

15.0 RESPIRATORY

Last Reviewed: December 13

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15.1 ASTHMA

AEROMEDICAL CONCERNS: Asthma symptoms can rapidly progress from minimal to totally disabling. Exposure to dust, smoke or fumes can provoke attacks in susceptible individuals. Positive pressure breathing, breathing cold or dry air, and +Gz exposure can stimulate bronchospasm in individuals with hyperreactive airways.

WAIVER: Any history of asthma, to include childhood asthma and exercise-induced asthma, is considered disqualifying (CD) for aviation duties and training, even if the disease is very mild.

APPLICANTS: Waivers for applicants with a history of asthma may be *considered* if all of the following criteria are met, with complete documentation submitted to Code 42:

1. The individual is currently asymptomatic and has been asymptomatic for a minimum of five years without medication use or prescriptions filled.
 - a. Depending on the needs of the Navy, asthma that is symptomatic/requires medication use into adulthood (≥ 18 yo) is generally not considered for waiver in untrained personnel.
2. Baseline pulmonary function testing (PFT) within 1 year of waiver application is normal.
3. Methacholine challenge test within 1 year of waiver application is within normal limits and not suggestive of bronchial hyperresponsiveness.
4. Completed Navy [ARWG Asthma worksheet](#) reviewed with patient and signed by submitting FS/AME. (form follows this section)

A history of inhaler use that is clearly not suggestive of asthma is NCD. **A complete asthma worksheet submitted with the flight physical may be sufficient. Further records, testing, and consultation may be required by NAMI on final review.**

DESIGNATED PERSONNEL: Asthma is CD for designated aviation personnel. A history of childhood asthma that was previously waived requires a new waiver should the individual develop recurrent symptoms or require medication. Waivers may be considered based on severity of disease, response to therapy and evidence of adherence to the proper components of care. Moderate and severe asthma not readily controlled with therapy will not be waived. **A Local Board of Flight Surgeons may NOT be used to provide temporary flight clearance for asthma.**

INFORMATION REQUIRED:

1. Aeromedical Summary (AMS) addressing the four components of care (below)
 - a. For tobacco users, documentation of smoking cessation is required
2. Family practice (FP), Internal Medicine (IM), or Pulmonology evaluation
3. Results of pulmonary function testing
 - a. NOTE: Spirometry must be within normal limits and without obstruction at time of waiver application.
4. Allergy consult and results of allergen testing (e.g. skin testing, RAST testing) for personnel with persistent asthma in whom AIT may be beneficial (e.g. patients with allergic rhinitis, seasonal asthma, difficult to avoid triggers).

RENEWAL REQUIREMENTS:

1. AMS addressing the four components and any interval changes
 - a. In prior smokers, documented abstinence is required.
2. FP, IM, or Pulmonology evaluation with comments on stability.
3. Annual PFTs when clinically indicated or directed by waiver requirements.

Four Components of Asthma Care (AMS should address them all)

1. **Asthma Severity and Control:** The AMS must classify severity using most current asthma guidelines (i.e. intermittent, mild persistent, moderate persistent, or severe persistent) and comment on impairment (frequency of attacks, nighttime symptoms, and functional limitations to daily activities). The AMS should also note the level of control (lifetime history of hospitalizations, number of emergency room and clinic visits related to asthma in the past 12 months, frequency of rescue inhaler usage).
2. **Patient Education:** The AMS must contain comments on patient education about both the asthma and the medications used to control it.
3. **Environmental Factors and Comorbid Conditions:** The AMS should comment on any work or home related stimuli affecting the member's asthma.
4. **Medications:** The AMS should include all medications (including those used "as needed") noting frequency of use of each medication. Records should be reviewed to ensure compliance with required therapy. Evidence of non-compliance may warrant grounding. ***All aviation personnel with asthma must carry a rescue inhaler while flying.***

