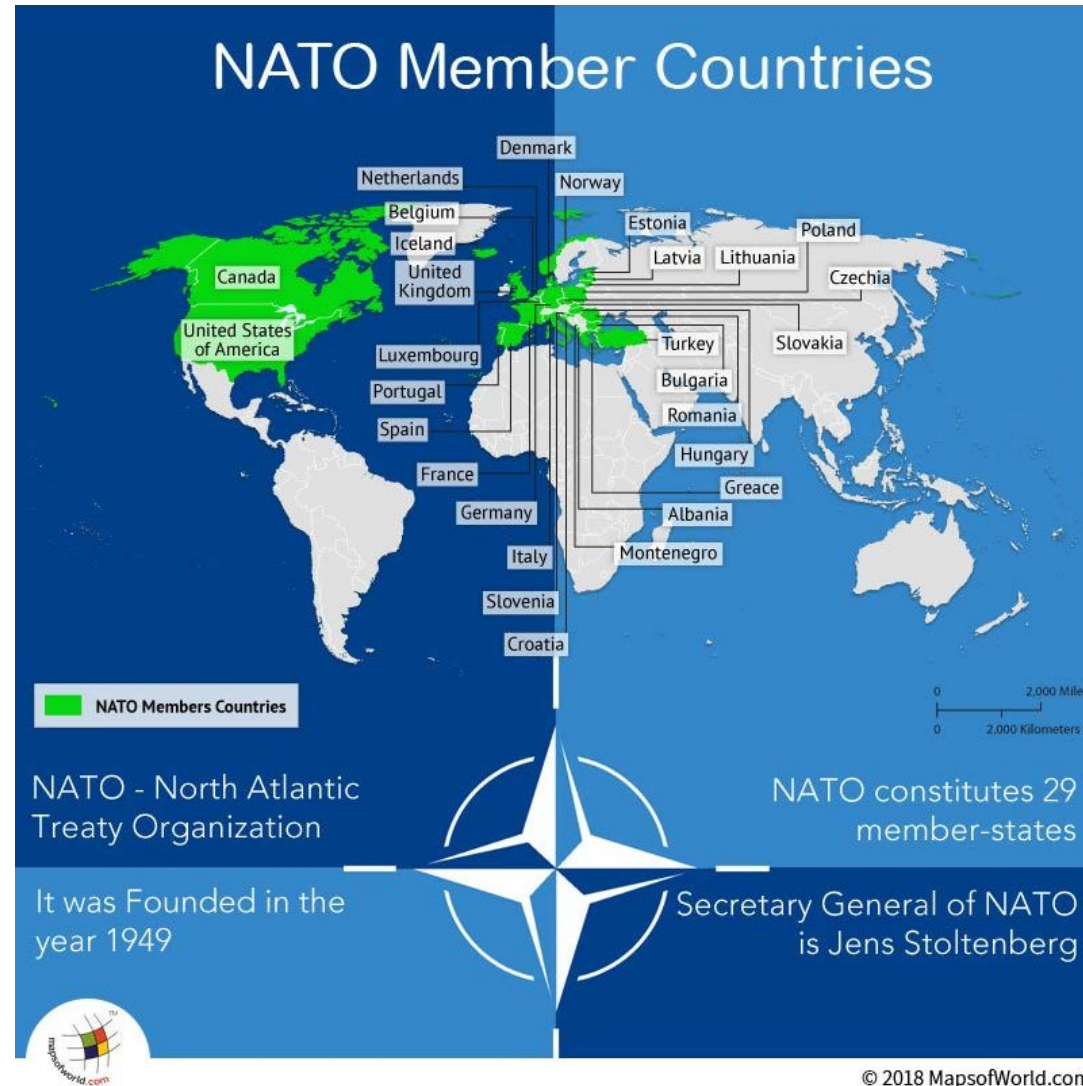


Pulmonary Screening Policies in NATO Countries



Major Erik Frijters, RNLAF
Major Karsten Lindgaard, RDAF

Background

- In 2018 NATO HFM-299 formed: Pulmonary Screening of Aircrew

➤ No uniform policy regarding acceptable conditions

➤ No uniform policy about treatment

- Questionnaire sent out to NATO and PfP nations

- 15 Returned Questionnaires, 14 Countries



SCIENCE AND TECHNOLOGY ORGANIZATION



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SHORT OF BREATH

- ▶ NASA URGES DEEPER STUDY OF F-35 PHYSIOLOGICAL EPISODES
- ▶ REPORT: USAF SUPPRESSED PILOT CONCERNS TO PROTECT PROGRAM

Lee Hudson Washington

Between 2011 and 2017, more than a dozen U.S. Air Force F-35 pilots reported experiencing oxygen-deprivation symptoms, NASA has obtained new information that may help solve the mystery behind those physiological episodes and wants to study the issue more deeply. But the F-35 Joint Program Office is disputing the findings.

The recently released—but not widely circulated—report from the NASA Engineering and Safety Center (NESC) pilots a gap between the pilot's breathing patterns and the aircraft's life support systems, that is different between each pilot and the program. It is the first independent review focused on the hypoxia-like episode reported by pilots to Lockheed Martin F-35 for more than a decade.

