



# **NASA Commercial Crew Program & Medical Operational Challenges**

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Flight Surgeon

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Disclosure Information  
93<sup>rd</sup> Annual Scientific Meeting  
Joe Dervay, MD

- I have no financial relationship to disclose.

# Commercial Crew Missions



# DM2



# SpaceX Demo-2 Crew



Commander  
Doug Hurley  
PLT for STS-127, STS-135



Flight Engineer  
Robert Behnken  
MS for STS-123, STS-130

# Mission Overview

- Crew: COL Doug Hurley, USMC (ret) & COL Bob Behnken, USAF
- Launch 30 May, 2020 KSC 3:23 PM EDT
  - First US launch since STS-135 in 2011
- Landing 2 August, 2020 1:48 PM CDT Pensacola, FL
  - First splashdown in 45 yrs, since Apollo-Soyuz
- Mission duration 63 days/23:25 hrs
- Test flight of Dragon capsule, first crewed
- Four EVAs completed (Cassidy and Behnken)

# NASA/SpaceX Commercial Crew

<p><b>SpaceX DEMO-2</b></p> <p>Launch: 30 May 2020 Landing: 2 Aug 2020</p>	<p><b>SpaceX Crew-1</b></p> <p>Launch: 14 Nov 2020 Landing: 2 May 2021</p>	<p><b>SpaceX Crew-2</b></p> <p>Launch: 23 Apr 2021 Landing: 9 Nov 2021</p>	<p><b>SpaceX Crew-3</b></p> <p>Launch: 11 Nov 2021 Landing: 22 Apr 2022</p>	<p><b>SpaceX Crew-4</b></p> <p>Launch: 27 Apr 2022 Landing: 14 Oct 2022</p>
	 <p><i>Mike Hopkins</i></p>	 <p><i>Shane Kimbrough</i></p>	 <p><i>Tom Marshburn</i></p>	 <p><i>Kjell Lindgren</i></p>
 <p><i>Douglas Hurley</i></p>	 <p><i>Soichi Noguchi</i></p>	 <p><i>Megan Behnken</i></p>	 <p><i>Raja Chari</i></p>	 <p><i>Bob Hines</i></p>
 <p><i>Robert Behnken</i></p>	 <p><i>Victor Glover</i></p>	 <p><i>Thomas Pesquet</i></p>	 <p><i>Matthias Maurer</i></p>	 <p><i>Samantha Cristoforetti</i></p>
	 <p><i>Shannon Walker</i></p>	 <p><i>Aki Hoshide</i></p>	 <p><i>Kayla Barron</i></p>	 <p><i>Jessica Watkins</i></p>



Board approval for flight

Board approval for flight

- CDR

**Kjell Lindgren, MD**

- Exp 44/45      141 days



- PLT

**Bob "Farmer" Hines**

- 1<sup>st</sup> spaceflight



- MS-1

**Samantha Cristoforetti**

- Exp 42/43      200 days



- MS-2

**Jessica Watkins**

- 1<sup>st</sup> spaceflight





# Mission Overview

## 170 days

Launch 27 April 2022 07:52:55 UTC

Dragon Freedom with F9 Block 5

Docking 27 April 2022 23:37 UTC Node 2 Zenith

Mission Station maintenance, Science experiments, SpX-25 and rodent research, CFT-2 docking, NRAL trash jettison

Undock 14 Oct 2022 16:05 UTC

Landing 14 Oct 2022 21:55 UTC Jacksonville Landing Site, Atlantic Ocean

**\*\*\* Fastest crew uphill to date**

**\*\*\* Fastest crew downhill to date**

**\*\*\* First NASA Atlantic splashdown since Apollo 9, March 1969**

# Mission Medical Staffing

## Medical

NASA

### Crew Surgeons

Joseph Dervay MD

David Picken MD

### Hawthorne Surgeons

Rahul Suresh MD

Becky Blue MD

James Pattarini MD

### Landing Nurses

Jessica Rutland RN

Chelsea Humphries RN

ESA

Maybritt Kuypers MD

Helmut Fleischer MD

Adrianos Golemis MD (Launch)

