AC-2B/AC-2C ‘PPR/PRIVATE USE HELIPORTS’ ARE COVERED IN THE
‘GENERAL AVIATION HELIPORT’ CHAPTER 2: THERE ARE A NUMBER OF
RELAXATIONS IN THE REQUIREMENTS FOR ‘PPR HELIPORTS’. 
COMMENTS BASED ON:-

(i) RESULTS OF DISCUSSIONS WITH FAA

(ii) REVIEW OF AC-2B AND AC-2C

COMMENTS SHOULD NOT BE TAKEN AS STATEMENT OF ACTUAL FAA POLICY

THE VIEWS EXPRESSED ARE MY OWN AND MUST NOT BE TAKEN AS BEING REPRESENTATIVE OF THOSE OF THE FAA, HAI, HAI Heliport Committee or AHS.
COMMENTS BASED ON:-

(i) RESULTS OF DISCUSSIONS WITH FAA

(ii) REVIEW OF AC-2B

THE VIEWS EXPRESSED ARE MY OWN AND MUST NOT BE TAKEN AS BEING REPRESENTATIVE OF THOSE OF THE FAA, HAI, HAI Heliport Committee or AHS.

Also please note that I will NOT cover all aspects in the ACs …… I will only address those issues which I consider important and those which I have been asked questions on during many meetings I have attended.
AC 150/5390-2C Heliport Design
Dated 24 April 2012 (made available in May 2011) is available on FAA web site:-

AC 150/5390-2B Heliport Design
Issued on 9/30/04 (30 September 2004) and is still available on a number of FAA and other web sites - the following is one useful web site to obtain the document:-
AC-2C MAJOR POLICY CHANGES

- Approach/Departure (8:1) Surface requirements: ‘penetrations’ allowed.
- Curved Flight paths introduced.
- Safety Nets – new requirements.
- Hospital Heliports: FATO Length “Adjustment for Altitude” added.
- Elevated Hospital Heliports: TLOF Size increased when FATO non load bearing. **
- Helicopter Protection Zone recommended for Hospital Heliports. **
- Hospital Heliports Ground Level FATO Surface Characteristics
- Taxiway/Taxi-Routes - new requirements.
- Hospital Heliports – Use of Medevac Helicopters: text changed.
- Flight Path Alignment markings and lights added.
- Heliport Perimeter Lighting requirements established.

** GA Heliport requirements applied to Hospital Heliports.

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Extract from AC-2C

a. Changed the term for the helicopter overall length (OL) to ‘D’ or ‘D-value.’
b. Added definitions for design loads for static and dynamic load-bearing areas (LBA).
c. Added guidance for pavement or structure larger than the touchdown and liftoff area (TLOF), but less than the size of the final approach and take off (FATO).
d. Added guidance for turbulence effects.
e. Added guidance to provide adequate clearance between parking areas and taxi routes and within parking areas.
f. Added guidance for minimum dimensions of curved approach/departure airspace.
g. Added guidance for Touchdown/Positioning Circle (TDPC) Marking.
h. Added guidance for Flight Path Alignment Guidance markings and lights.
i. Added an appendix providing guidance for Emergency Helicopter Landing Facility Requirements (EHLF).
j. Added FATO to FATO separation distance for simultaneous operations.
k. Revised standards for size of “H” for general aviation heliports.
l. **Added increased TLOF size when the FATO of a hospital heliport is not load bearing.**
o. To improve the legibility of the AC, changed the format to a single column and nested the tables in the text.
p. Deleted requirements for load bearing capacity of a FATO at general aviation and hospital heliports when the TLOF is marked.
q. Changed color of landing direction lights from yellow to green.
r. Added references to Engineering Brief 87, Heliport Lights for Visual Meteorological Conditions (VMC).

*Elevated Hospital Heliports ONLY*
HELIPORT PERIMETER LIGHT STANDARDS

ENGINEERING BRIEF 87 (EB # 87) – not dated: issued Jan 2012

A new raised light fixture (Type L-860HR) and a new semi flush light fixture (Type L-860HS) are specified in Engineering Brief # 87 to identify the heliport perimeter in visual meteorological conditions. Both the light intensity and horizontal/vertical light distribution are characterized. The light emitting diode (LED) raised heliport fixture and LED semi flush fixture will be identified as: L-860HR (L) and L-860HS (L) respectively. Any of these fixtures may be used as Flight Path Alignment Lights and Landing Direction Lights as described in AC 150/5390-2C.

FAA Website:  http://www.faa.gov/airports/engineering/engineering_briefs/media/EB_87.pdf

Heliport Design AC Workshop - HeliExpo 2013
ALL REQUIREMENTS INDICATED APPLY TO

AC 150/5390-2C (AC-2C)

and

AC 150/5390-2B (AC-2B)

UNLESS STATED.
NOTICE REQUIREMENTS
NOTIFICATION REQUIREMENTS

AC-2C [Slightly Revised AC-2B Text in AC-2C]

110. Notification requirements. Part 157 sets requirements for persons proposing to construct, activate, deactivate, or alter a heliport to give advance notice of their intent to the FAA. This includes changing the size or number of FATOs; adding, deleting, or changing an approach or departure route; or changing heliport status. An example of a heliport status change would be a change from private to public use or vice versa. When notification is required, file Form 7480-1 (see Figure 1–1) with the appropriate FAA Airports Regional or District Office at least 90 days before construction, alteration, deactivation, or change in use. See the FAA Airports web site at http://www.faa.gov/airports/ for contact information.

a. Draw the heliport layout plan to scale showing key dimensions, such as the heliport elevation, TLOF size, FATO size, safety area size, distance from safety area perimeter to property edges, and approach/departure paths showing locations of buildings, trees, fences, power lines, obstructions (including elevations), schools, churches, hospitals, residential communities, waste disposal sites, and other significant features as specified on Form 7480-1 and as suggested in Figure 1–2.
b. The preferred type of location map is the 7.5-minute U.S. Geological Survey Quadrangle Map, available from the US Geological Survey at nationalmap.gov. Web-based maps are also acceptable. Show the location of the heliport site and the approach/departure paths on the map. Point out the heliport site on this map with an arrow. Indicate the latitude and longitude of the proposed heliport in North American Datum of 1983 (NAD-83) coordinates. See Figure 1–3.

Heliport proponents should complete FAA Form 7480-1 (Figure 1-1), a heliport layout diagram (Figure 1-2), and a heliport location map (Figure 1-3). FAA Form 7480-1 is from the FAA web site htt://faa.gov.arp. The FAA web site also lists office addresses for FAA Airport District/Field Office or Regional Offices.
**REQUIRED NOTICE**

**FAA Form 7480-1**

AC-2B/AC-2C Figure 1-1

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**NOTICE OF LANDING AREA PROPOSAL**

- **Name of Proponent, Individual, or Organization**
- **Address of Proponent, Individual, or Organization (No., Street, City, State, Zip Code)**

**A. Location of Landing Area**
1. **Associated City/State**
2. **County/State (Physical Location of Airport)**
3. **Distance and Direction From Associated City or Town**

**B. Purpose**

- **Type Use**
  - Public
  - Private
  - Private Use of Public Land/Waters

**C. Other Landing Areas**

<table>
<thead>
<tr>
<th>Relation</th>
<th>Distance From Landing Area</th>
<th>Proposed Landing Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Airport, Seaplane Base, or Flightline</td>
<td>Prop A1</td>
</tr>
</tbody>
</table>