The NESC's work builds on a 2017 report that assessed pilot physiological episodes in other fighter aircraft (AUGUST 28-APRIL 20, 2018, p. 23). That study was driven by congressional mandates to the U.S. Navy to conduct an independent review of the hypoxia-like episode, and F-35 aircraft going back to 2006. But the standards did not cover the F-35. The new report is part of a larger pilot-breathing assessment that includes F-35 and F-35D data using CH-330 or CH-340 breathing gear.

"It is a really exciting area of NASA close to take on the F-35, and to take the first step in it with the right people," says Hans, one of the engineers on the NESC. He's Aviation Week. There is no current request by members of staff on Capitol Hill to review a brief of the NESC's findings on F-35 pilot physiological episodes.

NASA received former U.S. Air Force F-35 and F-35D test pilot Capt. Kevin Hill to serve as a subject matter expert. Hill received the program's permission to record pilot-breathing measurements from two F-35s to understand why aircrew might be experiencing their breathing patterns even though their life support systems seemed to be working as designed. He developed a measurement regime using the Oxylog 4000 pilot-breathing sensor to record more than 100 sets of data with Hill in the cockpit. Using two F-35s—tail numbers 1-085 and 12-002—Hill began collecting ground data with the engine running in January 2018.

But the F-35 data set, the first of its kind, was subsequently embargoed by the Air Force, and the NASA team had to wait about a year for the sensor to return pilot-

breathing data for independent analysis. F-35 pilots who had interventions with the NESC that information about breathing problems had been suppressed over concerns about protecting the program.

"There was a tremendous amount of concern amongst the Air Force that the program was vulnerable, at the time, and so there was a lot of pressure to continue testing, continue proving forward," one pilot said in the report. "The issue was a whole, and especially, the Program Office folks, were in charge of the life-support system at the time, and they were highly motivated to assign any symptoms to something that was not attributed to the jet."



Although the life-support systems were working as designed, pilots reported trouble breathing. One described a lag time between what he saw and what he felt, but the study values in both directions. One the same, another pilot could breathe normally.

A pilot pilot had a more severe description. "The jet at-tacked me. That's the essence of the way I felt." A second pilot corroborated that the F-35's life support system was working as designed but mentioned "Mild, mostly pressure me."

A third pilot had experience flying the F-35 and described how pilots did not have to deliberately check what they were breathing in that aircraft compared to the F-35. "I never thought about my breathing, even in the Shuttle Eagle. Before, the pilot had to check that I was breathing my levels, taking a deep breath to respond to things every 10-15 min, or so. I make sure that I'm that."

The Air Force and Navy both deferred to the F-35 Joint Program Office (JPFO) for any concerns.

Hill's data demonstrated a change in what he breathes and between levels bar and pressure from the life support system. The comparison showed significant differences

Flaps of elevated 2 000 p. 50 Understanding U.S. Navy SIMA p. 51

between the two aircraft used in terms of breathing dynamics, and suggest the pilot's breathing of some of the F-35s as "bad breathing."

Such F-35s tested delivered unacceptable flow at the beginning, middle and end of the breath that changed from breath to breath, the NASA report says. "Such rapid changes in the levels to breath supply from the pilot to continually compensate by adjusting breathing rate, volume and volume fraction flow."

Not only does a changing breathing pattern require a conscious adjustment, it could put stress on the pilot and result in the effects, fatigue and short- and long-term physiological changes, the report found.

"Indeed, these data show that both pilot workload and altitude in the air and pressure that I've not quantitatively more than any of those observed in the pilot-breathing assessment" but flight of F-35 and F-35 aircraft," the report says. "These data, combined with several pilot observations,

WHAT PILOTS TOLD NASA ABOUT FLYING THE F-35

"It was trying to kill me."

"Sometimes the F-35 just provides a whole bunch of pressure into the mask for unknown reasons.... It makes exhalation difficult."

"Sometimes even in a single exhalation there could be a change in the pressure. So there's like a kick back, and it can actually bite off a radio call."

"There is noticeable change between jets, and some are easy breathers versus more difficult breathers."

"The F-16 had some significant growing pains," said one pilot. "These were overcome, and [I] went on to become one of the most successful fighters in history, and I'm confident the F-35 will do the same."

"The F-35's behavior in this regard is a concern because it makes it extremely difficult to validate the data collected and challenges the ability of any associated formal reviews," Hill says.

Ultimately, the study found that when a pilot reported issues with breathing system performance, objective data supported the observation. That led to one of the report's key recommendations—that the military treat pilots when they report that something is wrong with the breathing system, and that services follow up with investigations. The military also should develop a standardized flight-test procedure to evaluate the performance of a pilot-breathing system and record data using pressure and breath tracks, and record pilot-breathing to create future hardware and system specifications, the report says.

Hill says the team has looked back at the Air Force and Navy on the F-35 pilot-breathing assessment, and stressed to the service that they need to conduct further analysis.

"I'd say that the F-35 section of our report is very controversial," Hill says. "We had an opportunity to do the very first look at the F-35 and we did it very much. But what we do have to do is that strongly supports our key recommendation that the military needs to take a closer look."



Pulmonary Screening and Care in Air Crew

NATO Working Group HFM-299



Dear colleague,

Thank you for participating in this questionnaire!

