A photograph of an airplane cabin interior, showing rows of blue seats and passengers. The image is slightly blurred and has a semi-transparent white box overlaid on top.

Is there a Doctor on the Plane?

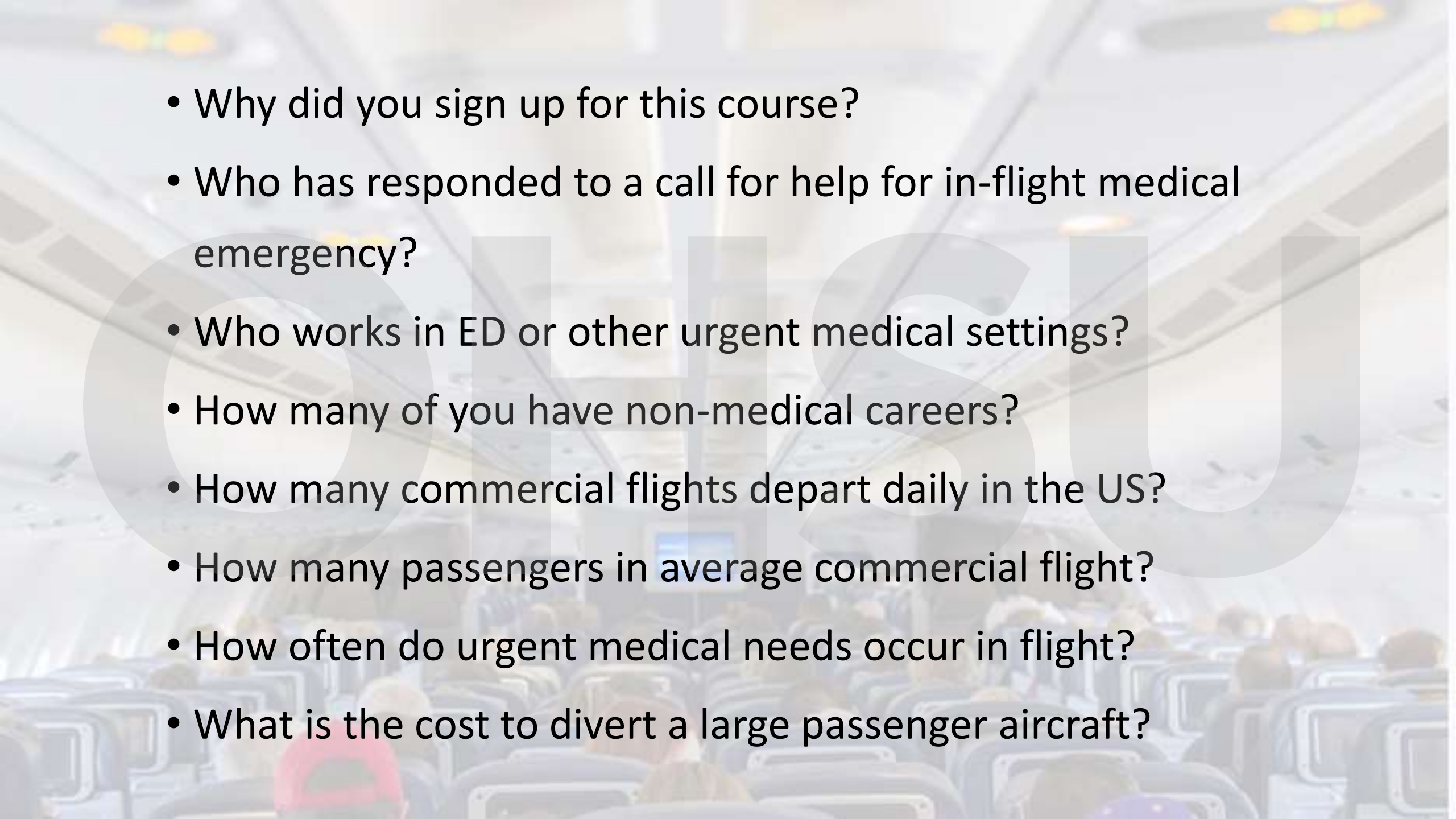
When Medical Professionals are Asked to Help In-Flight
McMenamins Kennedy School
June 28, 2019

Urgent Care at Altitude

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Assistant Professor
Senior Aviation Medical Examiner
Department of Family Medicine, OHSU

Conflicts of interest:

None

- 
- Why did you sign up for this course?
 - Who has responded to a call for help for in-flight medical emergency?
 - Who works in ED or other urgent medical settings?
 - How many of you have non-medical careers?
 - How many commercial flights depart daily in the US?
 - How many passengers in average commercial flight?
 - How often do urgent medical needs occur in flight?
 - What is the cost to divert a large passenger aircraft?

Our Day...