- **Magnetic Bearing of Runway (s) or Seaplane**
- **Length of Runway (s) or Seaplanes (s) in Feet**
- **Width of Runway (s) or Seaplanes (s) in Feet**
- **Type of Runway Surface (Concrete, Asphalt, Turf, etc.)**

**D. Obstructions**

<table>
<thead>
<tr>
<th>Relation</th>
<th>Distance From Landing Area</th>
<th>Proposed Landing Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Description of Lighting (if any)</td>
<td>Direction of Prevailing Wind</td>
</tr>
</tbody>
</table>

**E. Operational Data**

- **1. Estimated or Actual Number Based Aircraft**
  - Airport, Seaplane Base, or Flightline
  - Type of Aircraft
  - Single-engine
  - Gross Weight

**F. Other Considerations**

<table>
<thead>
<tr>
<th>Relation</th>
<th>Distance From Landing Area</th>
<th>Proposed Landing Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Average Number Monthly Landings</td>
<td>Proposed Landing Area</td>
</tr>
</tbody>
</table>

**G. Certification**

- **I hereby certify that all of the above statements made by me are true and complete to the best of my knowledge.**

Name, title (and address if different than above) of person filing

Date of Signature

Signature (in ink)

Telephone No. (Prefix with area code)

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**Heliport Design AC Workshop - HeliExpo 2013**

Leverton Associates International
Updated vision of AC-2B Figure 1-2

AC-2C Figure 1-2

Figure 1–2. Example of a Heliport Layout Diagram

Heliport Design AC Workshop - HeliExpo 2013
Example of a Heliport Location Map

AC-2B/AC-2C Figure 1-1

APPLICABILITY
Draft AC-2C used ‘must’ through the document instead of ‘should’ which, except in a few cases, is used in AC-2B.

[The regulatory implications of using “must” and “shall” in the ‘advisory circular’ instead of “should” and “may” has been discussed by HAI with the FAA: HAI stated that the use of ‘must’ should be removed to avoid the unintended consequence of establishing new regulatory mandates or additional burden on the operating community.]

The FAA changed the text to meet the principal HAI proposal to remove ‘must’, but reworded text in many places so that it implies ‘shall’ or ‘must’ i.e.

“Design the TLOF so the minimum dimension ….. is at least”

“Design the FATO outside of the TLOF to be load-bearing …..”

“…. Use the additional FATO length as depicted in Figure 4–4.”

“…. mark the area outside the TLOF…”

“…. Make sure obstacles do not penetrate into Area A or Area B…. ”

_Note: HAI proposed using ‘should’ instead of ‘must’ in AC-2C - not accepted by the FAA._
1. **Purpose.** This advisory circular (AC) provides recommendations for heliport design and describes acceptable requirements to develop a heliport. This AC applies to anyone who is proposing to construct, activate or deactivate a heliport.

**Draft AC-2C**

1. **Purpose.** This advisory circular (AC) provides recommendations for heliport design, including heliports serving helicopters with single and tandem (front and rear) rotors. Basic concepts may be applied to facilities serving helicopters with dual (side by side) rotors, however standards based on Rotor Diameter will not apply.

**AC-2C**

1. **Purpose.** This advisory circular (AC) provides standards for the design of heliports serving helicopters with single rotors. Apply basic concepts to facilities serving helicopters with tandem (front and rear) or dual (side by side) rotors, however many standards will not apply.
Reference to “Standard(s)” used extensively in AC: this makes AC more ‘regulatory’ in nature.

The FAA added new text [(203] in Chapter 2 which reads “Recommendations for PPR heliports are provided …..” In Chapter 4 (402) for hospital heliports “…. these standards are the FAA’s recommendations for designing all hospital heliports.”

Text confusing – it is HAI view that AC-2C will be considered by many to be a Standard.
AC-2B

1. PURPOSE. This advisory circular (AC) provides recommendations for heliport design and describes acceptable requirements to develop a heliport. This AC applies to anyone who is proposing to construct, activate or deactivate a heliport.

2. APPLICABILITY. This AC is not mandatory and does not constitute a regulation except when Federal funds are specifically dedicated for heliport construction.
6. APPLICATION. The recommendations and standards in this AC are for planning and designing civil heliports. To the extent that it is feasible and practical to do so, the standards in this AC should be used in planning and designing improvements to an existing facility when significant expansion or reconstruction is undertaken. Conformity with these standards is a prerequisite to Federal grant-in-aid assistance. Modification to a heliport design standard related to new construction, expansion, reconstruction, or upgrade on a heliport that received Federal aid requires FAA approval. The request for modification should show that the modification will provide an acceptable level of safety, economy, durability, and workmanship. The recommendations and standards in this AC are not intended to be sufficient to design an instrument approach procedure.
1. **Purpose.** This advisory circular (AC) provides standards for the design of heliports serving helicopters with single rotors. Apply basic concepts to facilities serving helicopters with tandem (front and rear) or dual (side by side) rotors, however many standards will not apply.

**FAA retained the Draft AC-2C text** – it not sure what “Apply basic concepts” means? Also it is not clear if “dual (side by side) rotors” applies to Tiltrotor Aircraft – these are not helicopters and in HAI opinion a separate ‘Vertiport Design AC’, or a separate section in the AC, is required to address the specific aspects associated with such vehicles. In addition to ‘helicopter type take-offs’, ‘STOL take-offs’ will need to be addressed.

**HAI offered to work with the FAA to develop such a document:** the FAA has not responded but appears they consider it is not needed

3. **Application.** The Federal Aviation Administration (FAA) recommends the guidelines and specifications in this AC for materials and methods used in the construction of heliports. **In general, use of this AC is not mandatory.** However, use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charge (PFC).
c. Planning. While the heliport itself may be simple, the planning and organization required to properly put one into place can be intimidating. To help make the process easier, the Federal Aviation Administration has published this AC 150/5390-2B, Heliport Design AC. This document describes physical, technical, and public interest matters that should be considered in the planning and establishment of a heliport. While this AC is a technical document intended to help engineers, architects, and city planners design, locate, and build the most effective heliport, it can be used by anyone considering the construction of a heliport.
Chapter 2: General Aviation Heliports **

AC-2B 200 b

**NOTE:** To the extent that it is feasible and practical to do so, the standards and recommendations in this AC should be used in planning and designing improvements to an existing heliport when significant expansion or reconstruction is undertaken. Furthermore, existing PPR heliports may continue to follow the recommendations and standards applicable at the time of design.

**includes PPR Heliports**
Chapter 4: Hospital Heliports

AC-2B 400 b

NOTE: To the extent that it is feasible and practical to do so, the standards and recommendations in this AC should be used in planning and designing improvements to an existing heliport when significant expansion or reconstruction is undertaken. However, existing hospital heliports may continue to follow the recommendations and standards applicable at the time of design.
GRANDFATHER CLAUSES NOT INCLUDED IN AC-2C

HAI requested such clauses were included in AC-2C: they are normal practice and considered essential. HAI suggested that the following text is included in the pre-amble and in front of Chapter 2 (General Aviation) and Chapter 4 (Hospital Heliports)

“To the extent that it is feasible and practical to do so, the recommendations in this AC should be used in planning and designing improvements to an existing heliport when significant expansion or reconstruction is undertaken. Furthermore, existing heliports may continue to follow the recommendations and standards applicable at the time of design.”
HAI requested such clauses were included in AC-2C: they are normal practice and considered essential. HAI suggested that the following text is included in the pre-amble and in front of Chapter 2 (General Aviation) and Chapter 4 (Hospital Heliports):

“To the extent that it is feasible and practical to do so, the recommendations in this AC should be used in planning and designing improvements to an existing heliport when significant expansion or reconstruction is undertaken. Furthermore, existing heliports may continue to follow the recommendations and standards applicable at the time of design.”
FAA reject HAI Proposal! Thus there are no ‘Grandfather Clauses’ for existing heliports in AC-2C.