SpaceX

Brandon Trapp MD (L&L)

Haig Aintablian MD (Landing)

## Management

### CMO / MMT

Shannan Moynihan MD

Terry Taddeo MD

### PMO

Ben Johansen MD

### CHPO

Jonathan Dory

## BMEs

### Mission Manager

Carissa Rosen

### BME Increment Manager

Carson Hoke

Corynn Greenhalgh

### BME Conference Manager

Neel Patel

Nancy Bansbach

Emma Robinson

### BME Technical Liaison

Shannon McLellan

Daniel Marburgh

## Contingency Team

Travis Houser

John Brown

Matthew Goldston

## Strength and Reconditioning Team

Bruce Nieschwitz

Cory Twine

Christi Keeler

Maj Danielle Andersen

## BHP

Al Holland MD / Kim Seaton PhD (Lindgren)

Chip Dukes MD / Jana Tran PhD (Hines)

Al Holland MD / Jana Tran PhD (Watkins)

ESA BHP (Cristoforetti)

Kelly Curtis/Rachel Passmore PhD

– KSC launch support

## Increment Surgeons

Dervay and Picken + Chamberlain

# Preflight

## Keeping Crew Healthy (and safe)



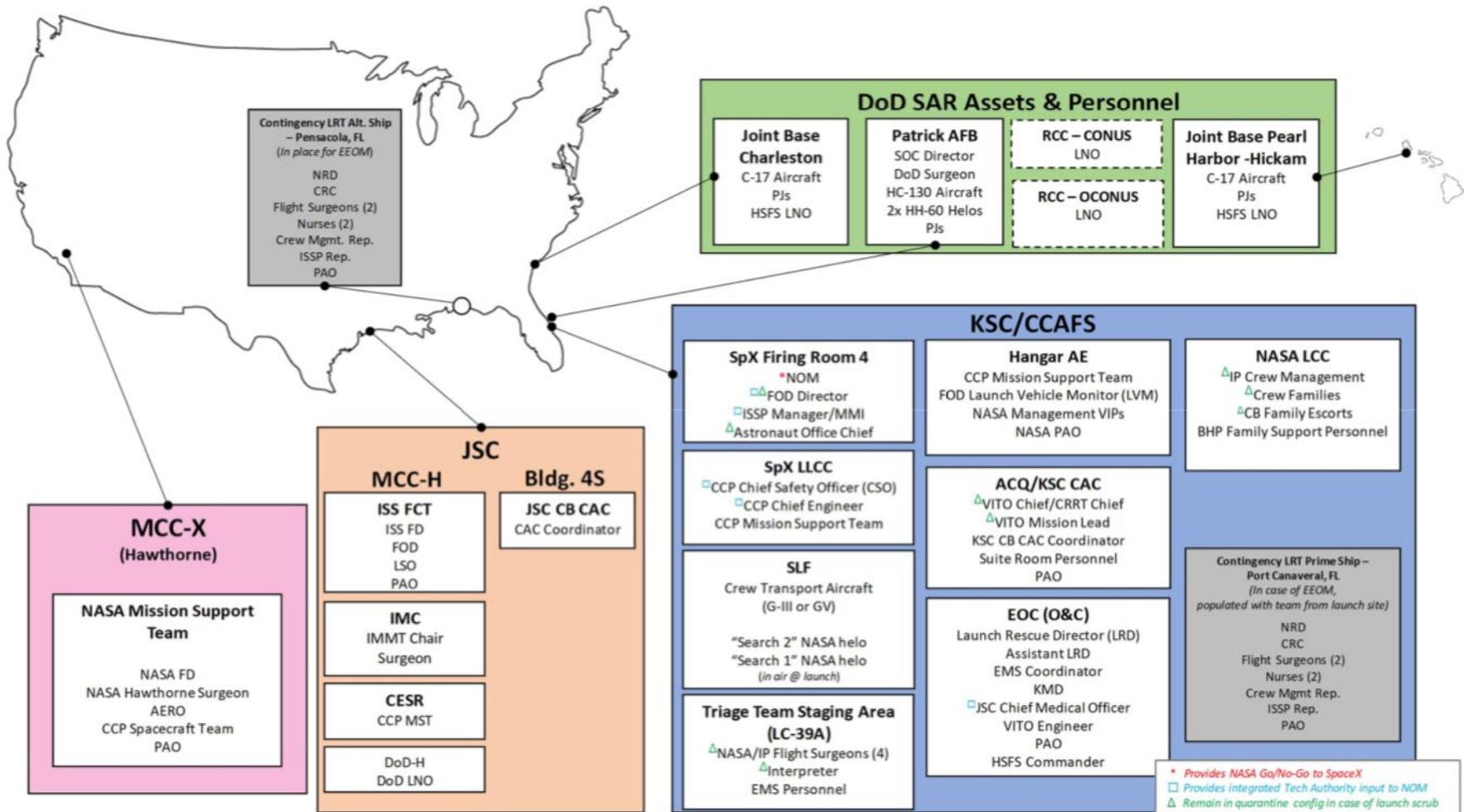
# Significant Activities to Prepare

- Operational training scenarios
- Simulations
- Flight Rule development
- Splashdown and water recovery scenarios
- Medical equipment needs
- Contingency planning
- Return plan to Houston/ESA

# Important Communication

- Integration with DOD
- Potential Definitive Care Medical Facilities
- SOMSTC training

# Mission Staffing for Launch

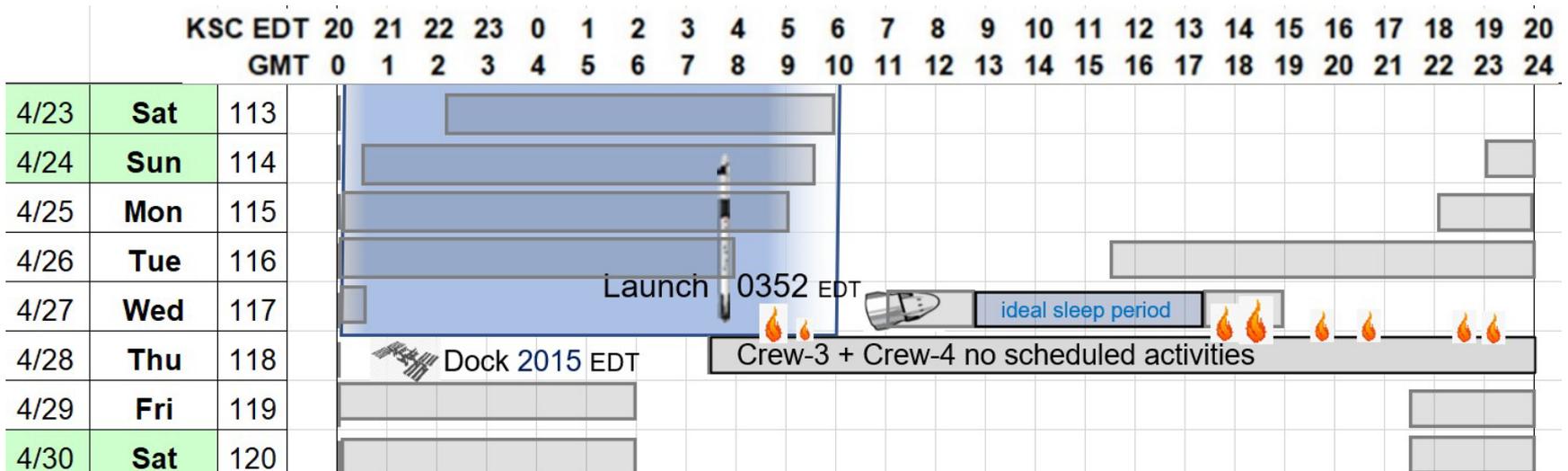


# Sleep Shift Issues

- Crew wanted to maximize daylight time with families at beach house
- Launch delays led to multiple iterations
- Minimal shift to a slam shift before dry dress and launch

