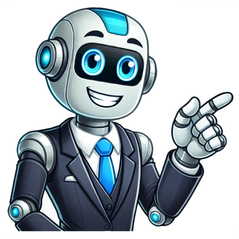
Click Here



1999-10-19 The use of jet-fuel, de-icing fluids, lubricants, hydraulics, engine oil and other fluids, are associated with single repeated/accidental or chronic exposure (s) to ground staff, flight-deck and cabin crew and passengers. These fluids can become airborne in vapor or aerosol phases, and are known to contain neurotoxicants, carcinogens, irritants and other toxic ingredients. Exposures (single or repeated) to these toxic materials are not rare events and some typical failures/working conditions include mechanical failures, seal leaks, and operational procedures, such as take off while fumes detected, pack burn outs.A method for calculation of exposure dose is proposed. The additional impact of exposure to toxicants in conditions of lowered pressure (and reduced oxygen level), other potentiation factors are still largely unknown, but are not presumed to be beneficial.These occupational and public exposures can impact on a range of issues, including: air safety; public liability; ground and air crew safety; control requirements on the supply/ handling/use/disposal of these products; and national and international regulations.A number of toxicity studies report a consistent range of symptoms in exposed individuals (Rayman, 1983; Van Netten, 1998). Because flight safety can be compromised, due to significant symptoms such as disorientation, blurred vision, impaired memory, altered coordination and so on, attempts have been made to address these problems worldwide. These include changes in engine design, drainage, containment, retrofitting of engine filters, modified maintenance and operation and procedures and the like. Some of these changes were developed in past decades or are being currently worked-out while new technologies are being developed that enable significant reduction in concentrations of toxic airborne chemicals.However, while the problem persists, exposure of staff and the public to levels of toxicants that may affect safety and health continues. We also recommend: Class 3 Pre-printed with a UN Number, these Hazard Class 3 placards meet the requirements of 49 CFR 172.500 for domestic and international shipments of hazardous materials by highway, rail and water. Is aviation fuel hazardous? Chemicals, including jet fuel, may also present toxic or irritant hazards. At high concentrations, jet fuel and other hydrocarbons can affect the nervous system, causing headache, dizziness, and lack of coordination. Chemicals may also cause chronic health problems, such as liver and kidney damage. What classification is Avgas? Dangerous Goods AVGAS 100 is classified as Dangerous Goods according to the Australian Code for the Transport of Dangerous Goods by Road and Rail. Is jet fuel a hazardous waste? As you correctly note in your letter, off-specification fuels, including gasoline, jet fuel, kerosene, diesel, etc. In that case, the off-specification fuel would be regulated as a hazardous waste under RCRA even when burned for energy recovery. Is JP 8 fuel flammable? Colorless or slightly yellow. Density within the range of 6.47-7.01 lb/U.S. gallon (0.775 – 0.840 kg/L) Flammable at temperatures above 100.4°F (38°C) in the presence of flames or sparks. Is Jet A1 fuel flammable? JET-A1, also has a flash point higher than 38˚C – crucial, as it makes the fuel less likely to combust unsafely. Once vaporised, however, jet fuel is extremely flammable and burns at a much higher temperature than other fuels. What class is Jet A1? Jet A-1 is a kerosine grade of fuel suitable for most turbine engined aircraft. It has a flash point minimum of 38 degrees C (100°F) and a freeze point maximum of -47 degrees C. What is the difference between avgas and race fuel? AvGas octane numbers are determined in a different test than motor gasoline octane numbers. AvGas has a lower specific gravity than most racing gasolines. This means that if a racer tries AvGas and has not re-jetted, he can burn a piston because the air-fuel ratio is too lean and/or the engine detonated. How is avgas different from car gas? The Main Difference Between Gas and Avgas: Lead Aviation gas still contains tetra-ethyl lead additives to lubricate the engine. Lead was taken out of automotive gas in 1986. Using leaded avgas in a modern car would ruin components such as the catalytic converter. Conversely, Jet-A wouldn't work in a gas engine. Is Jet Fuel flammable or combustible? This means it doesn't ignite easily and or form dangerous fuel-air mixtures. JET-A1, also has a flash point higher than 38˚C – crucial, as it makes the fuel less likely to combust unsafely. Once vaporised, however, jet fuel is extremely flammable and burns at a much higher temperature than other fuels. Is jet fuel a flammable or combustible liquid? The flash point of kerosene is controlled to be 100°F, or 37.8°C, to be classified as a combustible