In is clear that the FAA does not intend to allow ‘grandfathering’ since FAA has introduced new text (NOT in Draft AC-2C) in 105 which states “… It may not, however, be feasible to meet all current standards at existing heliports. ….” AC-2C then states “In those cases, consult with the appropriate offices of the FAA Office of Airports and Flight Standards Service to identify any adjustments to operational procedures necessary to accommodate operations to the maximum extent.” This means that the FAA could address ‘operation procedures’ for all types of heliports including PPR and Hospital Heliports!

The new ‘3’ since it states that the AC-2C applies to “construction of heliports” i.e. new designs! Even so the text in 202 refers to “other projects/heliports” – it is not sure what this means! The new 101 also makes reference to contacting “Flight Standards” i.e. it introduces “operational aspects” into the design AC

Recommendation to use the GA Chapter 2 ‘standards’ for hospital heliports is included in 402.
FIRE REQUIREMENTS

New Edition - 2011

Topic NOT addressed in this Presentation.
4.2.2 The design of the heliport, including all the aeronautical components, shall be in accordance with FAA AC 150/5390-2B, Heliport Design Advisory Circular. It is assumed this equally applies to AC-2C.
FIRE REQUIREMENTS

HAI Position – Heliport Design requirements should NOT be mandatory i.e. FAA is correct in giving Guidance in an Advisory Circular [Also LAI Position.]
110 Notification requirements.

c. The FAA role. The FAA will conduct an aeronautical study of the proposed heliport under part 157. Title 14 CFR Part 157.7, FAA determinations, states: “The FAA will conduct an aeronautical study of an airport proposal and, after consultations with interested persons, as appropriate, issue a determination to the proponent and advise those concerned of the FAA determination. The FAA will consider matters such as the effects the proposed action would have on existing or contemplated traffic patterns of neighboring airports; the effects the proposed action would have on the existing airspace structure and projected programs of the FAA; and the effects that existing or proposed manmade objects (on file with the FAA) and natural objects within the affected area would have on the airport proposal. While determinations consider the effects of the proposed action on the safe and efficient use of airspace by aircraft and the safety of persons and property on the ground, the determinations are only advisory. Except for an objectionable determination, each determination will contain a determination-void date to facilitate efficient planning of the use of the navigable airspace. A determination does not relieve the proponent of responsibility for compliance with any local law, ordinance or regulation, or state or other federal regulation. Aeronautical studies and determinations will not consider environmental or land use compatibility impacts.”
111. **Hazards to air navigation.** Part 77 establishes requirements for notification to the FAA of objects that may affect navigable airspace. It sets standards for determining obstructions to navigable airspace and provides for aeronautical studies of such obstructions to determine their effect on the safe and efficient use of airspace. **Part 77 applies only to public airports and heliports, airports operated by a federal agency or the Department of Defense, and private airports and heliports with at least one FAA-approved instrument approach procedure.** See Figure 1–4.

a. **FAA studies.**

(1) **Part 77.** Part 77 defines objects that are obstructions to surfaces. Presume these objects to be hazards unless an FAA study determines otherwise. The **FAA conducts aeronautical studies to determine the physical and electromagnetic effect on the use of navigable airspace, air navigational facilities, public airports and heliports, and private airports and heliports with at least one FAA-approved instrument approach procedure.** The FAA encourages public agencies to enact zoning ordinances to prevent man-made features from becoming hazards to navigation.

(2) **Part 157.** While the FAA performs aeronautical studies under part 157 (see paragraph 110.c), **such studies do not identify hazards to private facilities that do not have an FAA-approved instrument approach**
111. Hazards to air navigation. Part 77 establishes requirements for notification to the FAA of objects that may affect navigable airspace. It sets standards for determining obstructions to navigable airspace and provides for aeronautical studies of such obstructions to determine their effect on the safe and efficient use of navigable airspace. Part 77 applies only to public airports and heliports, airports operated by a federal agency or the Department of Defense, and private airports and heliports with at least one FAA-approved instrument approach procedure. See Figure 1–4.

a. FAA studies.
   (1) Part 77. Part 77 defines objects that are obstructions to surfaces. Presume these objects to be hazards unless an FAA study determines otherwise. The FAA conducts aeronautical studies to determine the physical and electromagnetic effect on the use of navigable airspace, air navigational facilities, public airports and heliports, and private airports and heliports with at least one FAA-approved instrument approach procedure. The FAA encourages public agencies to enact zoning ordinances to prevent man-made features from becoming hazards to navigation.

   (2) Part 157. While the FAA performs aeronautical studies under part 157 (see paragraph 110.c), such studies do not identify hazards to private facilities that do not have an FAA-approved instrument approach.
Hospital Heliports - What are they in AC-2C?

108 Explanation of terms. v. Hospital heliport. A heliport limited to serving helicopters engaged in air ambulance, or other hospital related functions. A designated helicopter landing area located at a hospital or medical facility is a heliport and not a medical emergency site.

107 AC organization. c. Hospital heliports. Hospital heliports are general aviation heliports that provide a unique public service. They are normally located close to the hospital emergency room or a medical facility. Find design standards for hospital heliports in Chapter 4.

210/409 VFR approach/departure paths. b (3) The FAA conducts such aeronautical studies only at public heliports, heliports operated by a federal agency or the Department of Defense, and private airports with FAA-approved approach procedures. Paragraph 111 provides additional information on hazards to air navigation.
Hospital Heliports - What are they in AC-2C?

108 Explanation of terms. v. Hospital heliport. A heliport limited to serving helicopters engaged in air ambulance, or other hospital related functions. A designated helicopter landing area located at a hospital or medical facility is a heliport and not a medical emergency site.

Note: Since the FAA does not identify hazards for private use heliports unless the facility has an FAA-approved instrument approach. The responsibility appears to fall onto the facility operator!! [FAA position on this subject is per Part 157 rule.] Not clear if this also relates to Hospital Heliports – many consider it does: FAA asked for clarification, no reply to date?

210/409 VFR approach/departure paths. b (3) The FAA conducts such aeronautical studies only at public heliports, heliports operated by a federal agency or the Department of Defense, and private airports with FAA-approved approach procedures. Paragraph 111 provides additional information on hazards to air navigation.
HELICOPTER DIMENSIONS
Helicopter Dimensions

OL = Overall Length
RD = (Main) Rotor Diameter

"Arc of Tail Rotor"

(1 OL − 1 RD) = (approx.) 0.2 RD

1 OL = 1D = (approx.) 1.2 RD

**Internationally OL = D or D-value – also used in AC-2C**
Undercarriage Dimensions

UC = Maximum width or length of the undercarriage: used to define some characteristics.