- **Welcome and Overview- Urgent Care at Altitude**
- **Scope of the Problem-** Riana Wurzbarger, MD MPH
- **The Legal Situation-** Jon Hoffman, JD
- **Flight Attendants on the Front Lines-** Karen Zolka & Corey Gallet De St Aurin
- **The Pilot in Command-** Captain John Little
- **Hands on the Ground-** Paulo M. Alves, MD, MSc
- **Been there, done that-** Jim Chesnutt, MD & Cat Livingston, MD, MPH
- **It's that bad... The Diversion Decision-** John, Karen, Corey, Paulo
- **The Role of Air Traffic Control-** Richard Kinnington
- **Group Discussion with Panel**

Our patient population...

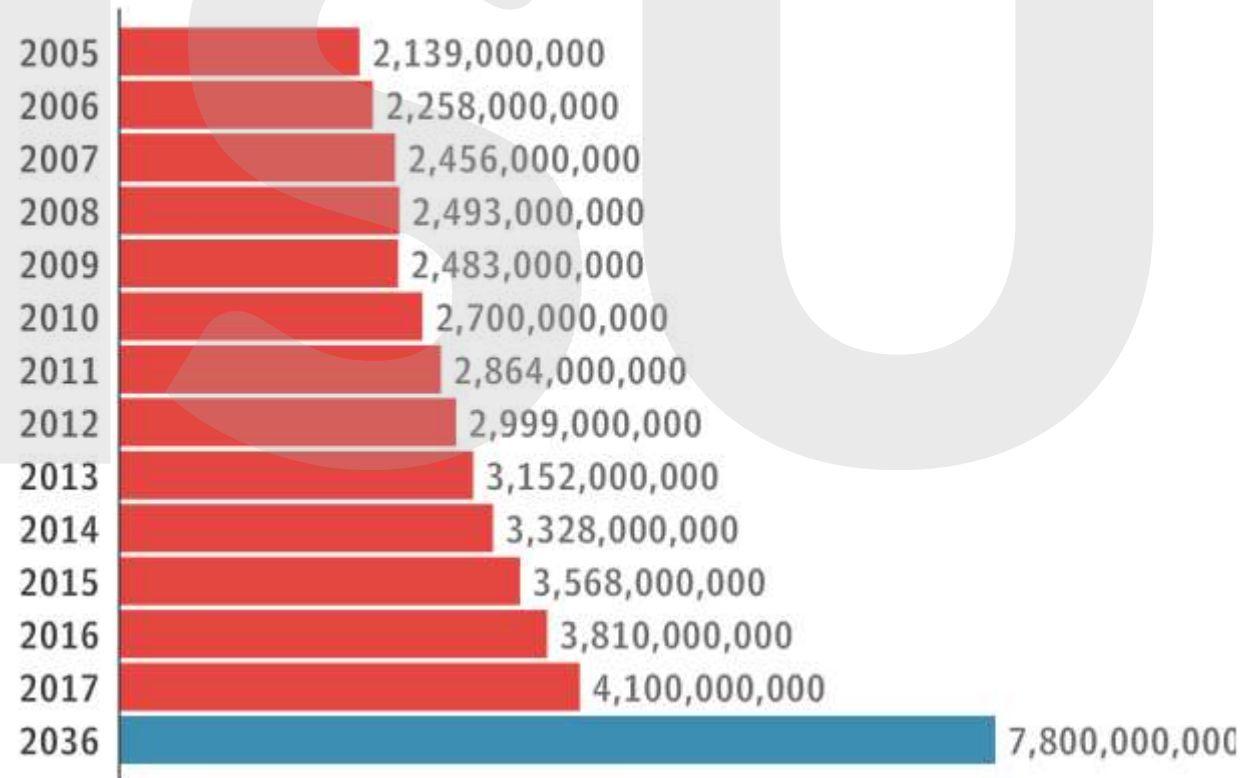
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<https://www.youtube.com/watch?v=G1L4GUA8arY>

