

# Pregnancy and Flying

## INTRODUCTION

Pregnancy is a normal physiological condition and not an illness; however, associated physiological changes may affect a pilot's performance. Additionally, flying pregnant may present a risk to the fetus, particularly during the first trimester. Risk factors vary both with the individual and type of flying—some women are more at risk than others. Each pregnancy should be reviewed on an individual basis with both a gynecologist and an aviation examiner familiar with flight crew duties. Whether a pregnant pilot chooses to stop flying immediately or to continue flying during her pregnancy, the decision is hers. The following information is meant to educate, not to dictate.

Once a pregnancy is confirmed, a pilot should report to her own doctor and to an aviation medical examiner. It is advisable, not only to minimize risk to the pilot and fetus but also to ensure flight safety, that her obstetrician is aware of the type of flying she intends to do. Some of the most common pregnancy complications can be detected and treated with careful prenatal evaluation, observation, and care.

## LEGAL FRAMEWORK

### ICAO Provisions

The following are excerpts from ICAO Annex 1 (Eleventh Ed, July 2011), they highlight the international provisions relating to pregnancy and flying. Individual States use these provisions to develop their national legislation.

6.3.2.21 Applicants who are pregnant shall be assessed as unfit unless obstetrical evaluation and continued medical supervision indicate a low-risk uncomplicated pregnancy.

6.3.2.21.1 Recommendation. - For applicants with a low-risk, uncomplicated pregnancy, evaluated and supervised in accordance with 6.3.2.21, the fit assessment should be limited to the period from the end of the 12th week until the end of the 26th week of gestation.

6.3.2.22 Following confinement or termination of pregnancy, the applicant shall not be permitted to exercise the privileges of her license until she has undergone re-evaluation in accordance with best medical practice and it has been determined that she is able to safely exercise the privileges of her license and ratings.

## National Differences

Regulations concerning pregnancy and flying differ considerably in different States. For example, EASA allows for female pilots to fly from the beginning of their pregnancy until the 26th week, but national regulations of EASA Member States may be different. For example, in Germany, legislation protects any pregnant women from shiftwork, and therefore it is not allowed to fly at all if one is pregnant.

It is important to review the applicable legislation in your State.

## INFERTILITY TREATMENT

The recommendation to ground a pilot during infertility treatment should be assessed on a case-by-case basis. The level of risk depends on both the type of treatment and medication used as well as the individual. Some medications are not compatible with flying. The assessment should be done with a gynecologist and aviation specialist.

## INCAPACITATION RISK

### Miscarriage

Particularly during early pregnancy, the incapacitation risk is increased due to the higher probability of miscarriage. Approximately 15 percent of embryos will abort in the first trimester. Ionizing radiation, stress and some physical efforts can contribute to an increased risk of miscarriage.

### Extrauterine Pregnancy

Ectopic pregnancy, also known as tubal pregnancy, is a complication of pregnancy in which the embryo attaches outside the uterus.<sup>1</sup> Most ectopic pregnancies occur in the fallopian tube. Unlike the uterus, which can expand with the growing fetus, the fallopian tube will stretch, rupture, and result in life-threatening internal bleeding. An ectopic pregnancy occurs in about one to two percent of all first trimester pregnancies and is the most common cause of maternal death in the first trimester. The risk of death among those in the developed world is between 0.1 and 0.3 percent while in the developing world it is between one and three percent.

Ectopic pregnancies are difficult to predict and diagnose, frequently presenting with an abrupt onset of incapacitating pain and life-threatening bleeding. An ectopic pregnancy in a rupture phase during flight can lead to an emergency situation. Due to the high risk of incapacitation due to ectopic pregnancy, some countries require an ultrasound examination at six weeks of pregnancy.

### Morning Sickness

Nausea and vomiting in early pregnancy occurs in 30 percent of all pregnancies, especially during the first trimester. While some women are sick at specific times during the day, others experience morning sickness without warning or throughout the day. Medications to treat the symptoms are prohibited while flying. Morning sickness is not compatible with flying duties.

### Hypotension (low blood pressure) and Syncope (loss of consciousness)

Blood pressure generally decreases in pregnancy. This is due in part to dehydration, but mainly because of hormonal effects on blood vessel relaxation. The relaxation of smooth muscles in blood vessel walls lowers the baseline blood pressure. In addition, about 25 percent of blood flow is directed to the uterus and placenta. This decreases systemic blood pressure, decreases G-tolerance, and increases the risk of grey-out, black-out, and syncope.

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1 ACOG Practice Bulletin. *Medical Management of Ectopic Pregnancy*. June 2008; 111:148185

Syncope is a transient loss of consciousness due to decreased blood flow to the brain, and usually resolves without lasting effects once blood flow is restored.

### **Lower G-tolerance**

Hypotension is especially important to pilots exposed to G-forces as it increases the risk for G-LOC. Tolerances may differ significantly from the non-pregnant tolerances to which the pilot has been accustomed. It is important for the pregnant pilot to understand these changes may vary throughout pregnancy and modify her ability to anticipate, recognize, and counter G-induced grey-out, black-out, or syncope. Pregnant pilots are generally restricted to low-G exposure aircraft for this reason.