UCw = undercarriage width: used for defining taxiway width

Width of Undercarriage (UCw)

Length of Undercarriage
GENERAL DESIGN CONSIDERATIONS
[AC-2B 101 b] **Design Helicopter.** A generic helicopter that reflects the maximum weight, maximum contact load/minimum contact area, overall length, rotor diameter, etc. of all helicopters expected to operate at the heliport.

[AC-2C 108 c] **Design helicopter.** A single or composite helicopter that reflects the maximum weight, maximum contact load/minimum contact area, overall length (D), rotor diameter (RD), tail rotor arc radius, undercarriage dimensions, and **pilot’s eye height of all helicopters expected to operate at the heliport.**

*Design Helicopter* used for FATO, TLOF and Safety area.

For Taxi Route/Taxiway maximum RD and UCw for Ground Taxi and Hover Taxi operations need to be considered.

Parking Areas are based on **individual helicopters**, group of helicopters or the *Design Helicopter*.

**Related to the siting of an optional VASI i.e.** “The optimum location of a VGSI is on the extended centerline of the approach path at a distance that brings the helicopter to a hover with the undercarriage between 3 and 8 feet (0.9 to 2.5 m) above the TLOF. Figure 2–35 illustrates VGSI clearance criteria. To properly locate the VGSI, estimate the vertical distance from the undercarriage to the pilot’s eye”. VASI are NOT often used at heliports.
BASIC DESIGN

- REQUIREMENTS LARGELY BASED ON A DESIGN HELICOPTER

- IMPORTANT PARAMETERS –
  - MAIN ROTOR DIAMETER (RD)
  - OVERALL LENGTH (OL) - ‘D’, ‘D FACTOR’ or D-value
  - MAXIMUM WEIGHT (MASS)
  - MAXIMUM UNDERCARRIAGE ‘SPREAD’ DIMENSION (WIDTH OR LENGTH) – (UC)
  - MAXIMUM UNDERCARRIAGE WIDTH (UCw)
  - UNDERCARRIAGE POINT LOADINGS/TIRE PRESSURES
  - UNDERCARRIAGE CONTACT AREA(S)
APPROXIMATE RELATIONSHIPS

• $FATO = 1.5 \frac{OL}{D}$ [1.5 x OVERALL LENGTH] **

  • TAIL ROTOR SIZE: 1/6 TO 1/5 RD

  • $OL = 1.16$ RD TO 1.2 RD

  • ASSUME $OL / D = 1.2$ RD

  THAN $1.5 \frac{OL}{D}$ $FATO = 1.8$ RD and

  $1$ RD TLOF $= 0.83 \frac{OL}{D}$

** $OL = ‘D’, ‘D-value’ or ‘D factor’: used Internationally and in AC-2C.

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UNDERCARRIAGE SIZE APPROXIMATIONS

• UC - approximately 0.2 / 0.25 RD for ‘Skids’
  - approximately 0.4RD for ‘Wheels’

Exceptions: SH-60 Sikorsky Black Hawk/S-70 Fire Hawk (UC = 28.3 ft. i.e.. 0.52 RD) …… and most ‘helicopters with tail wheels.’

NOTE: Length-to-width (L/W) varies from 0.8 to 2
- value typically increases with helicopter size/weight
• OFTEN DIFFICULT TO DECIDE

• CHOOSE ‘LARGER VALUES’ IF FEASIBLE

• WEIGHT: ADD 10-30 % FOR GROWTH OF TYPE OR SELECT HIGHER LIMIT

• Hospital Heliports: Provide facility capable of taking the US Army/National Guard ‘H-60’ Helicopter if feasible**. Basic characteristics of ‘H-60’ included in AC-2B. Again If Feasible Assume 20% Weight Increase.

** THIS IS A REQUIREMENT IN AC-2B IF FEDERAL FUNDING IS INVOLVED – THIS REFERENCE REMOVED AND MADE MORE GENERAL IN AC-2C! [Not sure why!!] i.e. Consider the feasibility of accommodating large military helicopters that might be used in an emergency. NOTE: THERE IS ALSO THE S-70 FIRE HAWK.
• PRIVATE USE/PPR HELIPORTS and HOSPITAL HELIPORT: Design to the more demanding General Aviation (GA) Heliport requirements if “you can” i.e. if practical, technically feasible and economically reasonable. [*LAI recommendation.*]

• This is ‘effectively’ a requirement for Hospital Heliports if “funded under the Airport Improvement Program (AIP) or Passenger Facility Charge (PFC) program.” For other projects/heliports, these standards are the FAA’s recommendations for designing all hospital heliports.

• If high operational use, inclusion of at least one separate parking area is recommended by LAI. [*Need to avoid one helicopter being parked on the side of a FATO/TLOF when it is being used by another helicopter.*]
OVERVIEW
GENERAL ASPECTS

• FAA Advisory Circulars (AC’s) give minimum requirements
  – if possible...base design on “larger dimensions” than minimum ‘design helicopter’.
  – consider future use/potential growth

• Safety and Operational efficiency will be enhanced even if only some dimensions can be increased.

• FATOs and TLOFs can be turf or paved for PPR, Hospital and General Aviation Heliport. Paved TLOFs recommended for Hospital Heliports ..... 
  ..... and for PPR Heliports with ‘high usage.’

Paved TLOF essential for ‘heavy helicopters’ Bell 412, S-76 or ‘in wet areas’
FATO/TLOF ‘SURFACE’

- **TLOF:**
  - aggregate turf or Portland cement/concrete recommended. Asphalt less desirable since it may ‘rut’ – safety issue: particularly true if /when ambient temperature is high and/or ‘medium weight’ helicopters are used’. *Portland cement essential for helicopters like the S-76 and Bell 214.*

- **ELEVATED TLOF:**
  - Wood, Metal, Composite Material, Concrete.

- **TLOF: ‘Rough’ Surface To Provide Skid Resistance Recommended**

- **ELEVATED SITES WITH TLOF ONLY** – Allow “space” to *work around* the helicopter.
FATO: Final Approach and Takeoff Area
TLOF: Touchdown and Liftoff Area
• **8:1 (12.5%) APPROACH/DEPARTURE SURFACE.**

• **BASIC SIZE OF TLOF FOR GENERAL AVIATION AND TRANSPORT.** [NEW: TLOF for Elevated Hospital Heliports changed from 1RD to 1D (overall length) if ‘FATO outside TLOF’ is non-load bearing.]

• **SIZE OF FATO.** [New: GA requirements for elevation applied to Hospital Heliports]

• **TLOF OR FATO CAN STILL BE MARKED / LIGHTED.**

• **SAFETY ZONE WIDTH**

• **LITTLE CHANGE FOR TRANSPORT HELIPORTS.**
BASIC CONFIGURATION

No “Circular Heliport” configurations shown in AC-2B or AC-2C: FAA said when AC-2B was developed they wish to encourage use of “Square Layouts” since these provide improved Visual Cues

--- Even so Circular Layouts were still allowed e.g..

Par 201 b. TLOF Size.

Ground-level TLOF. For ground-level heliports, the minimum TLOF dimension (length, width, or diameter) should be 1.0 times the rotor diameter (RD) of the design helicopter.
LAI Recommendation: A square or rectangular FATO or TLOF provides much better visual cues, particularly on approach, to the pilot then a circular FATO or TLOF ... this is generally agreed but there are no known major studies to support this, even LAI recommends that a heliport should be designed with a square FATO and/or square TLOF if possible.