Please answer the questions as complete as possible:

Date

<input type="text"/>	<input type="text"/>	<input type="text"/>
MM	DD	YY

Which regulations do you use for air crew medical exams?
(e.g. FAA, EASA, Military Aviation Regulations)

How often do your **pilots** get an Aeromedical Exam?

Choose an item

Do you do Screening for Pulmonary Conditions in **pilot applicants**?

Choose an item

How often do you repeat Pulmonary Testing in **pilots**?

(Tick all boxes that apply)

- It is only done on initial application
- It is done every medical exam
- It is repeated on clinical indication
- Other (please specify):

What form of Pulmonary Screening do you use?

(Leave blank if not applicable)

(Tick all boxes that apply)

- Pulmonary Function Testing
- Standard Questionnaire (if so, can you send it?)
- Medical History
- Obtain Medical Records from General Practitioner
- Other (please specify):

Do you do other exams for Pulmonary Screening?

(Leave blank if not applicable)

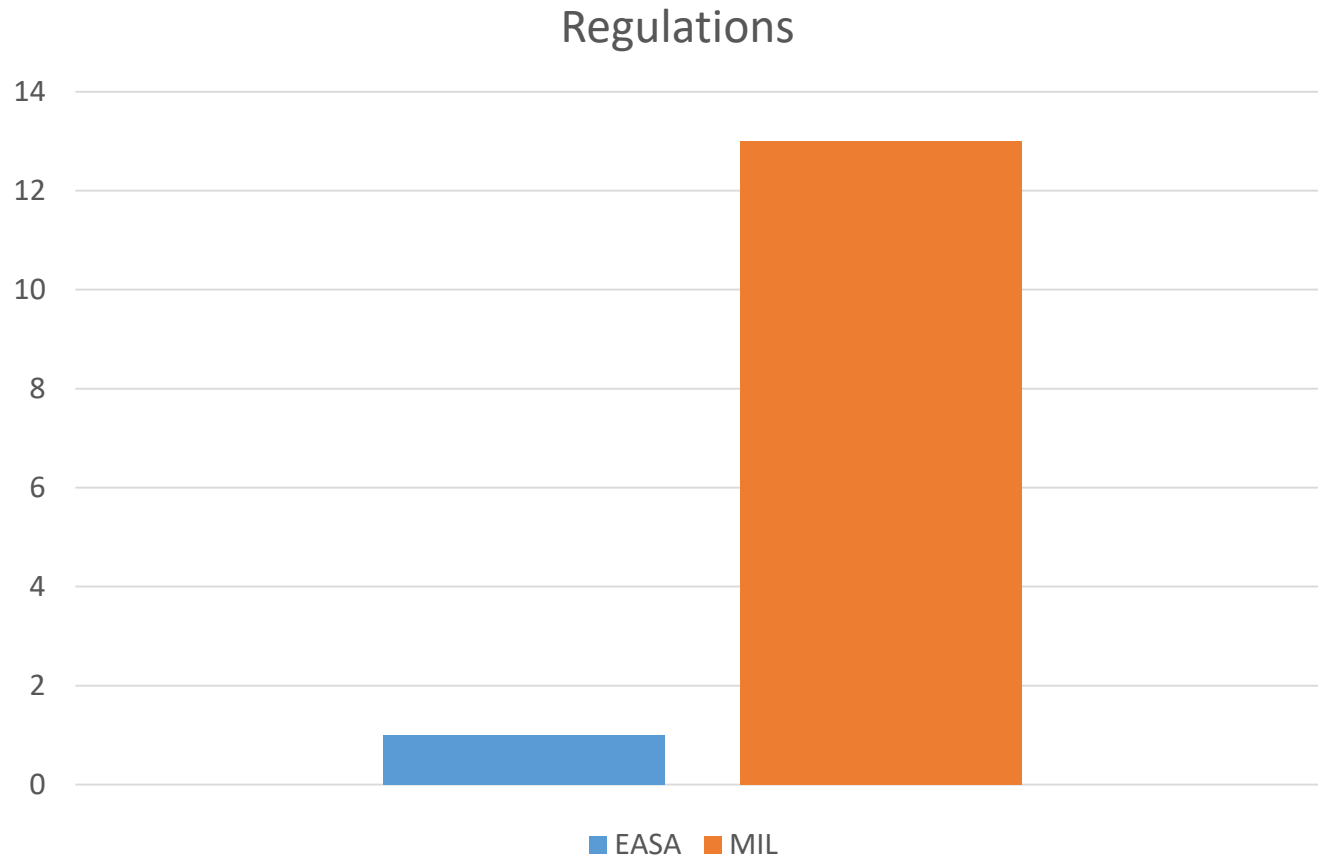
(Tick all boxes that apply)

- Chest X-Ray
- High Resolution CT Chest Scan
- VO₂ Max
- Bronchial Challenge Test
- Body Plethysmography
- Bronchial Challenge Test (if so, which one?)