liquid. Commercial jet fuel has many synonyms and trade names, including Jet A or JP-8. It is also known as aviation kerosene, Jet A-1, Jet A-50, Jet B, jet kerosene, jet kerosine, Turbo fuel A, and Turbo fuel A-1. Where can I find the aviation fuelling hazardous area classification? The Energy Institute Research Report on Aviation Fuelling Hazardous Area Classification is now available on the EI website. What are the hazards of entering airplane fuel tanks? Maintenance personnel who enter airplane fuel tanks to inspect or modify them face several potential hazards. These include exposure to flammable and toxic chemicals, potentially harmful atmospheric conditions, and the confined interior structure of the tank. What is an airport fueling system? Airport Fueling System – An arrangement of aviation fuel storage tanks, pumps, piping, and associated equipment, such as filters, water separators, hydrants and station, or aircraft fuel servicing vehicles, installed at an airport and designed to service aircraft at fixed positions. Is the loading of hazardous materials with other hazard classes allowed? In this table a statement is contained for each hazard class whether the loading, transport or storage with other hazard classes is allowed, is not permitted or is restricted. The table is based on U.S.-Code 49 CFR §177.848. May not be loaded, transported, or stored together in the same transport vehicle or storage facility. Solid waste refers to discarded materials that are abandoned, recycled, inherently waste-like, or military ammunition. Unused commercial chemical products (CCP) meet the definition of solid waste when the generator decides to discard them. Under the Resource Conservation and Recovery Act (RCRA), unused fuels like jet fuel, kerosene, and similar fuels must be classified as solid waste and potentially hazardous waste.Hazardous waste fuel produced at a petroleum refinery from oil-bearing hazardous wastes introduced into the refining process after the distillation step, or that are contaminated with water, dirt, or other materials, are considered hazardous waste. Hazardous waste can be classified as listed waste or hazardous waste fuel blending facilities. These facilities have activities that constitute storage and/or treatment of hazardous wastes, subject to full RCRA regulation.Unused commercial chemical products listed in §261. 33 that are themselves fuels, including those that are normal components of fuels, are also considered hazardous waste. Off-specification fuels, such as gasoline, kerosene, jet fuel, and diesel, are not considered solid waste when burned for energy recovery because they are used for their own purposes.The EPA has issued guidance on whether specific wastes are classified as hazardous wastes. Off-specification jet fuel is not a solid waste when burned for energy recovery because it is itself a fuel. Fuels reasonably used for heat, motive power, or other legitimate energy use are products and are not subject to hazardous waste regulations. Burning for JP-5, JP-8, and Jet A fuels has not been identified in any of the 1, 832 hazardous waste sites proposed for inclusion on the EPA National Toxic to aquatic life with long-lasting effects.Useful Articles on the TopicArticleDescriptionSiteHazardous Waste Identification ClarificationsEPA has issued guidance on whether or not specific wastes are classified as hazardous wastes … OFF-SPECIFICATION JET FUEL BURNED AS KEROSENE …fedcenter.govRO 11938 9441.1995 UNITED STATES …In that case, the off-specification fuel would be regulated as a hazardous waste under RCRA even when burned for energy recovery. There are also …rcrapublic.epa.govMATERIAL SAFETY DATA SHEET Jet Fuel SECTION 1However, conditions of use which results in chemical, physical changes or contamination, may subject it to regulation as a hazardous waste.utsi.edu Recycling Jet FuelThis was a video I shot while deployed to Djibouti Africa. It shows how the Military is using left over (bottom barrel) jet fuel for other … (Image Source: Pixabay.com) What Substances Are Considered Hazardous Waste?Hazardous waste is any discarded material harmful to human health or the environment, classified under the Resource Conservation and Recovery Act (RCRA). It includes solids, liquids, and gases that may exhibit corrosive, toxic, ignitable, or reactive properties. The U. S. Environmental Protection Agency (EPA) categorizes hazardous waste into three main types: listed waste, characteristic waste, and mixed radiological waste.Listed waste includes examples such as chlorinated aliphatics, dyes, paint wastes, and wastewater treatment sludges. The hazardous nature of waste can be determined by its listing on the F, K, P, or U lists found in Title 40 of the Code of Federal Regulations (CFR), part 261.In California, five distinct types of listed wastes are recognized. A waste is classified as hazardous if it meets RCRA's solid