..... at a distance during nighttime operations, a square or rectangular pattern of FATO or TLOF edge lights provides the pilot with better visual cues than a circular pattern: this is stated in AC-2B and was in Draft AC-2C.
A square or rectangular FATO or TLOF provides much better visual cues, particularly on approach, to the pilot than a circular FATO or TLOF ... this is generally but not mentioned in AC-2B: thus design square FATO and/or square TLOF if possible.

Many in industry have questioned this view – HAI requested the text on this aspect was removed from AC-2C until issue resolved: FAA Changed Text

** LAI Recommendation**
Circular heliports allowed … however the figures in AC-2B and AC-2C gives impression that only Square (or Rectangular) allowed …. No “Circular Heliport” configurations shown in AC-2B or AC-2C: FAA stated when AC-2C was being developed that it wish to encourage use of “Square Layouts” since these provide ‘better’ Visual Cues …. even so Circular Layouts are allowed and in AC-2C it is stated:-

207 b/406 b. “….TLOF to be rectangular or circular. Each has its advantages. A square or rectangular shape provides the pilot with better alignment cues than a circular shape, but a circular TLOF may be more recognizable in an urban environment.”
**FATO/TLOF**

- **AC -2B / AC-2C**
  - EACH TLOF MUST BE LOCATED IN A FATO.
  - SAFETY AREAS MUST NOT OVERLAP.

- **AC -2B / AC-2C : TLOF TECHNICALLY REQUIRED FOR HELIPORTS, BUT TLOF NEED NOT BE MARKED.**

*IF TLOF NOT MARKED, SAFETY AREA INCREASED FROM 1/3RD (10FT MIN. PPR/20FT MIN. GA) TO 1/2 OL (20FT OR 30FT MINIMUM).*

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AC-2B 202 e  FATO/FATO Separation. If a heliport has more than one FATO, the separation between the perimeters of the two FATO, should be such that the respective Safety Areas do not overlap. **This separation is based on the assumption that simultaneous approach/ departure operations will not take place.**

**Note:** *If simultaneous operations are planned, greater separation will be required.*

AC-2C 208 e - FATO/FATO separation. If a heliport has more than one FATO, separate the perimeters of the two FATOs so the respective safety areas do not overlap. This separation assumes simultaneous approach/departure operations will not take place. If the heliport operator intends for the facility to support simultaneous operations, provide a minimum 200 foot (61 m) separation.
FATO/FATO SEPARATION

TLOF Center-to Center Separation – approx 2.46 RD (2 OL/2 D)
FATO/FATO SEPARATION

AC 150/5390-2C

TLOF

FATO

Safety Area

TLOF Center-to Center Separation –approx 2.46 RD (2 D)
FATO/TLOF SEPARATION

TLOF Center-to-Center Separation – approx 2.46 RD (2D)

AC 150/5390-2C

NON-SIMULTANEOUS OPERATIONS

TLOF

FATO

Safety Area

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FATO/FATO SEPARATION

AC 150/5390-2C

TLOF

FATO

Safety Area

... also need to consider ‘Airspace’

TLOF Center-to Center Separation – approx 2.46 RD (2 OL)
Simultaneous Operations

FAA Order 7110.65R-Air Traffic Control (February 16, 2006) indicates a separation of 200 ft. for Simultaneous Helicopter Landings or Takeoffs: 200 ft. stated in AC-2C
ELONGATED FATO/TLOF

AC-2B / AC-2C

RD: Rotor diameter of the design helicopter
OL: Overall length of the design helicopter

A – Minimum TLOF Width: 1.0 RD
C – Minimum FATO Width: 1.5 OL
E – Minimum Separation between the perimeters of the TLOF and the FATO: [0.5{1.5 OL - 1.0 RD}]
F – Minimum Safety Area Width: See Table 2-1
G. Minimum Landing Position length and width: 1.0 RD
ELONGATED FATO/TLOF

**TERMINOLOGY**

RD: Rotor diameter of the design helicopter
OL: Overall length of the design helicopter

A – Minimum TLOF Width: 1.0 RD
C – Minimum FATO Width: 1.5 OL
E – Minimum Separation between the perimeters of the TLOF and the FATO: \[0.5\{1.5 \text{ OL} - 1.0 \text{ RD}\}\]
F – Minimum Safety Area Width: See Table 2-1
G. Minimum Landing Position length and width: 1.0 RD
TERMINOLOGY

RD: Rotor diameter of the design helicopter
OL: Overall length of the design helicopter

- Minimum TLOF Width: 1.0 RD
- Minimum FATO Width: 1.5 OL
- Minimum Separation between the perimeters of the TLOF and the FATO: \[0.5\{1.5\text{ OL} - 1.0\text{ RD}\}\]
- Minimum Safety Area Width: See Table 2-1
- Minimum Landing Position length and width: 1.0 RD

[0.5\{1.5\text{ OL} - 1.0\text{ RD}\}] \text{ in AC-2B replaced in AC-2C with ‘} \frac{3}{4}D – \frac{1}{2}\text{ RD}’ \text{’}
FATO LENGTH ADJUSTMENTS FOR ELEVATION

AC-2B: NOT REQUIRED FOR PPR OR HOSPITAL HELIPORTS

AC-2C: OPTIONAL FOR PPR – REQUIRED FOR HOSPITAL HELIPORTS

Example: 80 Feet is Added to the Basic FATO Length
For a Site Elevation of 3,200 Feet.
This is the GA Heliport requirement and the FAA considers that Hospital Heliports are a special case of a GA heliport and hence it should apply! HAI recommended that hospital heliports should be considered as a special case of a PPR Heliport and requirement should not apply!

One problem is that the source of ‘chart’ can not be located!

The reasoning behind this requirement is not understood or known: it does not appear to be appropriate for modern helicopters. Also it not clear how it is applied: clarification on this by the FAA for one member has result in additional confusion. This requirement can have major impact and could result in heliports (hospital) heliports not being built / updated at locations at elevations well above sea-level.

Some HAI members working with FAA to resolve concerns.
FATO LENGTH ADJUSTMENTS FOR ELEVATION

**AC-2B**: NOT REQUIRED FOR PPR OR HOSPITAL HELIPORTS

**AC-2C**: OPTIONAL FOR PPR – **REQUIRED FOR HOSPITAL HELIPORTS**

Major Impact – **NOT** considered by HAI to be required for Hospital Heliports.

Example: 80 Feet is Added to the Basic FATO Length For a Site Elevation of 3,200 Feet.
LOAD BEARING AREAS
SURFACE LOADING REQUIREMENTS

FATO: Varying Surface Requirements [Dynamic Load Bearing to Non-Load Bearing]

TLOF: Dynamic Load Bearing area (On all heliports)

Safety Area: No Surface Requirements
LOAD BEARING AREAS

• **Dynamic Load Bearing (DLB)** – 1.5 Maximum Takeoff weight ... assumed to apply through two (2) points of contact: normally the two rear wheels on wheeled helicopter or the two aft skid contact areas on skid helicopter. [AC-2B Par 806 b.]

• **Static Load Bearing (SLB)** – Maximum Takeoff applied through all points of contact i.e. total wheel or skid contact area. [AC-2B Par 806 a.]

• **Ground Effect Area (GEA)** – a 20 lbs/sq.ft (98 kg/sq.m) live load" is also defined in AC-2B: this is in effect a GEA but it is not called this by FAA and term is not used in AC-2C
LOAD BEARING AREAS

PPR (Private Use)
LOAD BEARING AREAS

PPR (Private Use) - Can be the same as GA (General Aviation) ... but less demanding requirements allowed

[GA Defined later in presentation]
AC-2B / AC-2C.