## **RISKS TO MOTHER AND FETUS**

### **Anemia**

Hemoglobin (and hematocrit) begins to fall between the third and fifth month and is lowest by the eighth month. This is primarily due to increased blood volume that results from an increase in plasma, the watery portion of the blood. This dilutes the oxygen-carrying red blood cells, causing the physiologic condition anemia. Increased iron requirements in pregnancy may further complicate anemia. Usually, adequate diet with supplementary iron and folic acid is necessary; however, self-medication and prescribed medicine should be avoided. Sometimes anemia may prevent medical certification.

### **Dehydration**

Pregnancy produces an increase in urine production, commonly contributing to dehydration. Dehydration results in lower blood pressure, which may cause lightheadedness, dizziness, visual disturbances, loss of consciousness, or adverse consequences for the fetus. Lower blood pressure compromises blood flow to maternal and fetal tissue.

### **Hypoxia**

Changes occurring in the lungs during pregnancy are medically relevant in the context of aviation. Hormonal changes affect pulmonary function by lowering the threshold of the respiratory center to carbon dioxide, thereby influencing the respiratory rate. In addition, more fluid collects in the lungs of a pregnant woman, resulting in reduced residual lung volume. Other physiological changes during pregnancy lead to an increased oxygen demand and greater stress on the heart and lungs. For these reasons, a woman is more susceptible to the effects of hypoxia when she is pregnant.

Hypoxia may potentially cause fetal malformation, spontaneous abortion, or developmental disorders. The mother's body provides a measure of protection for the fetus, as hemoglobin in the fetal blood has a much higher affinity for oxygen than the mother's hemoglobin. It remains unclear how susceptible the fetus may be during transient and repeated hypoxic exposure. Given the number of altitude changes on a typical flight and the number of flights performed, hypoxia must be considered in the aviation environment. Generally, it is believed adequate fetal oxygenation occurs at altitudes under 10,000 feet, within the normal range for cabin pressure for commercial flights. The possibility of cabin depressurization remains a risk.

### **Size of Abdomen**

As the pregnancy progresses and the uterus expands, the size of the abdomen may interfere with emergency egress and flight control manipulation. Abnormal flight (windshear, upset recoveries, engine loss, rapid depressurization, wake turbulence, and other emergencies) may require full deflection of flight controls and impose G-loads. Depending upon the nature of the reject, force from an aborted takeoff may cause placental abruption.

## **Heavy Lifting**

Lifting heavy weights, such as a suitcase, can lead to higher risk of spontaneous abortion, premature birth, and hypertension.<sup>1</sup>

## **Sleep**

Due to hormonal and physical changes, a woman needs more sleep when she is pregnant. Particularly during the third trimester, pregnancy-related hormones (progesterone, estrogen, cortisol, and oxytocin) markedly affect sleep quality. Studies show two-thirds of pregnant women suffer from sleep disorders; insomnia, restless leg syndrome, sleep apnea, nocturnal gastroesophageal reflux, and nighttime urination are common. Sleep deprivation during pregnancy is associated with longer labor, higher cesarean rates, and higher levels of pro-inflammatory serum cytokines (linked to preterm labor and post-partum depression). Irregular airline schedules negatively impact circadian rhythms and contribute to chronic sleep deprivation. Sleep deprivation attributed to shift work has been linked to a higher incidence of miscarriages and can affect pilot performance.

## **Edema, Deep Vein Thrombosis, and Pulmonary Embolism**

The incidence of varicose veins is three times higher in women than men. Due to the expanding uterus compressing the venous cava, the risk of edema and blood clot formation increases substantially during pregnancy. Increased estrogen levels increase blood coagulation. Deep vein thrombosis and pulmonary embolism are among the most common serious vascular diseases that occur during pregnancy and account for the greatest number of maternal deaths.

Sitting for prolonged periods increases the risk for lower extremity edema, thrombophlebitis, and deep vein thrombosis. Pilots, and especially pregnant pilots, should walk around every hour or two.

## **Pre-eclampsia**

Pre-eclampsia is a pregnancy complication characterized by high blood pressure and signs of damage to another organ system, most often the liver and kidneys. Pre-eclampsia usually begins after 20 weeks of pregnancy in women whose blood pressure had been normal. If left untreated, pre-eclampsia can lead to serious or even fatal complications for mother and fetus. As pre-eclampsia develops relatively late during the pregnancy, it usually is not of concern during the period when she is allowed to fly during the pregnancy.

## **Cosmic Radiation**

Cosmic radiation is linked to elevated numbers of chromosome aberrations which may cause intellectual development disorders, congenital anomalies, growth restrictions, and Down Syndrome. These changes may also lead to miscarriage.

According to current ICRP (International Commission of Radiation Protections) recommendations, the radiation exposure to the fetus should not generally exceed a limit of 1.0 mSv after declaring the pregnancy to the operator (the same limit applies to the general flying public and pregnant crew members). It should be noted that a flight crew member has most likely been exposed to some amount of cosmic radiation before confirmation of pregnancy. The average annual radiation exposure for a pilot is between 2-5 mSv. The IFALPA position paper [18POS02](#) on ionizing radiation provides additional information.