waste definition and is specifically listed as hazardous. Essential guidelines for managing hazardous waste are provided in the EPA Hazardous Waste Classifications Guide. Examples of hazardous materials include batteries, solvents, pesticides, and used oil, which can pose biological and chemical risks.Proper identification and management of hazardous waste are crucial to mitigate adverse effects on health and the environment. Understanding hazardous waste's complexities is vital, as it encompasses a wide range of substances with significant implications for safety and ecological balance. (Image Source: Pixabay.com) Are Fuel-Related Wastes Considered Hazardous?Fuel-related wastes are deemed hazardous unless proven otherwise. They can be disposed of as regulated hazardous wastes or managed under reduced requirements. Wastes that are not categorized as fuel-related include those containing hazardous chemicals like acids, phenols, arsenic, lead, and mercury, which pose risks to human health and the environment. Hazardous waste, as outlined by the Minnesota Pollution Control Agency, includes various forms like solids, liquids, gases, sludges, or pastes that exhibit hazardous characteristics.In Canada, hazardous wastes are defined by their properties, such as flammability. When these wastes are no longer used for the intended purpose, they become dangerous contaminants capable of harming health or the environment.Facilities that blend hazardous waste fuel are subject to full RCRA regulations, which include storage and treatment protocols. Waste management, particularly hazardous waste disposal, plays a crucial role in achieving sustainability goals. However, many recycling operations for hazardous waste can pose serious health and environmental risks and require regulation under Subtitle C of the Resource Conservation and Recovery Act (RCRA).Mixed wastes, which contain both hazardous waste and radioactive material, are also regulated. The EPA classifies hazardous waste based on specific lists or established hazardous characteristics, and petroleum-contaminated media may be excluded from hazardous waste definitions under certain conditions. (Image Source: Pixabay.com) Is Hazardous Waste A Risk To Human Health?Hazardous wastes are discarded materials that can pose potential risks to human health or the environment due to their harmful properties. While not all such waste presents immediate health dangers, some certainly can. The Environment Agency provides guidance on the classification of hazardous waste, emphasizing the importance of proper management. This paper conducts a systematic review of literature surrounding health effects linked to living near hazardous waste sites, aiming to evaluate existing evidence.Risk assessments are crucial in determining the threat level of these sites, particularly regarding carcinogenic and noncarcinogenic hazards stemming from hazardous waste combustion emissions. The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 to establish a framework for managing hazardous materials effectively. Emergency response teams must also consider health and ecological risks associated with hazardous substance releases, which can impact responders and affected individuals.Read also: Does Smog Exacerbate Hail Storms?Research has shown associations between numerous health outcomes, including cancer and behavioral abnormalities, with residential exposure to hazardous waste sites. Additionally, hazardous substances can lead to severe accidents and persistent negative effects through chemical emissions into air and water. Health issues resulting from hazardous waste exposure can include skin and eye irritation, chemical burns, respiratory difficulties, headaches, nausea, and various physiological malfunctions affecting individuals of all ages. (Image Source: Pixabay.com) What Is The HS Code For Jet Fuel?HS Code 2710121520 pertains to the tariff classification of jet fuel, specifically naphtha-type and spirit-type jet fuels, excluding aviation spirits. This includes examples such as Jet A-1 fuel, refined in Germany, and TS-1 jet fuel, particularly used in military aviation. HS-codes. com specializes in providing information on harmonized tariff numbers and commodity codes, assisting users in finding relevant HS codes and descriptions. The platform allows you to discover a 6-digit universal HS code applicable in numerous countries, alongside EU, UK, and USA-specific declarable codes.Details regarding Jet Fuel imports under HS Code 27101990 are also available, including shipment data, import and export prices, major exporting nations, and monthly trends. Accurate classification of HS codes is crucial for compliance and can significantly affect financial advantages in the supply chain. Seair is noted for its expertise in interpreting specific HS codes for jet fuel products and navigating customs regulations. Notably, other related HS Codes include 2710.19. 