– GROUND LEVEL: 1RD BUT IF PORTION IS PAVED, PAVED AREA CAN BE 2 UC. NEED TO BE LOCATED IN CENTER OF TLOF AND TO ENSURE THERE IS “NO LIP” BETWEEN PAVED AND UNPAVED AREAS.

– NOTE: TLOF is still 1RD and not 2UC!! Slightly confusing since all TLOF can be turf/un-paved – it must however be dynamic load bearing.

NOTE: 1.5 UC OF AC-2A CHANGED TO 2 UC IN AC-2B TO PROVIDE LARGER AREA AND BETTER VISUAL CUES.
PPR GROUND LEVEL HELIPORT

AC-2B / AC-2C

TLOF Marked.

TLOF 1RD DLB Area

FATO 1.5 OL – GEA
PPR GROUND LEVEL HELIPORT

TLOF Marked.

TLOF 1RD DLB Area

FATO 1.5 OL – No Surface requirement [OK to make it SLB]
PPR GROUND LEVEL HELIPORT

TLOF Marked.

Paved Portion of **Ground Level TLOF 2 UC DLBA Area**

**FATO 1.5 OL – GEA**

**TLOF 1RD SLB Area ??**
PPR GROUND LEVEL HELIPORT

FATO – 1.5 OL/1.5 D GEA

Safety Area

1/3 RD (Min 10 ft/3 m)

‘Landing Pad’ – 2UC DLB Area

TLOF – 1RD

SLB Area ??

TLOF Marked
AC-2B / AC-2C

(2) Elevated PPR heliports. At PPR rooftop or elevated facilities where the height of the TLOF surface above the adjacent ground or structure is no greater than 30 inches (76 cm), and there is a solid adjacent ground or structure equal to the rotor diameter (RD) able to support 20 lbs/sq ft (98 kg/sq m) live load, design the minimum dimension of the TLOF to be at least the smaller of the RD and two times the maximum dimension (length or width) of the undercarriage of the design helicopter. Locate the center of the LBA of the TLOF in the center of the FATO.

1RD BUT THE TLOF CAN BE THE SMALLER OF 1 RD AND 2UC if there is a “solid surrounding area” of 1RD able to support 20 lbs./sq ft. and height above “surrounding area” is 30 inches (75c/m) or less.

“Solid Surrounding Area” provides ‘ground effect area’
PPR ELEVATED HELIPORT

AC-2C

"Surrounding Area" of 1RD

TLOF Smaller of 1RD and 2UC DLB Area
30 inches (76 cm) or LESS above "Surrounding Area" of 1RD
[Surrounding Area - GEA]
PPR ROOFTOP HELIPORT

FATO – 1.5 D

Safety Area
1/3 RD (Min 10 ft/3 m)

Landing Pad – 2UC DLB

TLOF – 1RD – GEA **

** 20 lbs/sq.ft (98 kg/sq.m) live load
LOAD BEARING AREAS

Hospital Heliports
TLOF - HOSPITAL HELIPORT

AC-2B  401 b

TLOF Size. The minimum TLOF dimension (length, width, or diameter) should be 1.0 rotor diameter (RD) of the design helicopter but not less than 40 feet (12 m).

Proposed AC-2C  405 b

TLOF Size. The minimum TLOF dimension (length, width, or diameter) is equal to the rotor diameter (RD) of the design helicopter but not less than 40 feet (12 m). …. Change proposed by Industry and originally agreed by FAA ……. but retained in AC-2C!

AC-2C  406 b

TLOF size. The minimum TLOF dimension (length, width, or diameter) is equal to the rotor diameter (RD) of the design helicopter but not less than 40 feet (12 m).
GROUND LEVEL HOSPITAL HELIPORT

AC 150/5390-2C

AC 150/5390-2B

TLOF – DLB Area

FATO – DLB or if TLOF marked ‘No Loading Requirement’

FATO 1.5 OL

TLOF Marked

FATO – GEA ?
FATO SURFACE CHARACTERISTICS

AC-2C: 406 c (1)

FATO Surface characteristics. If the heliport operator marks the TLOF, the FATO outside the TLOF need not be load-bearing.

(1) Ground-level hospital heliports. If the heliport operator does not mark the TLOF, and/or intends that the helicopter be able to land anywhere within the FATO, design the FATO outside the TLOF and any FATO supporting structure, like the TLOF, to be capable of supporting the dynamic loads of the design helicopter.
GROUND LEVEL
HOSPITAL HELIPORT

AC-2B

FATO “Need not be LB”

TLOF - DLB Area

AC-2C

FATO – “TLOF marked -need not be load bearing” or DLB if TLOF NOT marked

TLOF Marked

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208 b/407 c. FATO surface characteristics. If the heliport operator marks the TLOF, the FATO outside the TLOF need not load-bearing.

208 b (4) Elevated PPR heliports. For elevated PPR heliports, if the heliport operator intends to mark the TLOF, as an option design the FATO outside the TLOF and the safety area to extend into the clear airspace (see Figure 2–4).

……

407 c (2) Elevated hospital heliports. The FATO outside the TLOF may extend into clear airspace. However, there are some helicopter performance benefits and increased operational flexibility if the FATO outside the TLOF is load bearing. Design the FATO outside of the TLOF to be load-bearing unless the minimum width and length or diameter of TLOF is increased to the overall length of the design helicopter. [i.e. 1D instead of 1RD!]

[Ground Level GA must be Dynamic Load Bearing; Elevated GA can be in clear airspace if TLOF increased to 1D]
**General Aviation: 207 b. TLOF size.** Design the TLOF so the minimum dimension (length, width, or diameter) is at least equal to the RD of the design helicopter (except as noted in (2) below).

(1) **Elevated public general aviation heliport.** If the FATO outside the TLOF is not load-bearing, increase the minimum width, length or diameter of the TLOF to the overall length (D) of the design helicopter.

(2) **Elevated PPR heliports.** At PPR rooftop or elevated facilities ……the minimum dimension of the TLOF to be at least the smaller of the RD and two times the maximum dimension (length or width) of the undercarriage of the design helicopter.

**Hospital Heliport 406 b. TLOF size.** The minimum TLOF dimension (length, width, or diameter) is equal to the rotor diameter (RD) of the design helicopter but not less than 40 feet (12 m).

1) **Elevated hospital heliport.** If the FATO outside the TLOF is non-load-bearing, increase the minimum width, length or diameter of the TLOF to the overall length (D) of the design helicopter.
HAI objected to TLOF size change, when the FATO is non-load-bearing, but the FAA retained requirement of a ‘1D TLOF’, given in Draft AC-2C, in AC-2C: this is a major change and will have major impact on design of elevated hospital heliports in terms of cost and location! FAA also retained’ min 40 ft. (12 m) requirement’ for the TLOF.

*Note: Most elevated hospital heliports are built with non-load bearing FATOs – the TLOF area is increased by 44%!

There is a minimum separation between the FATO and TLOF. Thus increasing the TLOF size also increases the FATO size (to approx. 1.67D instead of 1.5D) and the total length/width or diameter (to approx. 2.21D instead of approx. 2.04D) [Values based on assumption at 1RD = 0.83D].