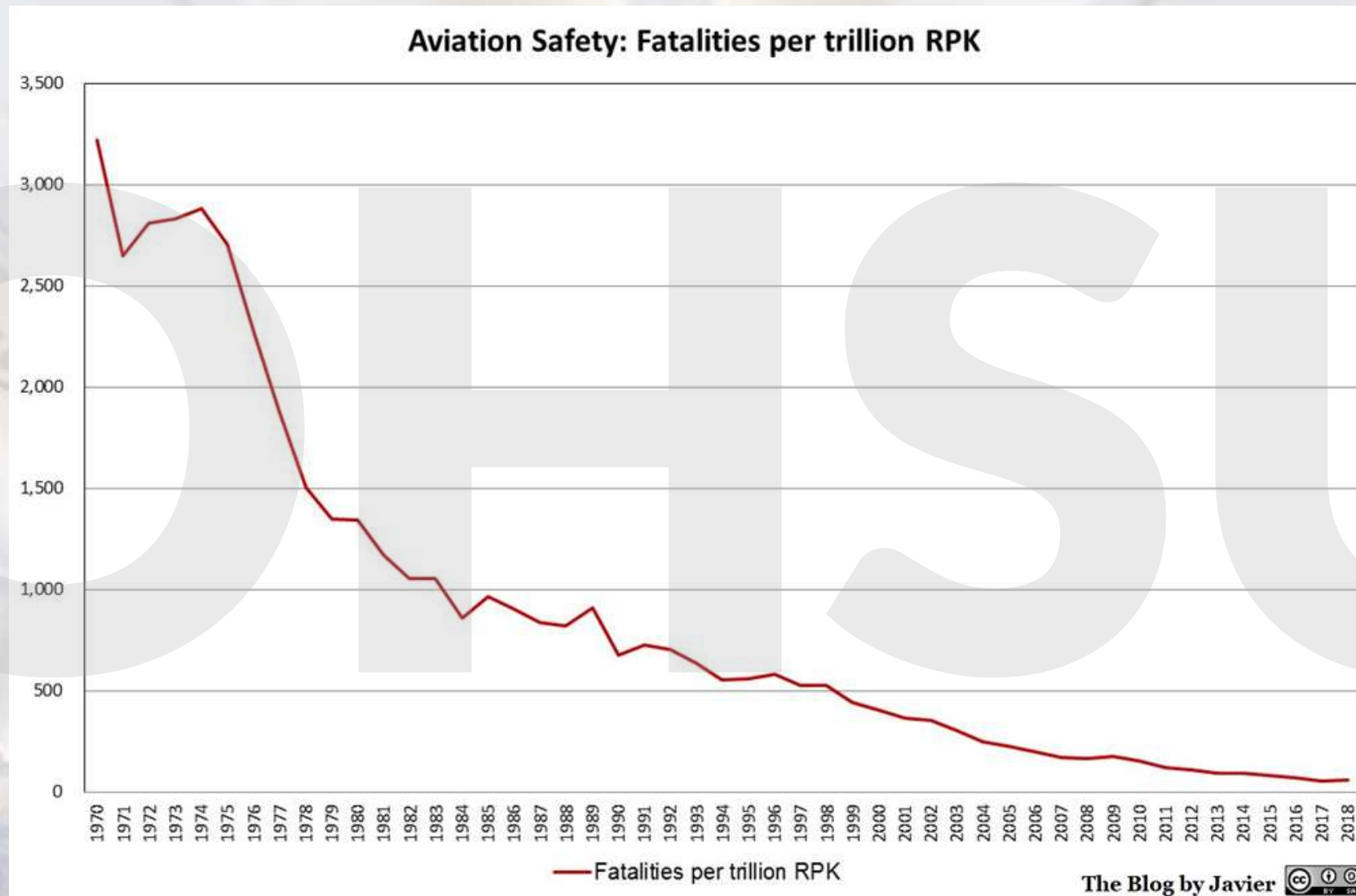
- The International Air Transport Association (IATA) expects 7.8 billion passengers to travel in 2035, a near doubling of the 3.8 billion air travelers in 2016.

About 100,000 flights depart daily

How many people fly each year?



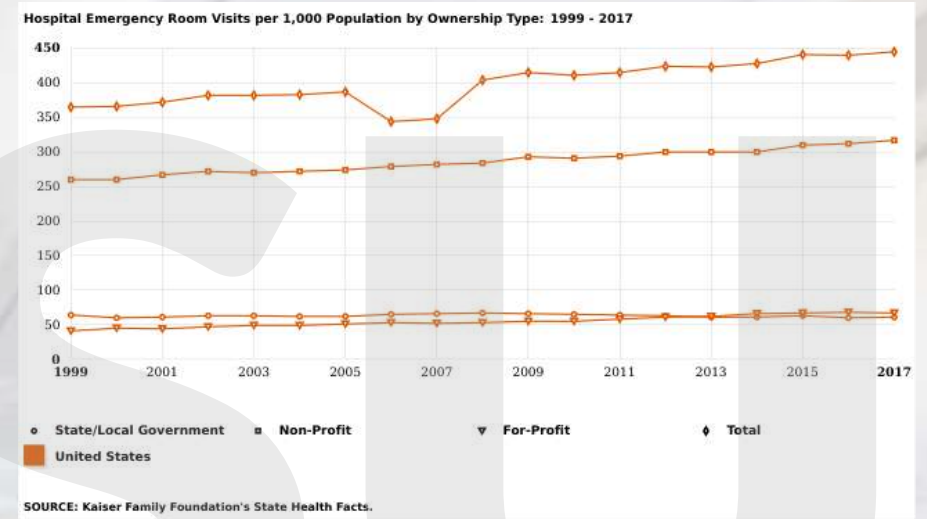
Commercial aviation safety...



By Javier Irastorza Mediavilla - <https://theblogbyjavier.com/2019/01/02/aviation-safety-evolution-2018-update/>, CC BY 3.0,
<https://commons.wikimedia.org/w/index.php?curid=75517959>

Health Care in General...