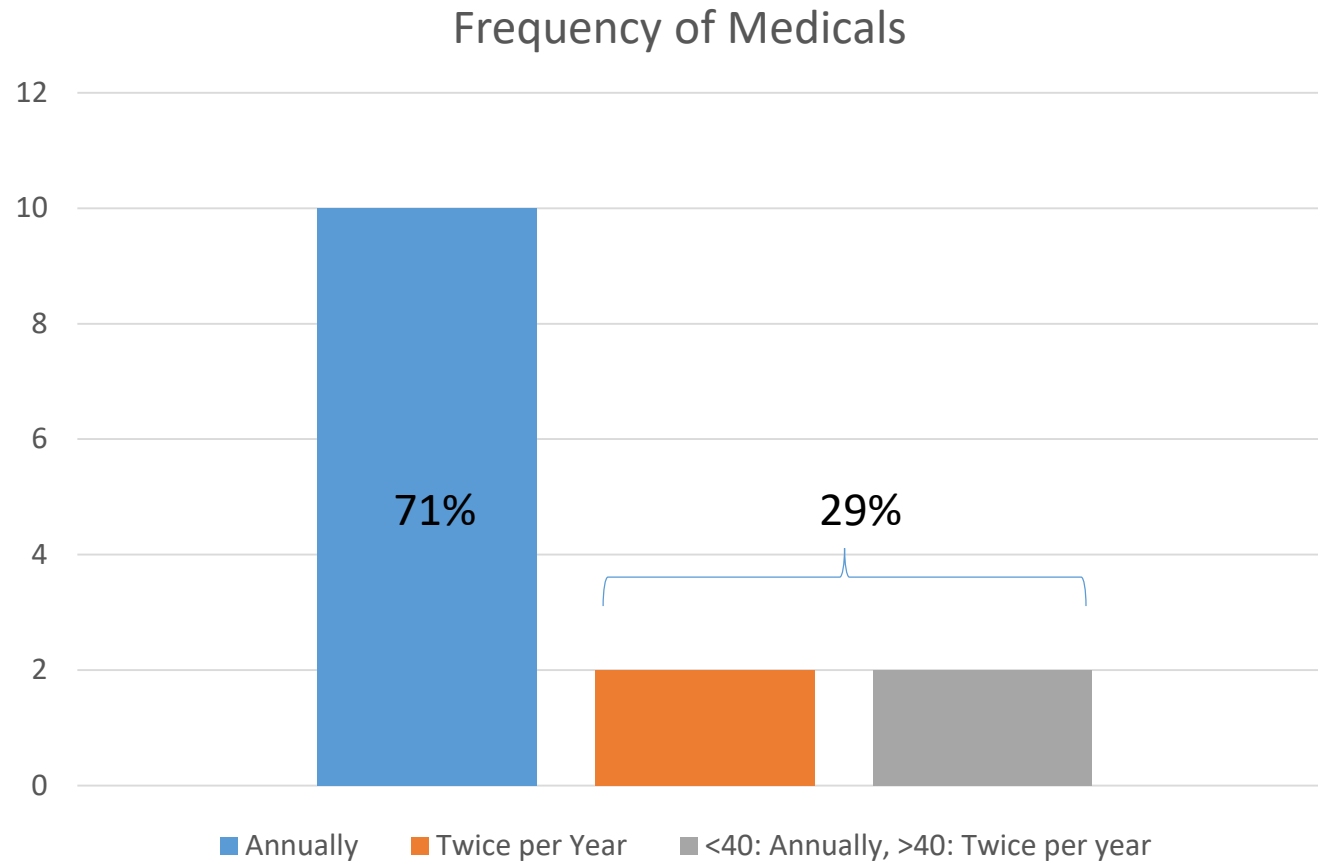
- Allergy Testing (if so, how)?

- Impulse Oscillometry (IOS)
- Other (please specify):

Regulations Used for Military Medical Exam

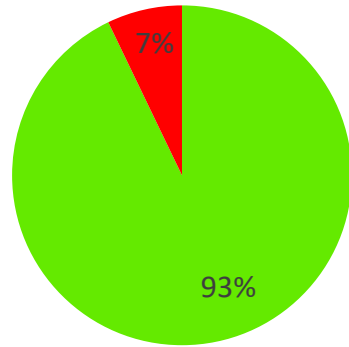


Frequency of Medical Exams for Aircrew

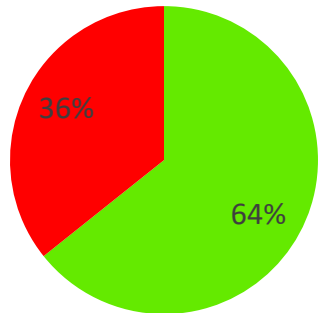


Pulmonary Function Testing (PFT) at aeromedical exam?