DISCUSSION: The diagnosis of asthma is based primarily on history, with the aid of the physical exam and pulmonary function testing (PFT) demonstrating reversible airway obstruction. Regarding methacholine challenge testing (MCCT), it is currently required for all applicants with a known or questionable history of asthma in order to exclude current bronchial hyperresponsiveness. In designated personnel, bronchoprovocation studies (e.g. MCCT) may not be necessary to establish a diagnosis of asthma, particularly those with classic symptoms or documented reversible airway obstruction. MCCT is most useful in symptomatic patients when asthma is suspected, but spirometry is normal or shows borderline obstruction. In borderline cases, a negative MCCT can help to rule out asthma. In asymptomatic patients, a negative MCCT does not rule out a *remote* history of asthma and/or seasonal asthma. When referring patients with remitted childhood asthma for pulmonary testing, avoid testing in the setting of a recent (within two weeks) respiratory infection to minimize confusion and ensure reliable results are obtained.

When diagnosing and treating asthma in aviation personnel, the FS/AME should reference and be familiar with the **Asthma Guidelines from the National Heart, Lung, and Blood Institute**. Links to applicable documents can be found at the NAMI website.

Waiverable Medications in Designated Personnel: Any of these medications may be waived within the context of overall severity and control.

- Short-acting beta agonists -e.g. albuterol, levalbuterol
- Inhaled corticosteroids (ICS) e.g. fluticasone, budesonide
- Long-acting beta agonists (when combined with ICS) –e.g. salmeterol, formoterol
- Leukotriene Receptor Antagonists –e.g. montelukast

Personnel requiring immunomodulators (omalizumab), methylxanthines (theophylline) or systemic corticosteroids for control are NPQ with no waiver recommended.

ICD-9 CODES:

493.0 Extrinsic Asthma

493.1 Intrinsic Asthma

493.9 Asthma, Unspecified (use for Exercise Induced Asthma)

15.2 CHRONIC OBSTRUCTIVE PULMONARY DISEASE

AEROMEDICAL CONCERNS: Chronic obstructive pulmonary disease (COPD) results in a reduction in maximum oxygen uptake and exercise tolerance. Cerebral hypoxia can adversely affect psychomotor skills, memory, judgment and cognition. Decrements in judgment and the ability to perform complex tasks are also caused by carbon dioxide retention that can occur in COPD. Sudden incapacitation as a result of pneumothorax can occur if a bulla ruptures.

WAIVER: Waivers will not be considered in Applicants. COPD is CD for class I and II. Per MANMED, mild COPD is NCD for class III, whereas moderate to severe COPD requires a waiver. A waiver is highly unlikely for class I and II, but may be considered for designated personnel on a case-by-case basis if there is no cardiovascular decompensation, exercise tolerance is unimpaired, and there are no bullae evident on CT. Aviation personnel meeting these criteria will be restricted from high-performance aircraft.

INFORMATION REQUIRED:

1. Internal medicine or pulmonology consultation
2. High-resolution CT of the chest
3. Complete PFT including pre- and post- bronchodilator
4. Resting oxygen saturations/ABGs
5. Echocardiogram
6. Documentation of smoking cessation

NOTE: Moderate-Severe COPD should be referred to a medical board

TREATMENT: Short-acting bronchodilators and long-acting bronchodilators, anti-muscarinics or beta agonists, either alone or in combination with inhaled corticosteroids, will be considered on a case-by-case basis depending on flying class, symptom control, and disease severity. Vaccination against pneumococcus, annual influenza immunization, and treatment aimed at weight loss (if overweight) are encouraged. **Smoking cessation is required.**

DISCUSSION: The lower limit of oxygenation needed to permit adequate cerebral oxygenation is a PaO₂>65 mm Hg at sea level. The corresponding lower limits for successive 1000 ft increments to 8000 ft are 61, 58, 55, 52, 50, 48, 46 and 45 mm Hg. Obesity or tight fitting clothing can reduce lung volumes leading to hypoventilation and ventilation/perfusion imbalance. Patients with COPD are also at increased risk of acute chest infections, further complicating care in the operational setting. Symptoms will be expected when the forced expiratory volume at 1 second (FEV₁) reaches 50% of that predicted by sex and age. While the normal FEV₁ declines at about 30 ml/year, the reduction in smokers can reach 90 ml/year. Of all patients, up to 50% will have persistent, productive cough, up to 25% will be moderately disabled with recurrent chest infections and increasing absences from work, and up to 25% will be severely disabled within 10 years.