- People are people
- We're all a little messy!
- Common things are common
- Expect the unexpected
- Our mortality is close to 100%. Best it not be in the air!



Taking it to the skies...

- In flight medical care is provided in a setting different from our usual practice environment
- Our equipment is limited.
- Our space is even more limited!
- We are relatively isolated from hands-on assistance and consultation when on an aircraft.

How much of a problem are in-flight medical occurrences?

- One incident per 30,000 passengers (8-40k)
- 70% of incidents on intercontinental flights
- 80% of cases, a physician or other professional helper (e.g., nurse, emergency medical technician) gave help on board

Lufthansa study 2012

Aviation: It Ain't Terra Firma!

OHIO SU

Basic Gas Physics:

- **Boyle's law:** With constant T, volume inversely proportional to pressure
 - Trapped air- GI tract, sinuses, etc.
- **Dalton's Law:** Pressure = sum of partial pressures
- **Henry's Law:** quantity of gas dissolved proportional to partial pressure in contact with fluid
 - Percentage of O₂ is the same, but partial pressure reduced- 110 mm Hg, compared to about 160 mm Hg
 - Mild hypoxia & tachypnea/ hyperventilation

The air we breathe...

- **Outside:**

- Air temperatures -52 to -60 degrees C
- Low air pressure: 200–300 hPa compared to 1013 hPa at sea level
- Low humidity

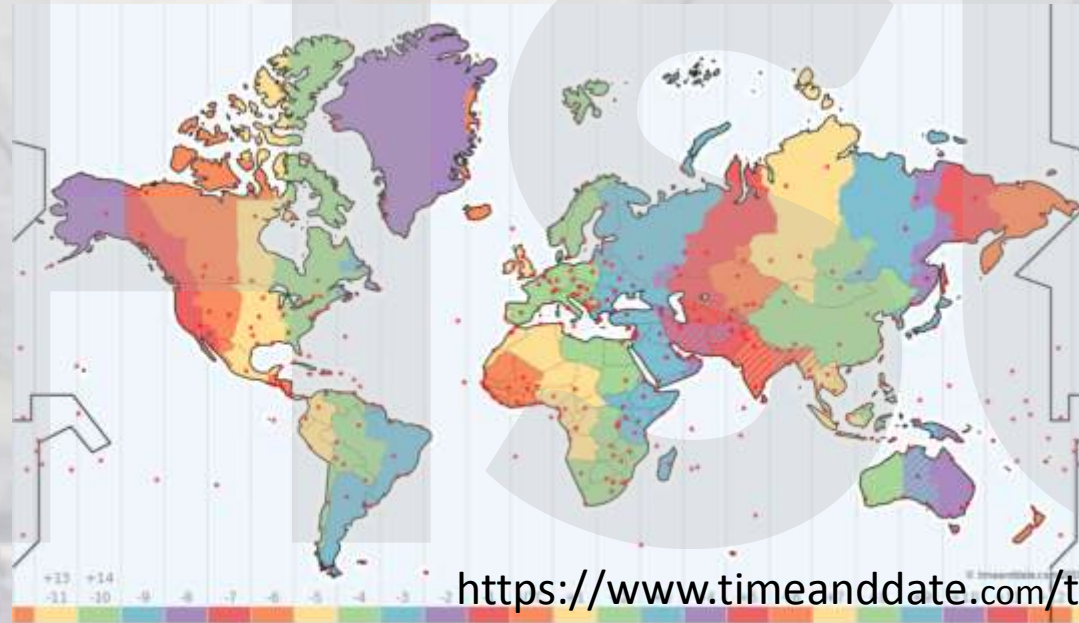
- **Inside:**

- Typical cabin pressures set to 8000' MSL, 753 hPa
- Humidity on board ranges from 6% to 18%
- Temperature 19-23 degrees C

And...

- **Gravity... you can't overcome it but you can fight it!**
- **Acceleration/ Airspeed** (a little faster than my Toyota!)

- **Time zones**



- **Sitting**
 - Immobilization, reduced ambient air pressure, venous stasis
 - VTE is uncommon absent risk factors

Classical Aerospace Medicine is about normal people functioning in the abnormal environment of air and space.

- People can survive in that abnormal environment.
 - Limits to survival
 - Those limits can be altered
- Can we extend these principles to people who are abnormal?

Boundaries here and there...

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Rules pertinent to the inflight environment:

- **CFR Title 14- Aeronautics and Space**
- **Basic passenger briefing:**
 - No smoking
 - Seatbelts, seatbacks, tables
 - Emergency exits, equipment & procedures
 - Personal electronics
- **Passengers under the influence 14 CFR § 91.17 (b)**
 - ...no pilot of a civil aircraft may allow a person who appears to be intoxicated or who demonstrates by manner or physical indications that the individual is under the influence of drugs (except a medical patient under proper care) to be carried in that aircraft.

Our concerns as volunteers...