# Final Plan

i.e., what was done





# Landing Preparation

- Private Medical Conferences
- Fluid loading and medication reviews with crew
- Anticipated sequence of events on recovery ship and helo flight to shore
- Review of NASA gulfstream ops to JSC
- COVID-19 plan throughout all phases
- Staffing plan and comm for JSC, recovery sites, and Hawthorne
- Shipboard potential sea-sickness for support personnel

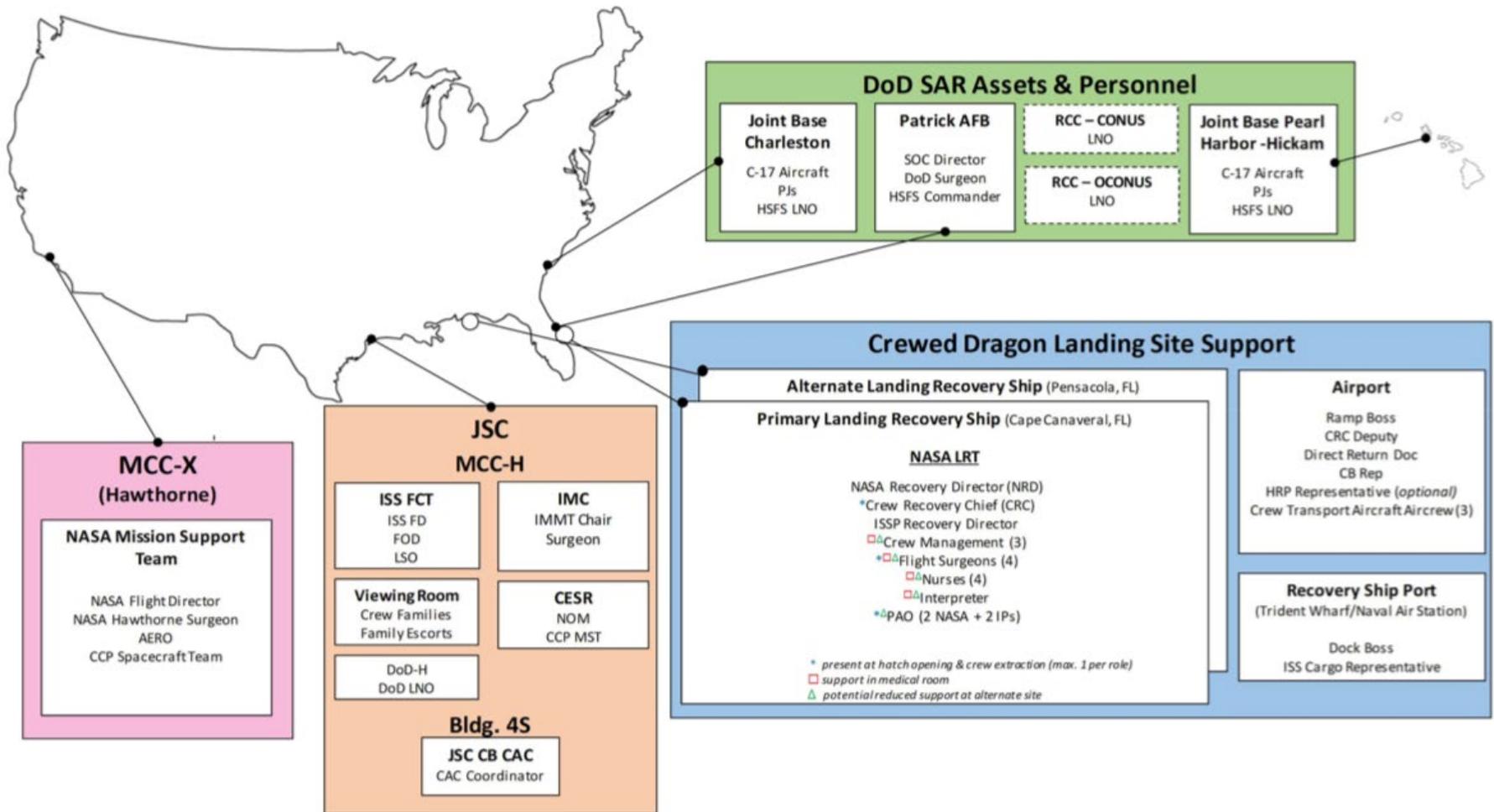
# Shipboard landing preparation

- R-1 Shipboard safety drills
- Medical bay equipment review
- Rehearsal of various scenarios with medical staff
- COVID-19 precautions