21 for kerosene-type jet fuel. Additionally, information on tariffs and duties for TARIC code 2710192100, as well as import statistics for jet fuel, is accessible, with an average import price for jet fuel under HS Code 27101920 recorded at $0. 53. (Image Source: Pixabay.com) How Should I Dispose Of Recyclable Fuel?You can store up to 110 gallons of recyclable fuel waste on your site for one year. Ensure waste is in closed, leak-proof containers with the initial accumulation date and labeled as 'Recyclable Fuel' or 'Waste Fuel for Recycling'. Gasoline typically begins to degrade and oxidize when exposed to air, which can take 3-6 months for regular 85 octane fuel and 2-3 months for high ethanol fuels. Poorly stored gas may smell 'spoiled' and look off.To extend gasoline shelf life, keep it in a cool, dry place away from sunlight and in a separate building from your home. Safe disposal methods for old petrol include taking it to a recycling center, household hazardous waste (HHW) site, or auto parts store. You may also dispose of small volumes (up to five liters) at Household Waste Recycling Centres (HWRC). Fees may apply, and prior booking might be necessary. It's essential to recycle or reuse old gasoline, as it cannot go in regular trash.Local gas stations or recycling centers may accept it. You can also explore municipal collection points for disposal. If you have leftover fuel from specific equipment or vehicles, contact local hazardous waste facilities for guidance. When disposing of gasoline, use certified containers, fill them leaving space for vapors, and seal tightly. Resources like Recycling Locator tools can help you find proper disposal options. Always prioritize safe and eco-friendly disposal methods to avoid accidents. (Image Source: Pixabay.com) Is Jet Fuel Classified As Hazardous Waste?Recyclable materials, such as jet fuel, kerosene, and similar fuels, are regulated under hazardous waste recycling laws but are not considered excluded recyclable materials. If these fuels are sent to an incinerator for destruction, they must be classified as solid waste and potentially hazardous waste. The EPA provides guidance on classifying various wastes, which is essential in the Hazardous Waste Identification Process. Off-specification fuels, such as gasoline and jet fuel that present a hazardous characteristic but are burned for energy recovery, are not considered solid waste when used as fuels.The management of off-spec fuel as hazardous waste (D001) is noted, with the intent to sell it as feedstock for jet fuel production, aligning with regulations that state recycled materials used for fuel production are not classified as solid waste. After confirming a material's classification as solid waste, it must be determined whether it is also hazardous waste. Important concepts include ensuring proper disposal of contaminated materials, following definitions and hazards provided by OSHA, and adhering to federal regulations on hazardous waste disposal.Off-specification fuels, alongside other petroleum products when mismanaged, may pose risks but are not typically subject to hazardous waste regulations when utilized for energy recovery. Proper precautions should be taken to avoid hazardous reactions. (Image Source: Pixabay.com) What Is The Code For Jet Fuel?ASTM Specification D1655 outlines the standards for aviation turbine fuels, including Jet A and Jet A-1, and is critical for jet fuel classification in the U. S. Jet A-1, having a maximum freezing point, is frequently utilized globally, with NATO Code F-35. In contrast, JET B, a civil aviation fuel featuring a different freezing point (-50°C) than F-40, primarily lacks FSII (Fuel System Icing Inhibitor). JP-8, a military equivalent of Jet A-1, includes corrosion inhibitors and anti-icing additives and complies with U.S. Military Specification MIL-T-83188D, serving as the main jet fuel for NATO air forces since its introduction in 1978. Other prevalent fuels include JP-4, specified in 1951, noted for its NATO Code F-40. The typical composition for jet fuel comprises kerosene along with other components like Naphthalene and Ethyl Benzene. A colour-code system distinguishes Avgas from Jet Fuel grades, ensuring proper identification. While Jet A has been used since the 1950s primarily in the U.S., Jet A-1 prevails worldwide, being noted for its specifications such as DEF STAN 91-91. HS Codes (like 27101916 and 27101921) are essential for classifying kerosene-type jet fuels for customs, with specific codes aiding in export declarations. Additionally, FSII (NATO Code S-1745) acts as an icing inhibitor for aviation turbine fuels, emphasizing its importance in maintaining operational efficiency. Overall, various specifications and standards shape the use and classification of different grades of aviation fuels, crucial for aircraft operation across global