- May I serve?
- Do I hafta, or can I pretend to sleep?
- I've never done this before... Am I competent?
- Do I have to prove myself?
- How am I legally liable for serving?

Thankful for the Cabin Crew!

- Welcome us at entry
- Protect us from doing dumb things with our carry on baggage
- Tell us the rules, and make sure we're secure before we fly
- Bring us hot coffee- and help when we spill!
- Retrieve our garbage and recyclables
- Ensure safety before landing
- Re-direct us when we're grumpy
- **Provide great emergency care & communication when required**

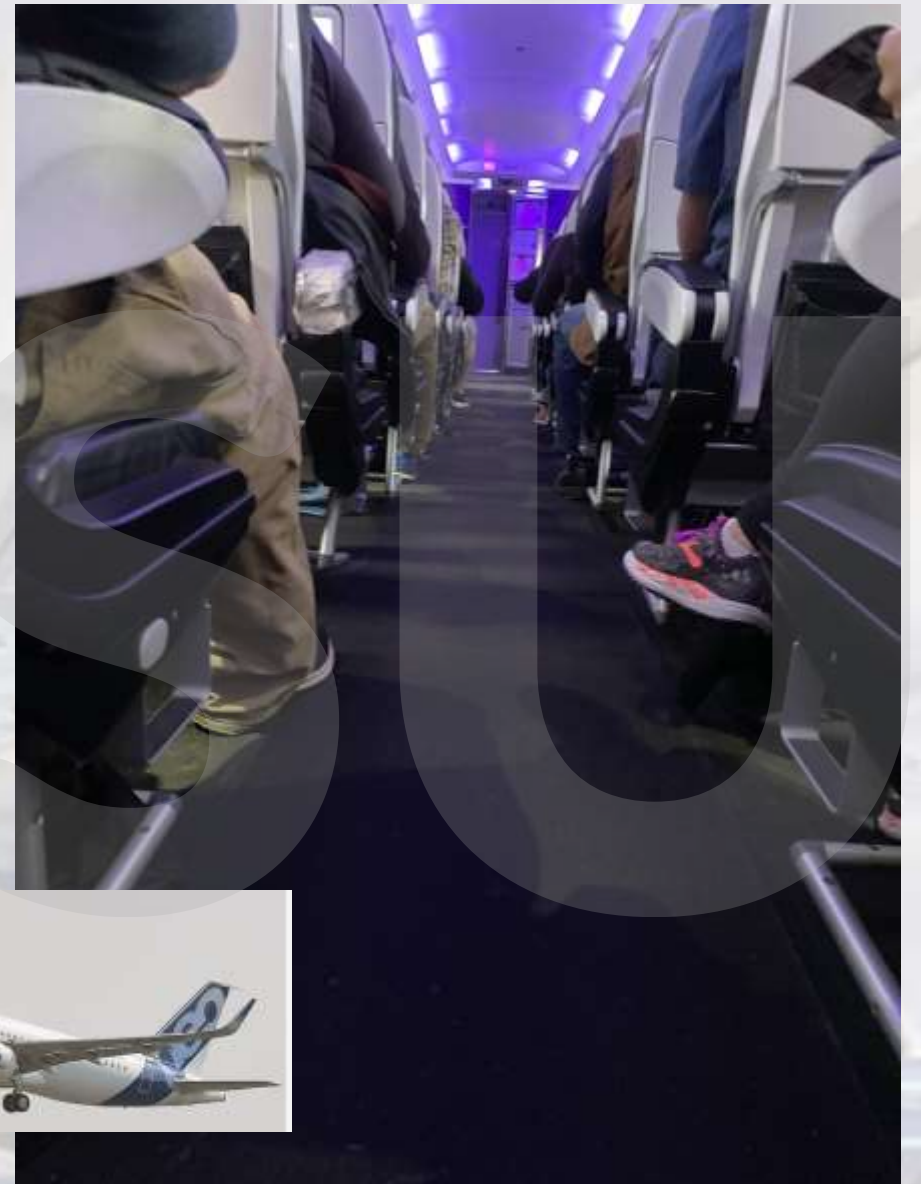
Not your neighborhood clinic...

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Room to Move....