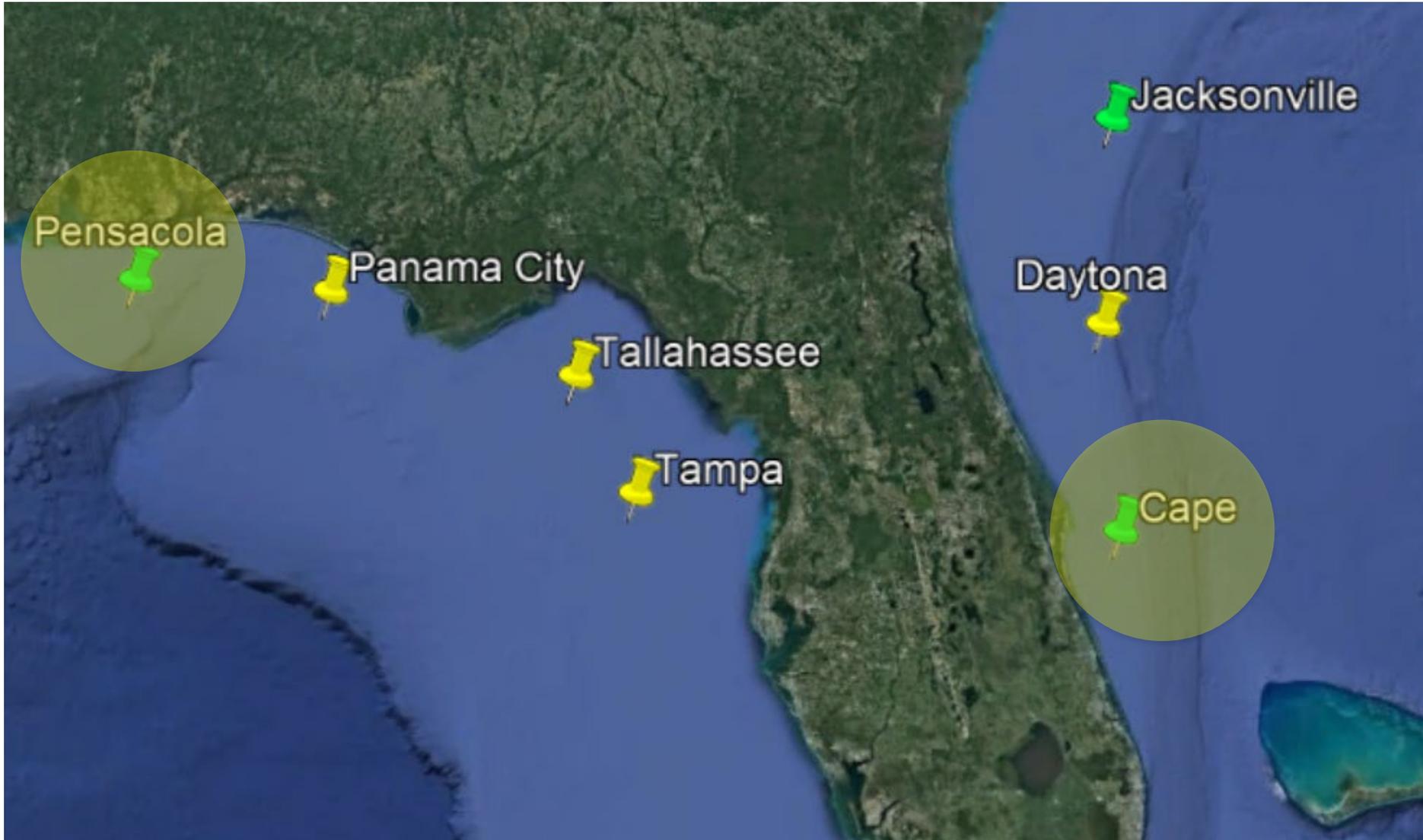
## Medical Team

- 2 NASA MDs + ESA MD
- 2 SpaceX MDs
- 2 NASA contract nurses
- 2 SpaceX paramedics
- Further review of workspace, equipment procedures, roles and responsibilities