ICD-9 CODE:

496 Chronic Obstructive Pulmonary Disease

15.3 PNEUMOTHORAX

AEROMEDICAL CONCERNS: Acute pneumothorax may cause acute chest pain and dyspnea during flight, worsening as ambient pressure falls. Tension pneumothorax is a life threatening condition that, although rare, will cause hypoxia arising from ventilation/perfusion imbalance and cardiovascular compromise.

WAIVER:

Traumatic Pneumothorax: Traumatic or surgical pneumothorax during the preceding year is CD. Waivers are considered on a case by case basis during the first year following the injury after complete healing and when the member is determined to be fit for full duty by the pulmonologist or surgeon.

Spontaneous Pneumothorax: Primary spontaneous pneumothorax is CD. A waiver can be considered based upon the guidelines below. A subsequent occurrence of spontaneous pneumothorax is CD. No waiver will be recommended unless surgical or chemical pleurodesis has been performed.

Applicants:

- **Single episode of spontaneous pneumothorax:** The applicant may be considered for waiver of standards one year after the resolution of the pneumothorax if treated solely with chest tube reinflation. High resolution CT scan must prove no pathology (blebs or underlying parenchymal disease) and pulmonary function tests must be within normal limits. If treated surgically or chemically, a waiver may be considered six months following resolution, provided the required studies are normal. All applicants must first be granted a waiver for commissioning before an aviation waiver can be considered. The commissioning waiver document must be submitted to NAMI with the aviation waiver request. Altitude chamber runs are not required for disposition and/or waiver recommendation.
- **Recurrent spontaneous pneumothorax:** Permanently disqualifying. No waivers will be recommended unless chemical or surgical pleurodesis has been performed resulting in a normal high-resolution chest CT scan and normal Pulmonary Function Testing (PFT).

Designated:

- **Single episode of spontaneous pneumothorax:** A waiver request may be submitted three months after resolution of the condition. The submission must include the required information. For designated personnel who undergo chemical or surgical pleurodesis, a waiver request may be submitted three months after resolution of the condition. An altitude chamber run is not required for disposition and/or waiver recommendation.
- **Recurrent spontaneous pneumothorax:** CD, waiver not recommended. Waivers may be considered only after definitive treatment (chemical or surgical pleurodesis) to prevent recurrence. Designated personnel who undergo chemical or surgical pleurodesis may be returned to flying status after three months

INFORMATION REQUIRED:

1. Thin cut, high-resolution chest CT scan demonstrating full lung expansion and no pathology that could predispose to recurrence
2. Normal Pulmonary Function Test results
3. Thoracic surgery consultation (in recurrent cases, or in cases with structural abnormalities)

FOLLOWUP: None required.

TREATMENT: All recognized forms of treatment (chemical or surgical pleurodesis) are acceptable for waiver consideration. Recurrence rate after chemical pleurodesis is higher than after thoracotomy and pleural abrasion.