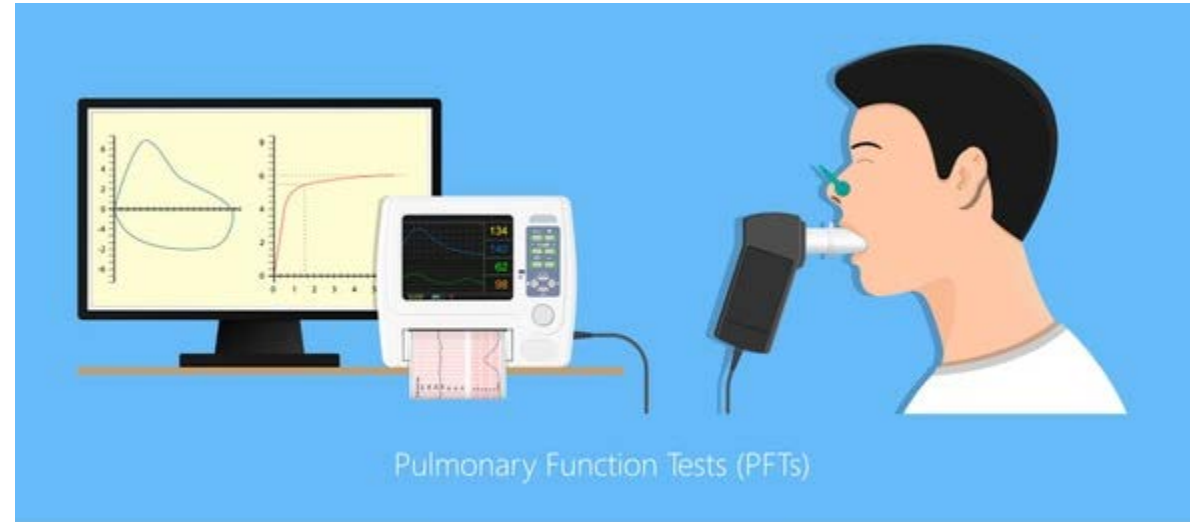
Initial exam



Revalidation exams

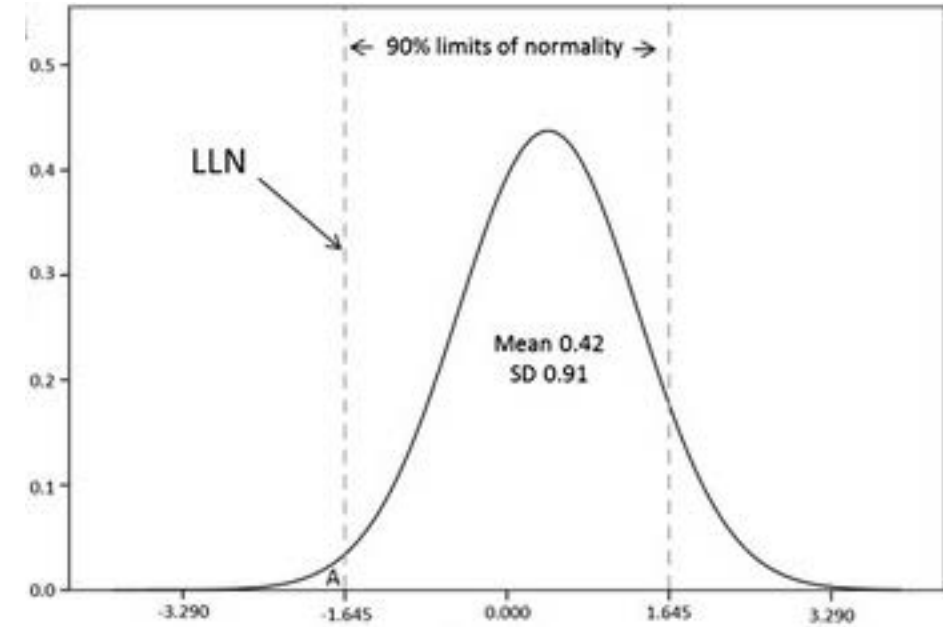
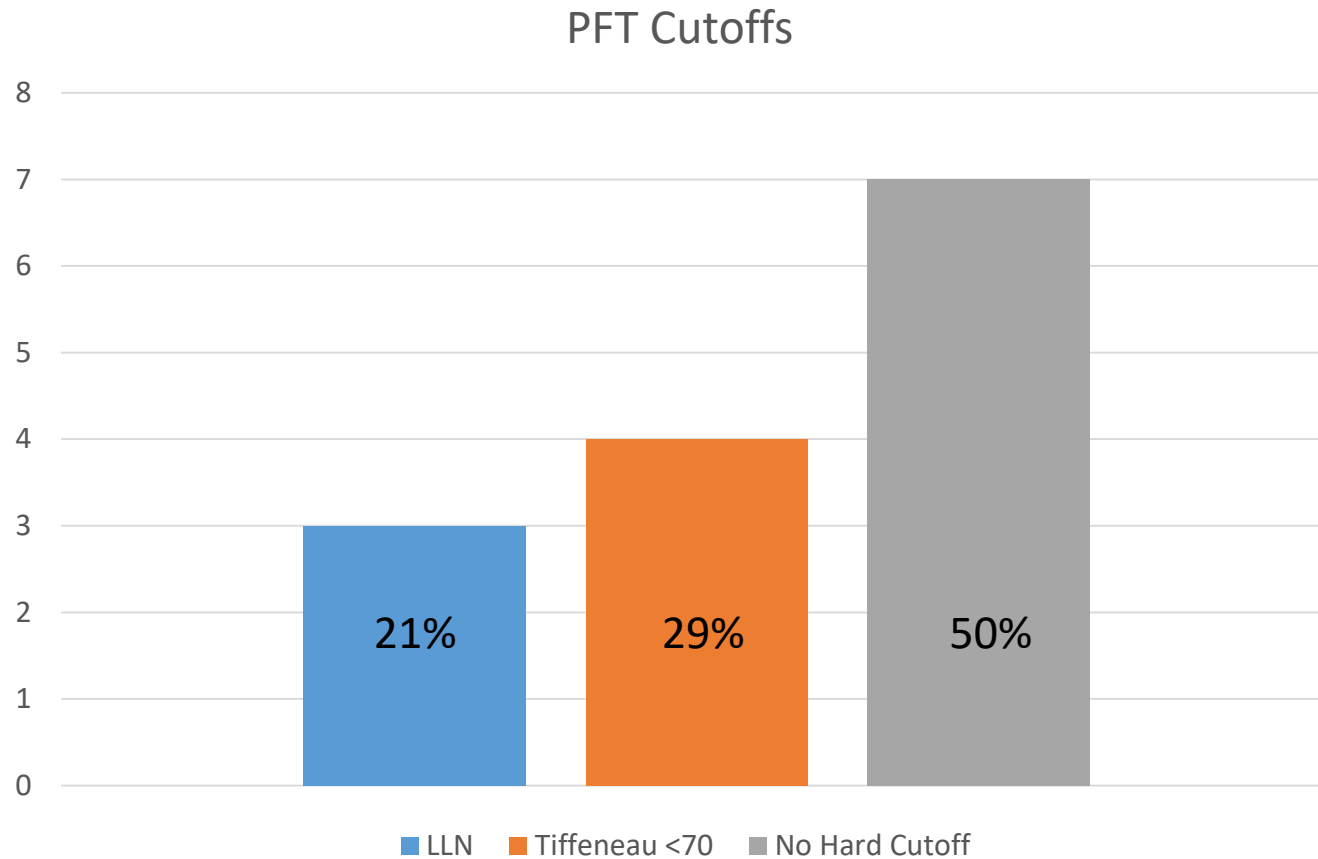