# Planned Mission Staffing for Landing



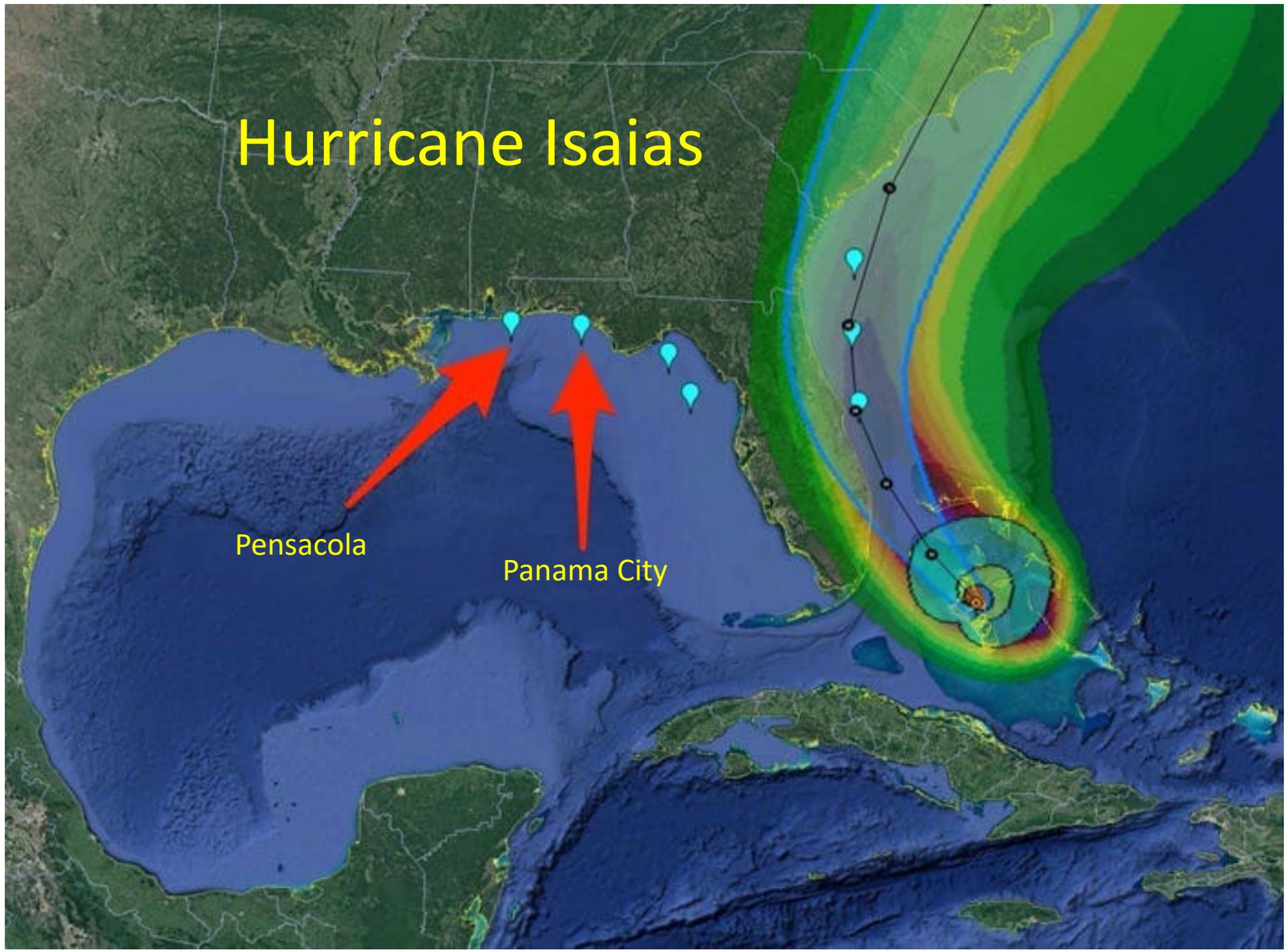
# Primary and alternate landing sites



# Hurricane Isaias

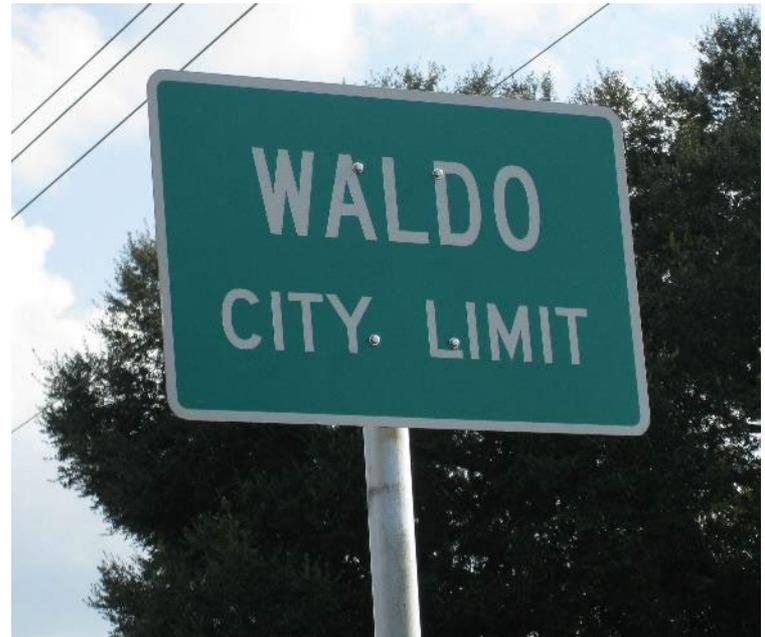
Pensacola

Panama City



A wide-angle photograph of a vast, deep blue ocean under a clear, light blue sky. The horizon line is straight and divides the image roughly in half. The water has a textured surface with small, rhythmic waves.

# Search for the Fountain of Good Weather





# Post-Landing Timeline

- Splashdown @ 1655 EDT

Minutes post

- MV Megan at capsule 25
- Nested 27
- Hatch open 37
- 1<sup>st</sup> crew egress 46
- 4<sup>th</sup> crew egress 53

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- MV Megan at capsule 25
- Nested 27
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- 1<sup>st</sup> crew egress 46
- 4<sup>th</sup> crew egress 53
- Helo with crew take-off 131
- Helo lands at JAX 169 (38 min flight)
- FBO – Standard Measures
- GV takes off for EFD 274

# Thank you

Our appreciation to everyone who contributed  
to the success of this mission