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1 <https://www.inspq.qc.ca/sites/default/files/documents/maternite-travail/SoulevementCharges1997.pdf> (in French, accessed 15 Jan 2018)

## Cabin Air Quality

Although cabin air is normally of acceptable quality, fume events may cause quality to deteriorate rapidly. Fume events pose a risk to passengers and crew, including to a pregnant woman and her fetus.

## Exposure to Viral Infections During Layovers

Several viral diseases may cause birth defects. The Zika virus is a notable example. It is carried by mosquitoes and may cause microcephaly in the offspring of exposed women. Current recommendations advise pregnant women not to travel to areas where Zika virus is present. In addition, if a pregnant woman's sexual partner lives in or has travelled to a Zika affected area, it is recommended to practice safer sex, including the use of condoms, for the rest of the pregnancy.<sup>1</sup> Pregnant women should check the current recommendations concerning Zika from health authorities.

Pregnant women may have a more severe reaction to malaria than women who are not pregnant. Malaria can increase the risk for serious pregnancy complications including, but not limited to, premature birth, miscarriage, and stillbirth. Pregnant women should avoid travel to areas where malaria transmission occurs.<sup>2</sup>

## Foodborne Illness

Pregnant women should follow the advice of local health authorities on what foods should be avoided due to the risk of foodborne illness. There is publicly available advice on the issue, e.g.:

[FDA Food Safety for Pregnant Women.](#)

## Listeria

Listeria is a harmful germ that can hide in many foods. Pregnant women are ten times more likely than other people to contract a listeria infection and may pass the infection to their fetus. Listeria infection can cause miscarriages, stillbirths, and preterm labor. It can also cause serious illness and even death in newborns. For example, soft cheeses made with unpasteurized milk, raw sprouts, or refrigerated smoked seafood have been a source of listeria. A pregnant international pilot should be aware that pasteurization is less common in some countries.

## Toxoplasmosis

Toxoplasmosis is caused by the protozoan parasite *Toxoplasma gondii*. It is relatively widespread, for example in the United States it is estimated that 11 percent of the population six years and older is infected with *Toxoplasma*.<sup>3</sup> Usually, only new infections (just before or during pregnancy) may be passed to the fetus. Toxoplasmosis may cause serious symptoms, such as blindness or mental disability. Toxoplasmosis is not passed between people, except in instances of mother to child (congenital) transmission, and blood transfusion or organ transplantation. There are three principal routes of transmission which are foodborne, animal to human (zoonotic) or mother to child (congenital).

Pregnant women should avoid undercooked meat (especially pork, lamb, and venison) and pay attention to good hygiene when handling raw meat. In addition, pregnant women should not empty cats litter boxes as infected cats shed parasites in their feces.

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1 <http://www.who.int/csr/disease/zika/information-for-travelers/en/> (accessed 15 Jan 2018)

2 <http://www.who.int/malaria/travellers/en/> (accessed 15 Jan 2018)

3 <https://www.cdc.gov/parasites/toxoplasmosis/epi.html> (accessed 15 Jan 2018)

## **POSTPARTUM DEPRESSION**

Postpartum depression (PPD) is a non-psychotic depression that women may experience shortly after childbirth. PPD is different from the “baby blues,” which begin within the first three or four days of giving birth, require no treatment, and lift within a few hours or up to 10-14 days. PPD is a deeper depression that lasts much longer. It usually starts within the first month after childbirth (although it can occur any time within the first year), and can last weeks to years. In more serious cases, it can develop into chronic episodes of depression.<sup>1</sup>

Apart from the fact that it happens soon after childbirth, PPD is clinically no different from a depressive episode that occurs at any other time in life. PPD symptoms are the same as in general depression and must meet the same criteria for diagnosis.<sup>2</sup> Often medical treatment is needed. A pilot has to be free of symptoms of depression and any medication prescribed should be accepted for use while flying before they return to duty.

## **RETURNING TO FLYING**

ICAO Manual of Civil Aviation Medicine, Third Ed. 2012 states that provided the puerperium is uncomplicated and full recovery takes place, pilots should be able to resume aviation duties four to six weeks after birth or termination of pregnancy.

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1 [http://www.camh.ca/en/hospital/health\\_information/a\\_z\\_mental\\_health\\_and\\_addiction\\_information/Postpartum-depression/Pages/default.aspx](http://www.camh.ca/en/hospital/health_information/a_z_mental_health_and_addiction_information/Postpartum-depression/Pages/default.aspx) (accessed 15 Jan 2018)

2 [http://www.camh.ca/en/hospital/health\\_information/a\\_z\\_mental\\_health\\_and\\_addiction\\_information/Postpartum-depression/Pages/default.aspx](http://www.camh.ca/en/hospital/health_information/a_z_mental_health_and_addiction_information/Postpartum-depression/Pages/default.aspx) (accessed 15 Jan 2018)