airspace. (Image Source: Pixabay.com) What Hazmat Number Is Jet Fuel?Chemical identifiers for Kerosene and Fuel Oil No. 1 include CAS Number 8008-20-6 and UN/NA Number 70892-10-3, respectively, with the DOT hazard label of 1863, indicating a flammable liquid. This information is essential for risk assessments related to loading, transporting, and storing hazardous materials, specifically in the context of aviation turbine fuel. The supplier of the Safety Data Sheet is MOTOR OIL (HELLAS), CORINTH REFINERIES S. A, with Shell and MOH Aviation Fuels A.Read also: Is A Michigan Smog Test Required?E. as suppliers. The contact address is 151 Kifissias Ave, Maroussi, Greece, and the phone number is +30 210 6006 380-1. The proper shipping name for this substance is "Fuel, Aviation, Turbine Engine," classified under Hazard Class 3 with Packing Group III. In case of ingestion, immediate medical attention is necessary, and vomiting should not be induced. The SDS number for Jet Fuel JP-8 is 9946, and various synonyms include Jet Fuel, Jet A, JP-5, and JP-8. Proper handling requires safety measures including eyewash stations, showers, and ventilation systems to mitigate risks associated with flammable liquids. (Image Source: Pixabay.com) What Are The 7 Main Hazardous Substances?Here are the top seven hazardous substances to be aware of: Acids and Caustic Substances, Disinfectants, Glues and Solvents, Biological Hazards, Paints and Heavy Metals, Pesticides, and Petroleum Products. Understanding COSHH (Control of Substances Hazardous to Health) is crucial in health and social care due to seven classifications of hazardous substances, including harmful, corrosive, flammable, explosive, toxic, oxidising, and those dangerous to the environment.The Classification, Labelling and Packaging of Dangerous Substances and Mixtures Regulations (CLP) identifies key groups of hazardous substances, necessitating knowledge of safety signs, warning labels, Safety Data Sheets (SDS), and hazard pictograms. For example, hazard pictograms indicate potential risks, while warning labels provide information regarding the specific type of hazard and necessary precautions. The main classes include Explosives (Class 1), Gases (Class 2), and Flammable Substances (Classes 3 and 4).Hazardous chemicals encompass biological agents, natural substances like dusts, as well as substances generated in the workplace. COSHH applies to various chemicals, including dust, vapours, and biological agents, emphasizing the importance of managing these substances safely. It's essential to recognize hazardous substances and their properties, as they can pose significant risks to health and the environment. This also includes understanding the Globally Harmonized System (GHS) classifications and ensuring proper labeling and safety measures are followed in all work environments. (Image Source: Pixabay.com) Is Fuel Considered A Hazardous Material?Gasoline, classified as a hazardous material under 49 CFR 172. 101, is recognized as an "oil" by the Clean Water Act of 1973, rather than a "hazardous substance." For carriers transporting any oil, there is a financial responsibility requirement of at least $1, 000, 000 coverage. The Safety Data Sheet (SDS), once known as the Material Safety Data Sheet (MSDS), is crucial for identifying a product's hazards. Questions have arisen regarding the applicability of DOT's Hazardous Materials Regulations (HMRs) to fuel tanks, including those used to supply equipment.While diesel fuel is listed as a flammable liquid—and can be designated as a combustible liquid if it has a flash point above 100°F—it is part of "petroleum" and not specifically classified as a hazardous substance. Stale gasoline can be deemed hazardous waste by the EPA due to its ignitability. Internal combustion engines utilizing flammable liquids are also classified as hazardous materials, posing risks such as irritation and dizziness.It is important to recognize that items containing fuel vapors are not mailable, and removing fuel does not make them acceptable to send. Overall, the classification and regulations surrounding gasoline and diesel fuel require careful attention to ensure compliance and safety in transportation and storage. (Image Source: Pixabay.com) Which Is Not Considered Hazardous Waste?Municipal solid waste refers to the non-hazardous waste generated from residential and commercial sources, including items like packaging, furniture, electronics, clothing, food scraps, and yard trimmings. Effective waste management is critical for public health and environmental safety. The Resource Conservation and Recovery Act (RCRA), established in 1976, provides a framework for managing hazardous and non-hazardous waste in the United States. Under RCRA, certain solid wastes are excluded from hazardous waste classification.For example, common materials such as paper, plastics, glass, and metals are