CRJ 700



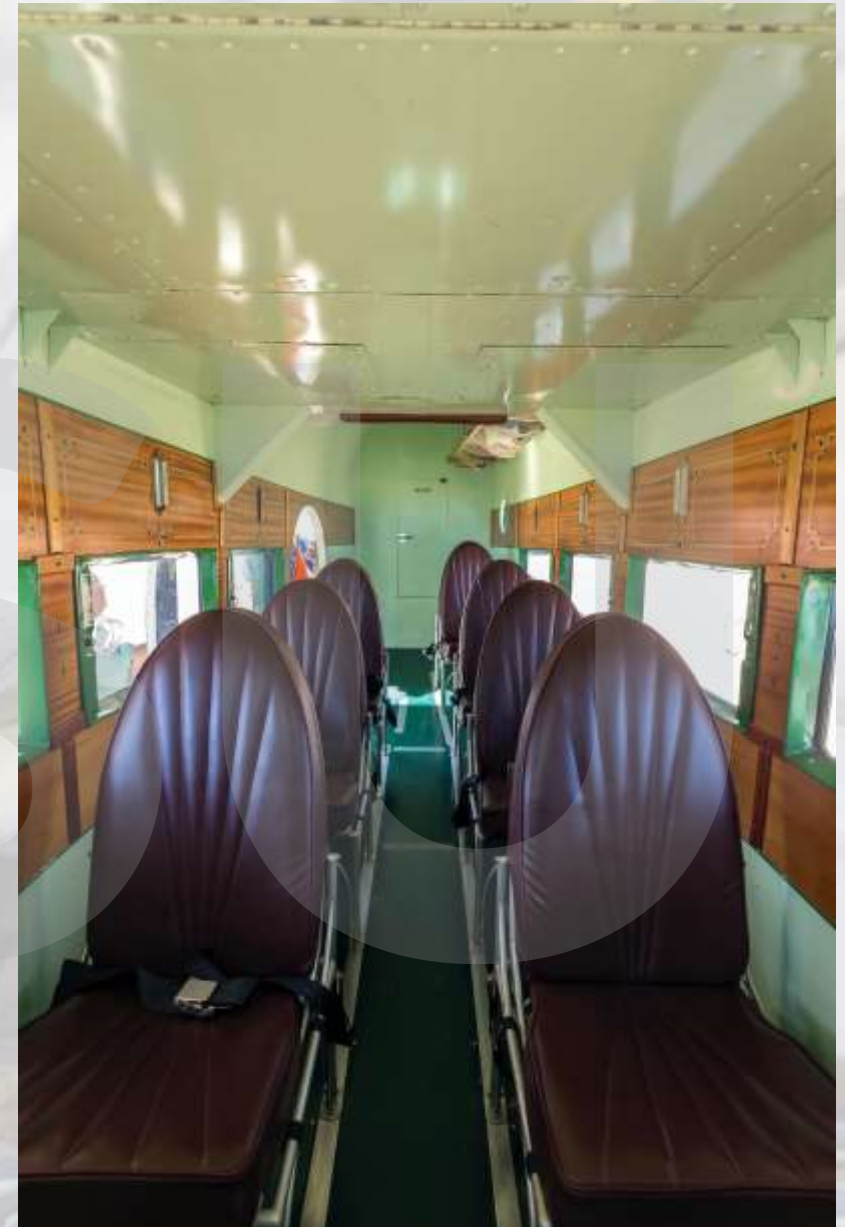
Airbus 320



Ford Trimotor



By Alexf - Own work, CC BY-SA 3.0,
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Douglas DC-3- 1930's