HAI does not consider there is a safety reason to justify the increase in TLOF size: FAA asked for safety justification of change – reply not received.

Major economic impact – 44 % in size (area): total cost increase (based on member inputs) are between 20% and 44%.
ELEVATED HOSPITAL HELIPORT

AC 150/5390-2B

- TLOF 1 RD (40 ft min) – DLB Area
- FATO non-LB

AC 150/5390-2C

- TLOF 1D (Approx. 1.2 RD) – DLB Area

Major Change!!

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LOAD BEARING AREAS

General Aviation
GROUND LEVEL GA HELIPORT

FATO 1.5 1 D/1 OL
TLOF 1RD

TLOF – DLB Area

FATO – ‘if TLOF marked’ no LB requirement or if ‘TLOF not marked’ DLB
GROUND LEVEL GA HELIPORT

TLOF Marked

TLOF NOT Marked

FATO – ‘No LB Requirement’

TLOF - DLB Area

FATO – DLB Area

Increased Safety Area

FATO 1.5 D /TLOF 1RD
GROUND LEVEL GA HELIPORT

TLOF Marked

FATO – SLB Area

TLOF - DLB Area

TLOF NOT Marked

FATO – DLB Area

Increased Safety Area

Same Applies to Elevated GA Heliports, but ….

FATO 1.5 OL / 1.5D - TLOF 1RD

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ELEVATED GA HELIPORT

AC-2C

208 b (3) Elevated heliports. As an option, design the FATO outside the TLOF to extend into clear airspace. However, there are some helicopter performance benefits and increased operational flexibility if the FATO outside the TLOF is load bearing. Design the FATO outside of the TLOF to be load-bearing, or increase the minimum width and length or diameter of TLOF to the overall length of the design helicopter.
ELEVATED GA HELIPORT

TLOF 1 D –DLB Area
(1OL/1D= Approx 1.2RD)
FATO/TLOF SEPARATION

TLOF -- 1RD (Dynamic Load Bearing)

FATO -- 1.5 OL (Static Load Bearing)

Safety Area -- 1/3 RD **

FATO/TLOF Separation -- ‘0.5 x (1.5 OL – 1RD)’

** Other values can apply No Surface Requirement

Par 202 b (2): The minimum distance between the TLOF perimeter and the FATO perimeter should be not less than the distance [0.5 x (1.5 OL – 1RD)] where OL is the overall length and RD is the rotor diameter of the design helicopter. The relationship of the TLOF to the FATO and the Safety Area is shown in Figure 2-2. [ Par 402 b (2) is similar.]

New AC-2B Requirement

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208 a (2): Design the minimum distance between the TLOF perimeter and the FATO perimeter to be not less than the distance \((\frac{3}{4} D - \frac{1}{2} RD)\) where \(D\) is the overall length and \(RD\) is the rotor diameter of the design helicopter. Note that if the TLOF and FATO are not of similar shape, this applies at all points of the TLOF perimeter. The relationship of the TLOF to the FATO and the safety area is shown in Figure 2–2. [407 b (2)]

** Other values can apply No Surface Requirement
FATO/TLOF SEPARATION

MINIMUM DIMENSIONS

TLOF – 1RD

FATO – 1.5 OL/1.5D

Safety Area – 1/3 RD

FATO/TLOF Separation- [0.5 x (1.5 OL – 1RD)]
FATO/TLOF SEPARATION

MINIMUM DIMENSIONS

TLOF – 1RD
FATO – 1.5 OL

ADEQUATE SAFETY AREA

Safety Area – 1/3 RD

FATO/TLOF Separation- [0.5 x (1.5 OL – 1RD)]

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FATO/TLOF SEPARATION

TLOF – Larger than 1RD

FATO – 1.5 OL

Safety Area – 1/3 RD

INADEQUATE SAFETY AREA
FATO/TLOF SEPARATION

**Safety Area** – 1/3 RD

**TLOF** – Larger than 1RD

RD Size of ‘design helicopter’ must be stated on TLOF and NOT actual TLOF size

**ADEQUATE SAFETY AREA**

**FATO** = ‘TLOF + (1.5OL – 1 RD)’
FATO/TLOF SEPARATION

TLOF – Larger than 1RD

RD Size of ‘design helicopter’ must be stated on TLOF and NOT actual TLOF size

ADEQUATE SAFETY AREA

FATO - Larger than 1.5 OL

Safety Area – 1/3 RD
FATO/TLOF
SEPARATION

TLOF – Larger than 1RD
TLOF = 55 ft x 55 ft [RD = 44 ft]

RD Size of ‘design helicopter’ must be stated on TLOF and NOT actual TLOF size

ADEQUATE SAFETY AREA

FATO - Larger than 1.5 OL

Safety Area – 1/3 RD
FATO/TLOF SEPARATION

• TLOF is often made larger than the minimum value since this enhances the safety factors and increases the operational flexibility. In this case the size of the FATO must be increased.

• FATO = TLOF size + 2 x 0.5 (1.5 D – 1 RD) [or (0.75 D – 0.5RD)]
  = TLOF size + (1.5 D – 1 RD).

• Example: if RD = 44 ft (13.4 m) and OL = 52.5 ft (16.0 m) * and the TLOF is made 50 ft. (15.24 m) instead of the minimum 1 RD of 44 ft (13.4 m), then FATO required is NOT 1.5 OL of 78.8 ft (24.0 m), but FATO = 84.8 ft (25.8 m). This increases the size of the FATO by the same amount as the TLOF i.e. 6 ft (1.8 m). The total area (FATO + Safety Area) i.e. 1.5 OL + 2 x ‘Safety Area’ ** will similarly be increased from a minimum of 108 ft (32.9 m) to 114 ft (34.8 m).

Note: In the example the numbers are rounded to the nearest 1/10th and thus the metric conversions are not exact.

*Size for Sikorsky S-76.
** Safety Area 1/3 RD – assuming standard makings are applied (see Tables 2-1 and 4-1 in AC-2C) – 14.66 ft (4.5 m) or rounded up 15 ft (4.6 m).

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It is generally accepted that, if it is structurally and financially possible, a *load bearing area* larger than the minimum requirement of the 1RD is beneficial to all the heliport users - both the pilots and the passenger/patients – and as operational and safety advantages. For example a larger *load bearing area* at a PPR heliport allows more room for passengers and at a hospital heliport more room to maneuver a patient on a gurney out from under the main rotor and away from the tail rotor.
Even so, the requirement in Advisory Circular 150/5390-2B (AC-2B) for the FATO/TLOF can appear to discourage designing an elevated PPR or Hospital heliport with a load bearing area larger than the minimum size TLOF of 1RD since increasing the size of the TLOF results in an increase in the size FATO and safety area and hence ‘total area’ – and often cost. This was NOT the intent of AC-2B.

The current requirements for ‘lights’ are also not clear in the case where the load bearing area is larger than the minimum size TLOF of 1RD but less than the size of the FATO. In addition AC-2B does not appear to recognize that the safety net surrounds the ‘load bearing area’ and not simply the TLOF or FATO. These are oversights and are NOT intended to inhibit the designing the of load bearing area to be as large as possible.
Even so, the requirements in Advisory Circular 150/5390-2B (AC-2B) for the FATO/TLOF can appear to discourage designing an elevated PPR Hospital heliport with a load bearing area larger than the minimum size TLOF of 1RD since an increase in the size of the TLOF results in an increase in the size FATO and safety area, and hence 'total area'– and often cost. This was NOT the intent of AC-2B.