generally non-hazardous as they lack toxic properties. Hazardous waste is identified by specific characteristics, including ignitability, corrosivity, reactivity, and the possibility of combustibility. Notably, waste types that do not display these characteristics are classified as non-hazardous, with examples including clean packaging, food scraps, and other everyday items.Domestic sewage and mixtures that enter sewer systems are also excluded from hazardous waste definitions, thus not governed by RCRA Subtitle C regulations. In industrial contexts, materials like ash, sludges, and non-toxic liquids are typically considered non-hazardous. It's essential to differentiate between hazardous and non-hazardous waste for appropriate disposal and regulatory compliance. (Image Source: Pixabay.com) What Are Contaminated Or Degraded Fuels?Contaminated or degraded fuels are those affected by impurities that impair their quality without requiring extensive treatment, aside from simple filtering. Such fuels can still be used for energy production without falling under hazardous waste regulations. Fuel contamination occurs when unwanted substances, like water or microorganisms (bacteria, molds, and yeast), mix with the fuel, affecting its efficacy. Microbial growth is particularly encouraged by the presence of moisture, often manifesting as sludge that can corrode storage tanks and lead to significant operational issues.The main causes include water ingress, phase separation, and particulates. Water poses serious risks, especially in gasoline, as it can degrade fuel quality and damage machinery if not addressed immediately. Treating contaminated fuel promptly is crucial to prevent extensive damage to systems, such as blocked fuel injectors, resulting in decreased combustion quality. Moreover, organic and inorganic debris, as well as degradation products, contribute to the contamination of fuels, with diesel being particularly susceptible to oxidative instability.Regular checks on fuel quality are important; samples from the tank should remain clear and bright, while cloudy or dark samples signal contamination. In summary, mitigating fuel contamination involves understanding its causes and taking swift action to preserve fuel quality and operational efficiency. Recyclist Podcast 5-3-2024: Landfill Gas Jet Fuel?Your weekly news roundup from the world of Waste, Gas, and Energy, brought to you by DiamondSci.com223-7500. Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. Facebook Twitter LinkedIn Syndicate Type of aviation fuel This article is about aviation turbine fuel. For the chain of European fuel stations, see Jet (brand). Jet fuel An Airbus A310-300 of Czech Airlines being fueled at Prague Václav Havel Airport Identifiers CAS Number 8008-20-6 (kerosene, also called fuel oil no. 1) Y64742-47-8 (Aviation Kerosene) Y ChemSpider None UNII 1C89KKC04E Y CompTox Dashboard (EPA) DTXSID80109005 Properties Appearance Straw-colored liquid Density 775-840 g/L Melting point −47 °C (−53 °F; 226 K) Boiling point 176 °C (349 °F; 449 K) Hazards NFPA 704 (fire diamond) 2 2 0 Flash point 38 °C (100 °F; 311 K) Autoignitiontemperature 210 °C (410 °F; 483 K) Safety data sheet (SDS) [1] [2] Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa). Y verify (what is YN ?) Infobox references Chemical compound Jet fuel or aviation turbine fuel (ATF, also abbreviated avtur) is a type of aviation fuel designed for use in aircraft powered by gas-turbine engines. It is colorless to straw-colored in appearance. The most commonly used fuels for commercial aviation are Jet A and Jet A-1, which are produced to a standardized international specification. The only other jet fuel commonly used in civilian turbine-engine powered aviation is Jet B, which is used for its enhanced cold-weather performance. Jet fuel is a mixture of a variety of hydrocarbons. Because the exact composition of jet fuel varies widely based on petroleum source, it is impossible to define jet fuel as a ratio of specific hydrocarbons. Jet fuel is therefore defined as a performance specification rather than a chemical compound.[1] Furthermore, the range of molecular mass between hydrocarbons (or different carbon numbers) is defined by the requirements for the product, such as the freezing point or smoke point. Kerosene-type jet fuel (including Jet A and Jet A-1, JP-5, and JP-8) has a carbon number distribution between about 8 and 16 (carbon atoms per molecule); wide-cut or naphtha-type jet fuel (including Jet B and JP-4), between about 5 and 15.