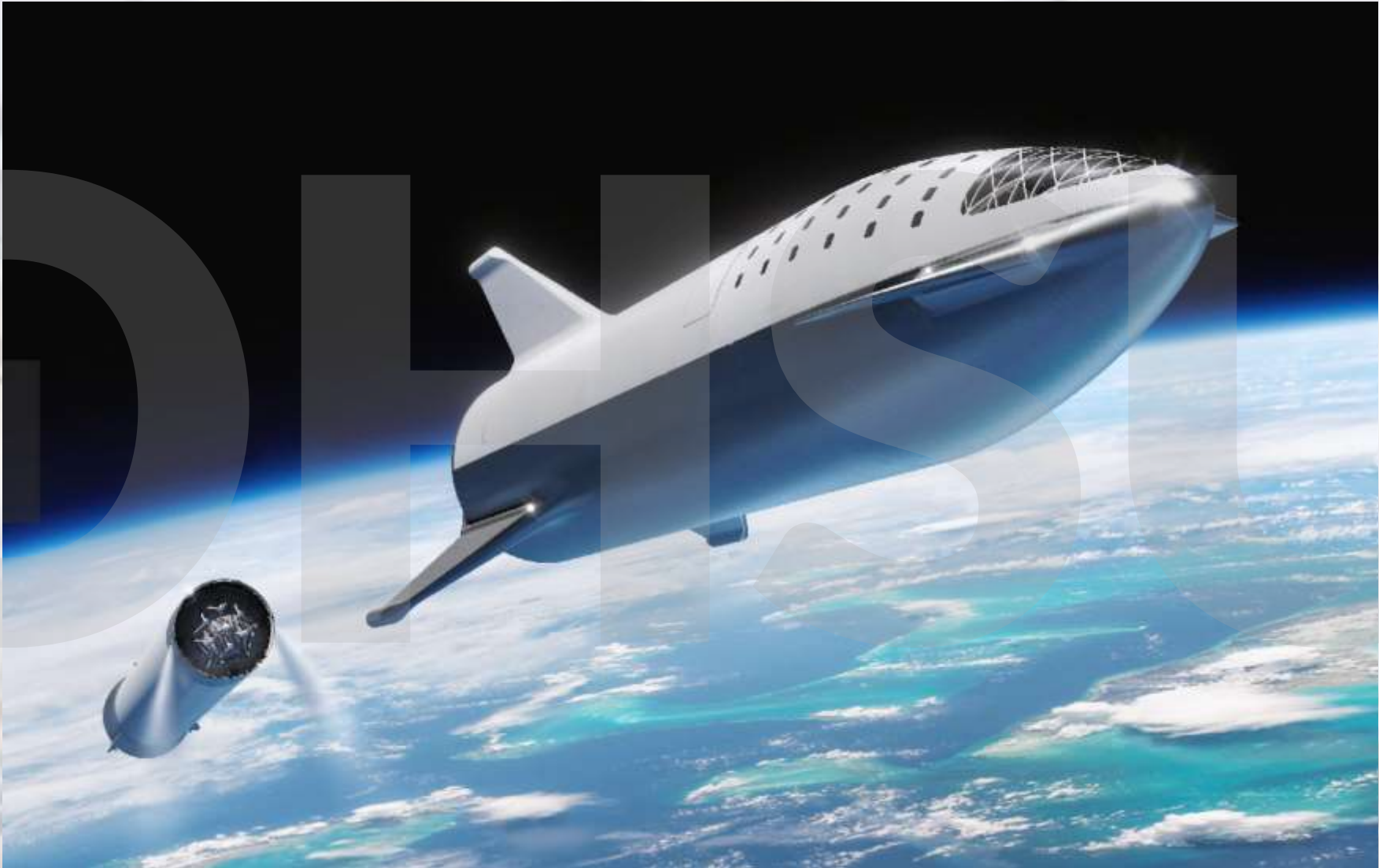


By Towpilot - Own work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=1511430>