■ Yes ■ No

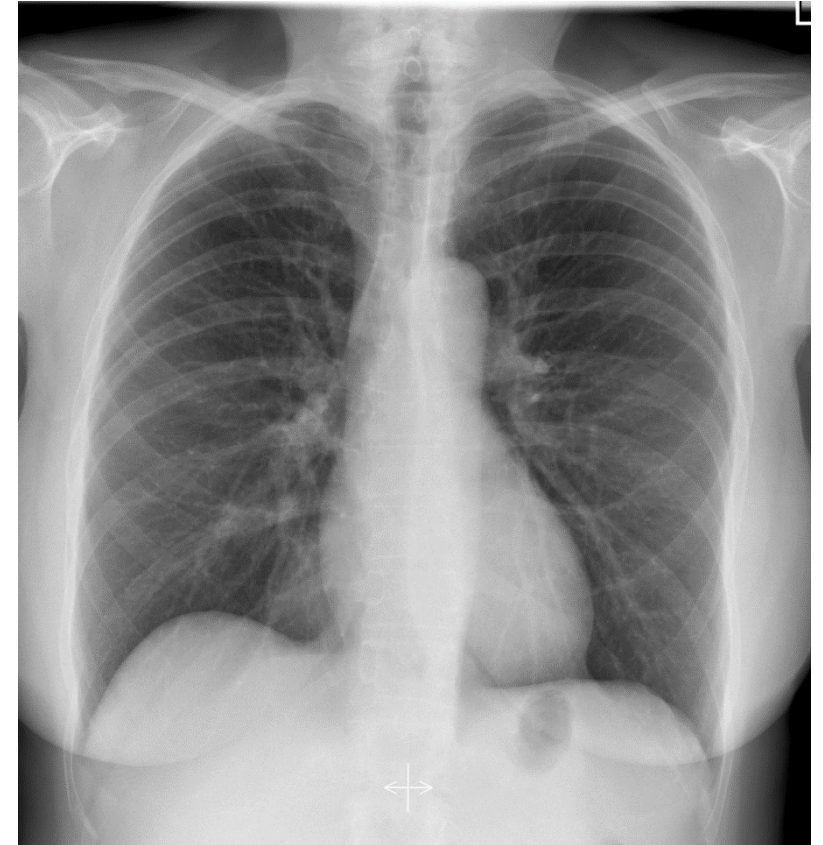
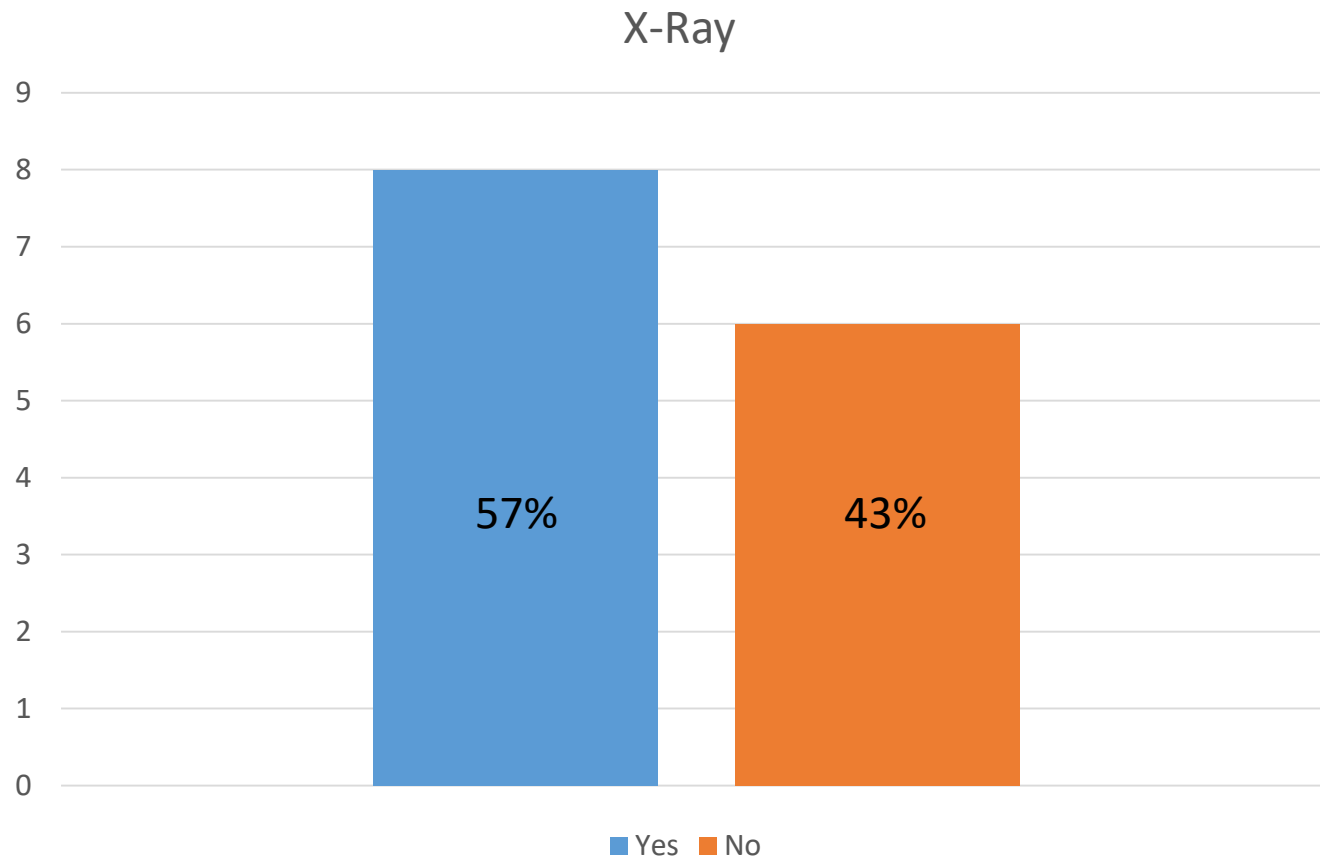