[2][3] Fuel for piston-engine powered aircraft (usually a high-octane gasoline known as avgas) has a high volatility to improve its carburetion characteristics and high autoignition temperature to prevent preignition in high compression aircraft engines. Turbine engines (as with diesel engines) can operate with a wide range of fuels because fuel is injected into the hot combustion chamber. Jet and gas turbine (turboprop, helicopter) aircraft engines typically use lower cost fuels with higher flash points, which are less flammable and therefore safer to transport and handle. The first axial compressor jet engine in widespread production and combat service, the Junkers Jumo 004 used on the Messerschmitt Me 262A fighter and the Arado Ar 234B jet recon-bomber, burned either a special synthetic "J2" fuel or diesel fuel. Gasoline was a third option but unattractive due to high fuel consumption.[4] Other fuels used were kerosene or kerosene and gasoline mixtures. A pressure to move from Jet fuel to sustainable aviation fuel, aka Aviation biofuel, has existed since before the 2016 Paris Agreement.[5][6] Most jet fuels in use since the end of World War II are kerosene-based. Both British and American standards for jet fuels were first established at the end of World War II. British standards derived from standards for kerosene use for lamps—known as paraffin in the UK—whereas American standards derived from aviation gasoline practices. Over the subsequent years, details of specifications were adjusted, such as minimum freezing point, to balance performance requirements and availability of fuels. Very low temperature freezing points reduce the availability of fuel. Higher flash point products required for use on aircraft carriers are more expensive to produce.[3] In the United States, ASTM International produces standards for civilian fuel types, and the U.S. Department of Defense produces standards for military use. The British Ministry of Defence establishes standards for both civil and military jet fuels.[3] For reasons of inter-operational ability, British and United States military standards are harmonized to a degree. In Russia and the CIS members, grades of jet fuels are covered by the State Standard (GOST) number, or a Technical Condition number, with the principal grade available being TS-1. Shell Jet A-1 refueller truck on the ramp at Vancouver International Airport. Note the signs indicating UN1863 hazardous material and JET A-1. A US Airways Boeing 757 being fueled at Fort Lauderdale–Hollywood International Airport An Iberia Airbus A340 being fueled at La Aurora International Airport Jet A specification fuel has been used in the United States since the 1950s and is usually not available outside the United States[7] and a few Canadian airports such as Toronto, Montreal, and Vancouver,[8] whereas Jet A-1 is the standard specification fuel used in most of the rest of the world,[a] the main exceptions being Russia and the CIS members, where TS-1 fuel type is the most common standard. Both Jet A and Jet A-1 have a flash point higher than 38 °C (100 °F), with an autoignition temperature of 210 °C (410 °F).[11] The differences between Jet A and Jet A-1 are twofold. The primary difference is the lower freezing point of Jet A-1 fuel:[7] Jet A's is −40 °C (−40 °F) Jet A-1's is −47 °C (−53 °F) The other difference is the mandatory addition of an antistatic additive to Jet A-1 fuel. Jet A and Jet A-1 fuel trucks and storage tanks, as well as plumbing that carries them, are all marked "Jet A" or "Jet A-1" in white italicized text within a black rectangle background, Jet A-1 fuel must meet: DEF STAN 91-91 (Jet A-1), ASTM specification D1655 (Jet A-1), and IATA Guidance Material (Kerosene Type), NATO Code F-35. Jet A fuel must reach ASTM specification D1655 (Jet A).[12] Typical physical properties for Jet A / Jet A-1[13] Jet A-1 Jet A Flash point 38 °C (100 °F) Autoignition temperature 210 °C (410 °F)[11] Freezing point −47 °C (−53 °F) −40 °C (−40 °F) Max adiabatic burn temperature 2,230 °C (4,050 °F) open air burn temperature: 1,030 °C (1,890 °F)[14][15][16] Density at 15 °C (59 °F) 0.804 kg/L (6.71 lb/US gal) 0.820 kg/L (6.84 lb/US gal) Specific energy 43.15 MJ/kg (11.99 kWh/kg) 43.02 MJ/kg (11.95 kWh/kg) Energy density 34.7 MJ/L (9.6 kWh/L)[17] 35.3 MJ/L (9.8 kWh/L) Jet B is a naphtha-kerosene fuel that is used for its enhanced cold-weather performance. However, Jet B's lighter composition makes it more dangerous to handle.[12] For this reason, it is rarely used, except in very cold climates. A blend of approximately 30% kerosene and 70% gasoline, it is known as wide-cut fuel. It has a very low freezing point of −60 °C (−76 °F), and a low flash point as well. It is primarily used in northern Canada and Alaska, where the extreme cold makes its low freezing point necessary, and which helps mitigate the danger of its lower flash point. The GOST standard 10227 specifies civilian fuels, among which TS-1, T-1, T-1S, T2 and RT.[18] Military fuels such as T-1pp,[19] T-8V (aka T-8B) and T-6 are specified by GOST 12308.[18] Icing inhibitors are specified by GOST 8313.[18] Some researchers refer to T-6 as "ram rocket fuel";[20] others have patented a method used to produce T-1pp from a mixture of T-6 and RT,[19] the latter of which has been characterized as "unified Russian fuel for sub- and supersonic aircraft".