DISCUSSION: Over 90% of patients presenting with spontaneous pneumothorax are under 40 years old, with 75% being younger than 25. In women, there is often a relationship to menstruation. Onset of spontaneous pneumothorax is accompanied by chest pain in 90% of cases and by dyspnea in 89%. Tension pneumothorax develops in 5% and hemopneumothorax in 2.5%. Recurrence rates in patients who have not had definitive treatment have been reported to be from 28% for PSP and 43% for SSP. In one series of patients followed for 10 years without surgery, ipsilateral recurrence followed in 50% of the patients, with 62% happening in the first 2 years. A study published in JAMA 1990 found that most recurrences occur within the first six months. Another study reported a recurrence rate of 30% after a first spontaneous pneumothorax, 50% after a second episode, and 80% after a third. The contralateral risk was reported as 5.2% to 14.6%. Recurrence depends on the procedure used for treatment. Thoracoscopic pleurodesis has recurrence rates less than 7% while chemical pleurodesis has been reported to have a recurrence rate of 9% to 12% depending on the agent used. Thoracotomy with pleural abrasion has rates ranging from 1 to 3.6%. The U.S. Air Force has reviewed patients exposed to chamber flight before return to flying duties. Their analysis revealed that no episodes were eliminated and there was no value in predicting later recurrence. Of note, they required a much longer grounding period before testing, so their data may not be directly comparable to our requirements.

ICD-9 CODES:**512.8 Pneumothorax****860 Any Traumatic or Iatrogenic pneumothorax**

15.4 SARCOIDOSIS

AEROMEDICAL CONCERNS: The protean manifestations of sarcoidosis can involve almost any organ system. Cardiac sarcoidosis, while uncommon, is associated with a restrictive cardiomyopathy and sudden death from arrhythmias. Patients with pulmonary infiltration may have symptoms of restrictive lung disease, which may be distracting in flight. Uveitis can cause permanent visual damage. Nervous system involvement can also occur. Hypercalcemia can predispose the aircrew member to renal stones.

WAIVER:

Applicants: CD, waiver not recommended.

Designated personnel: CD, waiver considered on case-by-case basis with depending on stage, clinical presentation, and flying class/platform. Contact NAMI Internal Medicine for guidance.

INFORMATION REQUIRED (minimum):

1. Pulmonary or Internal Medicine consult
2. Ophthalmology consult
3. CXR and chest CT with IV Contrast
4. Pulmonary function tests
 - a. Spirometry
 - b. Lung volume
 - c. Diffusion
5. Serum calcium
6. 24hr urine calcium
7. ECG
8. 24 hour holter monitor

FOLLOW-UP: Annual submission required with monitoring requirements at a minimum:

1. Chest X-ray
2. PFT's
3. ECG
4. Serum calcium
5. Eye exam

DISCUSSION: The incidence is highest in the 20-35 age group. Up to 50% present with abnormal radiographic findings (usually bilateral enlargement of hilar nodes) or nonspecific respiratory symptoms. Between 10 and 50% will have erythema nodosum, which is more commonly seen in females. Uveitis can be seen in 15 to 25% of patients, and superficial node enlargement is seen in about 30% of Europeans with sarcoidosis and up to 80% of African Americans. The spleen is palpable in 10 to 25% of patients, with massive splenomegaly present in 3%. Up to 30% of cases with acute sarcoidosis will have abnormal thallium scans suggesting myocardial involvement. Liver biopsy will show sarcoid granulomas in 70% of cases without evidence of altered liver function. Nervous system involvement is demonstrable in 10% but may be subclinical in a greater percentage. Osteolytic or osteosclerotic bone lesions are also present in 10% of cases. Most cases (80%) with hilar adenopathy resolve spontaneously

within 2 years, but there is a 5-10% chance of developing progressive pulmonary fibrosis and a 6-7% eventual mortality in those with radiologically evident pulmonary sarcoidosis. The presence of ocular involvement or chronic tonsillitis has been reported to be associated with a poorer prognosis. High levels of serum interferon-gamma (IFNg) before treatment are associated with a more favorable prognosis. Healed myocardial granulomas may lead to arrhythmias, and patients in remission who have had myocardial involvement remain at risk for sudden death. MRI scan may eventually prove to be the method of choice for identifying cardiac sarcoid granulomas.

ICD-9 CODE:
135 Sarcoidosis