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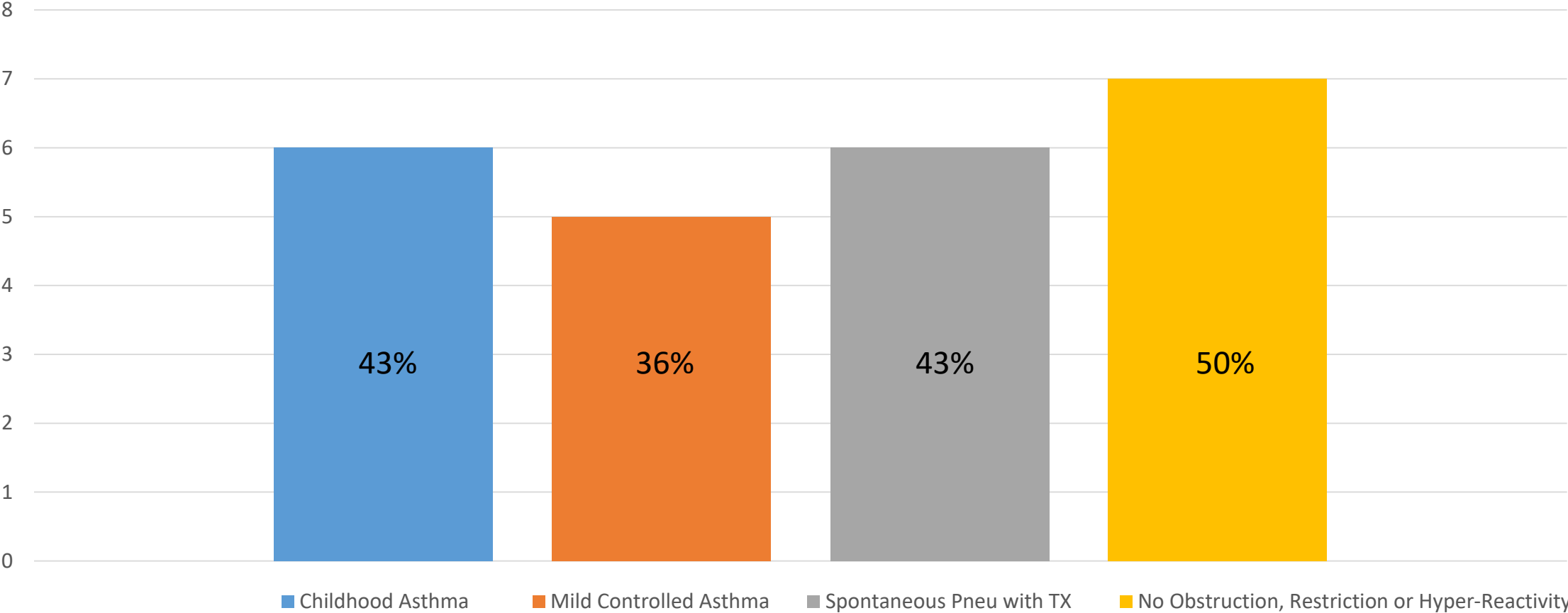
Cutoffs Used for PFT