The following are suggestions to address this issue – this is NOT in AC-2B but it had been discussed with representatives of ‘FAA Airports’ prior to December 2010 and they did not see any aspects which cause concern and indicated that revised text to cover this was being developed for including in AC-2C”. In addition AC-2B does not appear to recognize that the safety net surrounds the ‘load bearing area’ and not simply the TLOF or FATO. These are oversights and are NOT intend to inhibit the designing the load bearing area as large as possible.
ELEVATED HOSPITAL HELIPORT

“Hospital Roof-top”

FATO 1.5 OL

SAFETY AREA - 1/3RD

TLOF 1 RD (40 ft min.) – DLB

DLB = Dynamic Load Bearing Area
“Hospital Roof-top”

LBA > 1RD

Safety Net

Touchdown/Positioning ‘circle’ Marking
0.5 OL inner diameter.

FATO 1.5 OL

SAFETY AREA - 1/3RD

TLOF 1 RD – LB A
PERIMETER LIGHTS

Flush (inset) lights
Current AC-2B

Flush (inset) – outer edge of LBA **
or
Raised lights – inner edge of safety net

Safety Net

Raised lights – outer edge of safety net

** LBA = Load Bearing Area

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PERIMETER LIGHTS

- **Flush (inset) lights**
  - Current AC-2B

- **Flush (inset)** – outer edge of LBA

- **or**

- **Raised lights** – inner edge of safety net

- **Safety Net**

- **Raised lights** – outer edge of safety net

**LBA = Load Bearing Area**
106 w. **Load-Bearing Area (LBA).** The portion of the FATO capable of supporting the *dynamic load* of the design helicopter.

406 b. **TLOF size.** The minimum TLOF dimension (length, width, or diameter) is equal to the rotor diameter (RD) of the design helicopter but not less than 40 feet (12 m). …… **Increasing the load-bearing area (LBA) centered on the TLOF may provide some safety and operational advantages.** Increasing the TLOF dimensions may enhance safety factors and/or operational efficiency

414 c. **Extended pavement/structure markings.** As an option at hospital heliports, increase the pavement or structure without a corresponding increase in the length and width or diameter of the FATO to accommodate pedestrians and/or support operations. **Whether or not this increased area is part of the LBA,** mark the pavement or structure outside the TLOF with 12-inch-wide (30 cm) diagonal black and white stripes. See Figure 4–26 for marking details.
Extented Pavement or Structure Marking: Hospital

Note: FATO not marked and there are no FATO lights!

Notes:
1. Extended pavement/structure markings begin flush with TLOF edge markings and end at the edge of the extended pavement/structure.
2. Extended pavement/structure markings are 12 in [30 cm] wide black and white stripes on a 45° angle.
TLOF + LBA
The AC is somewhat confusing and unclear how it will be interpreted. In 216 a (1)/415 a (2) it states that ‘raised TLOF perimeter lights’ can be used if located on the “outside edge of the TLOF or the outer edge of the safety net.” Figures 2-28 and 4-29 shows ‘raised lights’ mounted on the outer edge of the TLOF/LBA ** or outer edge of safety net and ‘flush lights’ on edge of TLOF. However Figures 2-24 and 4-26 only show ‘flush TLOF perimeter lights’ – it NOT clear which requirements apply. The safety net will, of course, not be on edge of the TLOF if a LBA - “extended area” - is used!

It is stated in 216 a (2) “… As an option when the pavement or structure is larger than the TLOF, mount perimeter lights on the outer edge of the pavement or structure or the inner or outer edge of the safety net…. [This provision is not stated in Chapter 4 – Hospital Heliport]

A NEW requirement (not in Draft AC-2C) to always mark any ‘load bearing/solid area’ outside the TLOF with black and white stripes is implied by 215 c/414 c: the reason for this new requirement is not known.

Note: The FAA included the LBA requirement, as requested by HAI, but there is concern by many in the industry on the way it is “worded in AC-2C” which seems to imply that such a LBA would always be required or desirable on all hospital (and PPR) heliports, when of course it is intended to be optional.

** Normally taken as the ‘inner edge of the safety net’.
OTHER ISSUES
• **AC-2B** states “Hospital Heliports: If Federal Funds are used the facility should have sufficient size to support Normal Size Military Medivac Helicopters”.

  *Industry recommends this should apply to all new hospital heliports when practical. Aim should be to design for Blackhawk/UH-60 used by US Army and National Guard. Information for UH-60 included in AC-2B.*

• **AC-2C 402 Applicability**. ……….. Consider the feasibility of accommodating large military helicopters that might be used in an emergency.

• In addition in **AC-2C**, like **AC-2B**, information for UH-60 is included in Appendix B.
“Recommendation” added in AC-2C that a 280 ft (85.3 m) HELIPORT PROTECTION ZONE (HPZ) is established at Hospital Heliports i.e.

Heliport protection zone (HPZ) The FAA recommends the establishment of an HPZ for each approach/departure surface. The HPZ is the area under the 8:1 approach/departure surface starting at the FATO perimeter and extending out for a distance of 280 feet (85.3 m), as illustrated in Figure 4–11. The HPZ is intended to enhance the protection of people and property on the ground. This is achieved through heliport owner control over the HPZ. Such control includes clearing HPZ areas (and maintaining them clear) of incompatible objects and activities. The FAA discourages residences and places of public assembly in an HPZ. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly.) Do not locate hazardous materials, including fuel, in the HPZ.

Industry is concerned this will be taken by many to imply that a HPZ is essential – this is impossible at many hospital heliports.
FAA has included a ‘recommendation’ for a HPZ for Hospital Heliports: this will have a major impact on hospital heliports design.

Note: AC-2C states “the FAA recommends...”: thus it is not a standard. In AC-2B for GA Heliports it is effectively a ‘requirement’! It is not mentioned in AC-2B for hospital heliports.

In many cases this requirement, if rigorously applied, would prohibit hospital heliports being built or positioned near the ‘emergency facilities’.

The statement “The FAA discourages residences and places of public assembly in an HPZ. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly)” does not make any sense in the context of heliports!
EMERGENCY HELICOPTER LANDING FACILITY

AC-2C

108 g. Emergency helicopter landing facility (EHLF). A clear area at ground level or on the roof of a building capable of accommodating helicopters engaged in fire fighting and/or emergency evacuation operations. An EHLF meets the definition of a heliport in this AC and under Title 14 CFR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports.

A new provision (not in Draft AC-2C) this means that EHLF are subject to ‘Part 157’, Form 7480, etc. This is a major departure from the AC-2B which indicates that EHLFs are not "heliports".

HAI Heliport Committee (Chair: Ricarda Bennett) requested FAA to make it clear that in AC-2C that such EHLF facilities are NOT subject to such requirements – clearly this was not accepted by the FAA.

Note: EHLFs (which are used only by public agencies for evacuation of buildings or for the insertion of fire fighters) is treated just like a standard heliport in AC-2C: the property owner will need to fill out the FAA 7480-1 (and, possibly the FAA 7460-1) and go through an airspace determination evaluation process, with the ultimate result it could be included in the FAA National Data Base. At least one FAA official has stated Part 157 requires notification is for a “public use landing area only” and “As far as we know Hospital or Medical are private use.”

[Not clear how this will be handled by regional FAA officials or States.]
End of this section ….

…… MORE TO COME