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SpaceX Starship



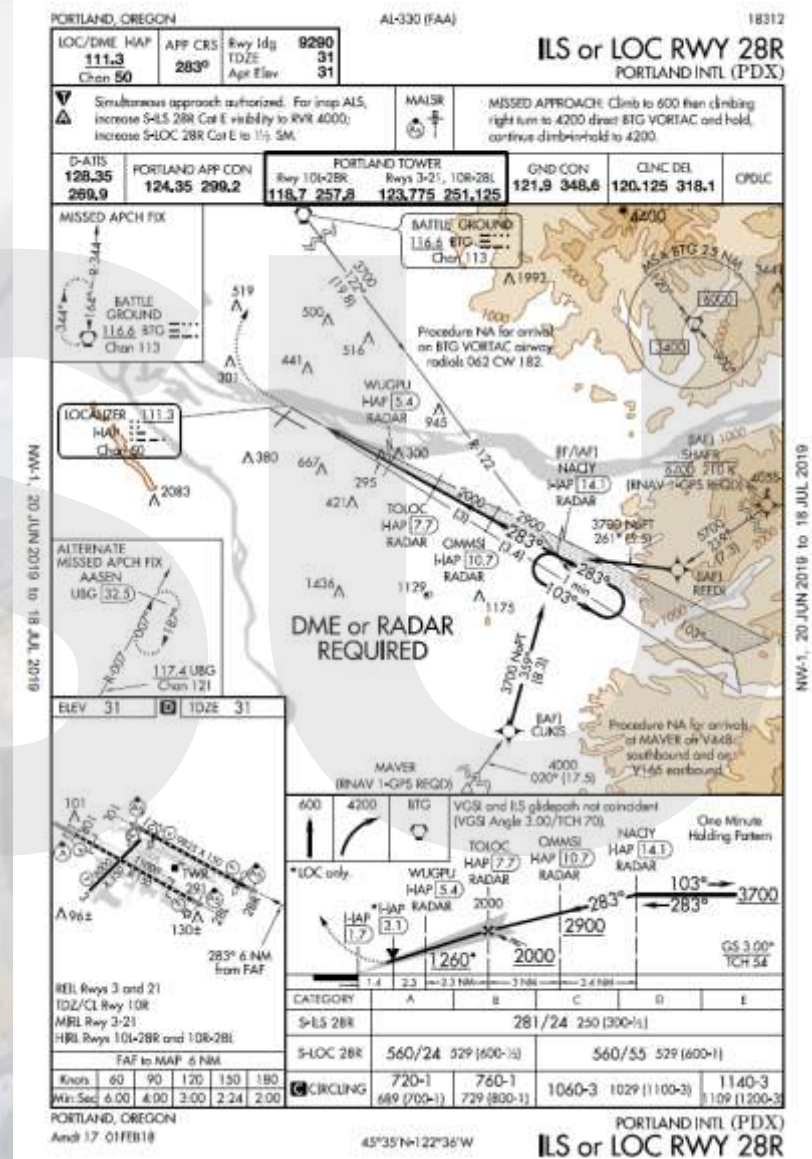
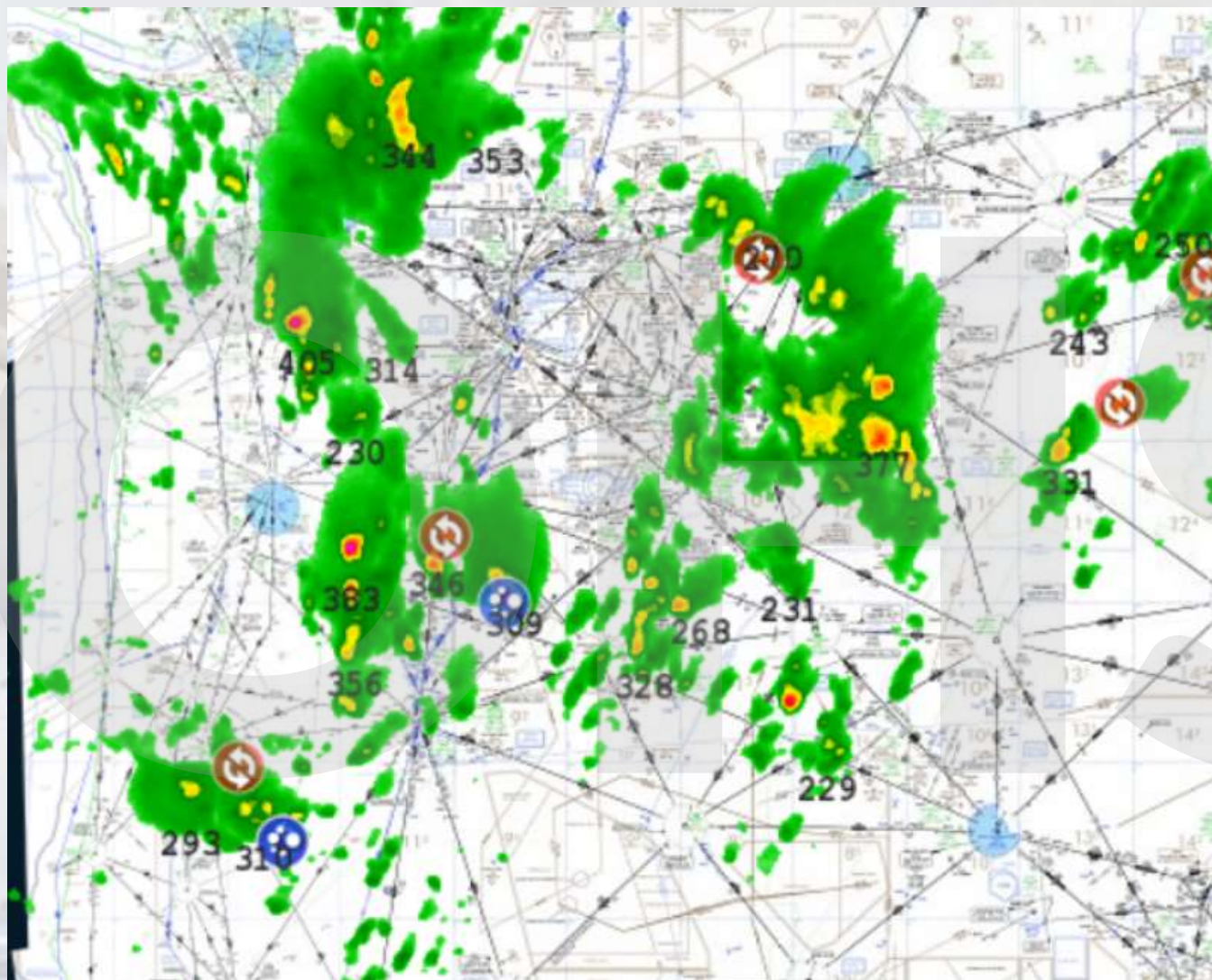
<https://www.spacex.com/mars>

Who's in charge here?

§91.3 Responsibility and authority of the pilot in command.

- (a) The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.
- (b) In an in-flight emergency requiring immediate action, the pilot in command may deviate from any rule of this part to the extent required to meet that emergency.
- (c) Each pilot in command who deviates from a rule under paragraph (b) of this section shall, upon the request of the Administrator, send a written report of that deviation to the Administrator.





Medical consultation when you need it...

- Understanding of flight environment and resources
- Understanding of urgent and emergent medical care
- Understanding of ATC and ground resources
- Good communication skills
- Ability to function in a team

Air Traffic Control support

- The BIG PICTURE
- Communication & emergency coordination
- Flight plan coordination & clearance delivery
- Departure and arrival/ approach control
- Airport surface management
- Traffic separation & vectoring
- Dissemination of weather information



Charles Conklin

<https://www.flickr.com/photos/28320862@N04/5450637898>

Thank you, and enjoy the flight!

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