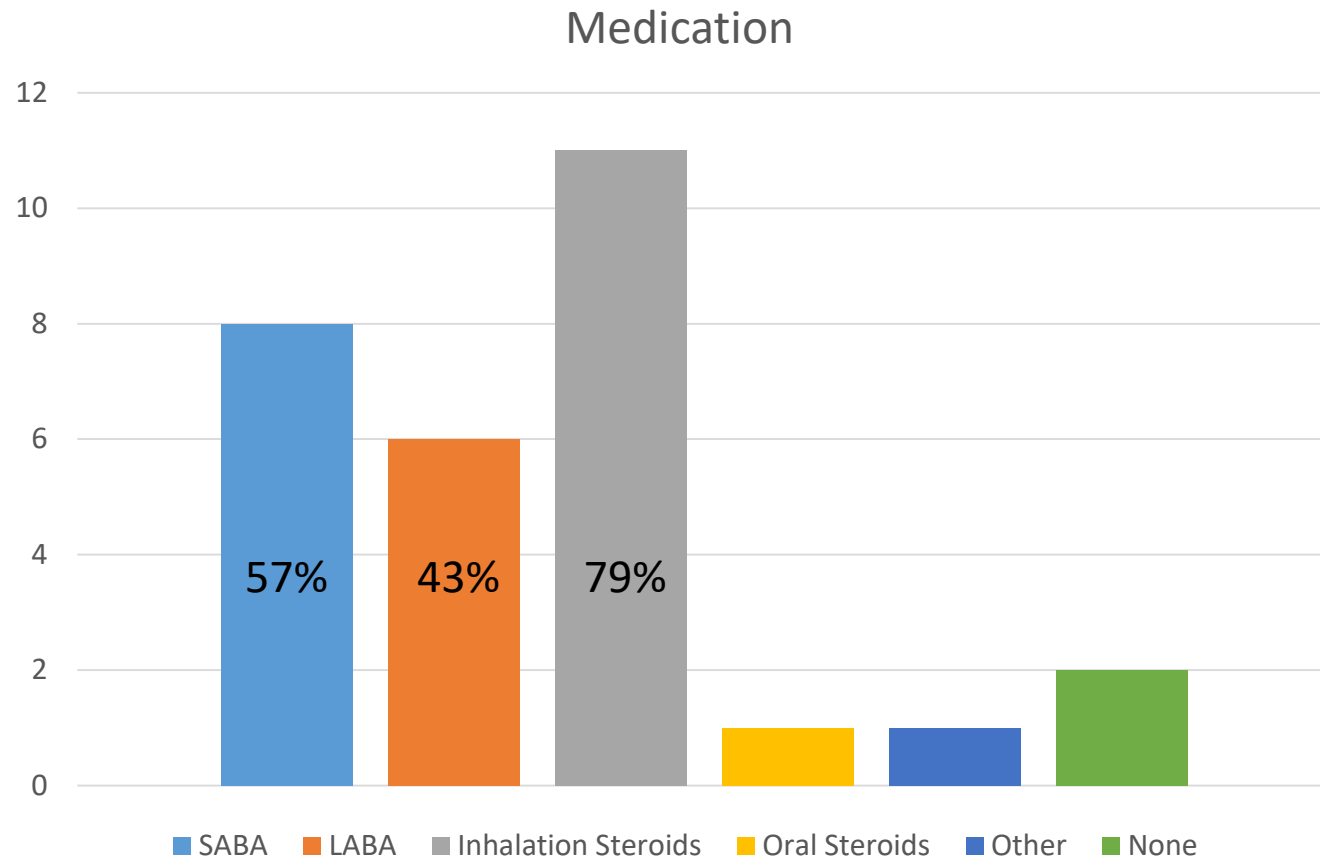
Chest X-Ray



Acceptable Pulmonary Conditions on Initial Exam



Acceptable Medication for Obstructive Airway Disease



SABA: Short Acting Beta Agonist
LABA: Long Acting Beta Agonist

Take Aways



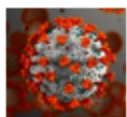
- Interesting Differences in screening policy among NATO partners
- Same challenges: comparable aircraft and general population
- Learn from Each Other!
- Results will be published & recommended practices formulated



Shout out to NATO Partners

- Please fill out the questionnaire (by the door)
- For the ones that already did before the Pandemic: how has COVID changed your pulmonary screening policies?





COVID SPECIFIC QUESTIONS *(Addition to 2019 questionnaire)*

Have your normal screening procedures towards pilots and aircrew changed due to COVID?

(If yes, please describe how)

Do you have mandatory COVID vaccination for aircrew?

Yes

No

Have you experienced an increase in long term grounding of pilot and aircrew due to post-COVID symptoms (impaired pulmonary function, fatigue, etc.)

Do you have special COVID regulations towards pilots and aircrew? Including return to flight after COVID procedures? (if possible pls. attach them to this questionnaire upon response)

Questions?