[21] TS-1 is a jet fuel made to Russian standard GOST 10227 for enhanced cold-weather performance. It has somewhat higher volatility than Jet A-1 (flash point is 28 °C (82 °F) minimum). It has a very low freezing point, below −50 °C (−58 °F).[22] The DEF STAN 91-091 (UK) and ASTM D1655 (international) specifications allow for certain additives to be added to jet fuel, including:[23][24] Antioxidants to prevent gumming, usually based on alkylated phenols, e.g., AO-30, AO-31, or AO-37; Antistatic agents, to dissipate static electricity and prevent sparking; Stadis 450, with dinonylnaphthylsulfonic acid (DINNSA) as a component, is an example Corrosion inhibitors, e.g., DCI-4A used for civilian and military fuels, and DCI-6A used for military fuels; Fuel system icing inhibitor (FSII) agents, e.g., 2-(2-Methoxyethoxy)ethanol (Di-EGME); FSII is often mixed at the point-of-sale so that users with heated fuel lines do not have to pay the extra expense. Biocides are to remediate microbial (i.e., bacterial and fungal) growth present in aircraft fuel systems. Two biocides were previously approved for use by most aircraft and turbine engine original equipment manufacturers (OEMs); Kathon FP1.5 Microbiocide and Biobor JF.[25] Biobor JF is currently the only biocide available for aviation use. Kathon was discontinued by the manufacturer due to several airworthiness incidents. Kathon is now banned from use in aviation fuel.[26] Metal deactivator can be added to reduce the negative effects of trace metals on the thermal stability of the fuel. The one allowable additive is the chelating agent salpn (N,N′-bis(salicylidene)-1,2-propanediamine). As the aviation industry's jet kerosene demands have increased to more than 5% of all refined products derived from crude, it has been necessary for the refiner to optimize the yield of jet kerosene, a high-value product, by varying process techniques. New processes have allowed flexibility in the choice of crudes, the use of coal tar sands as a source of molecules and the manufacture of synthetic blend stocks. Due to the number and severity of the processes used, it is often necessary and sometimes mandatory to use additives. These additives may, for example, prevent the formation of harmful chemical species or improve a property of a fuel to prevent further engine wear. It is very important that jet fuel be free from water contamination. During flight, the temperature of the fuel in the tanks decreases, due to the low temperatures in the upper atmosphere. This causes precipitation of the dissolved water from the fuel. The separated water then drops to the bottom of the tank, because it is denser than the fuel. Since the water is no longer in solution, it can form droplets which can supercool to below 0 °C (32 °F). If these supercooled droplets collide with a surface they can freeze and may result in blocked fuel inlet pipes.[27] This was the cause of the British Airways Flight 38 accident. Removing all water from fuel is impractical; therefore, fuel heaters are usually used on commercial aircraft to prevent water in fuel from freezing. There are several methods for detecting water in jet fuel. A visual check may detect high concentrations of suspended water, as this will cause the fuel to become hazy in appearance. An industry standard chemical test for the detection of free water in jet fuel uses a water-sensitive filter pad that turns green if the fuel exceeds the specification limit of 30 ppm (parts per million) free water.[28] A critical test to rate the ability of jet fuel to release emulsified water when passed through coalescing filters is ASTM standard D3948 Standard Test Method for Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer. "JP-1", "JP-2", and "JP-3" redirect here. For other uses, see JP1 (disambiguation) and JP2 (disambiguation). For the movie, see Jurassic Park III. A sailor inspects a sample of JP-5 jet fuel aboard an amphibious transport dock ship Military organizations around the world use a different classification system of JP (for "Jet Propellant") numbers. Some are almost identical to their civilian counterparts and differ only by the amounts of a few additives; Jet A-1 is similar to JP-8, Jet B is similar to JP-4.[29] Other military fuels are highly specialized products and are developed for very specific applications. JP-1 was an early jet fuel[30] specified in 1944 by the United States government (AN-F-32). It was a pure kerosene fuel with high flash point (relative to aviation gasoline) and a freezing point of −60 °C (−76 °F). The low freezing point requirement limited availability of the fuel and it was soon superseded by other "wide cut" jet fuels which were kerosene-naphtha or kerosene-gasoline blends. It was also known as avtur. JP-2 an obsolete type developed during World War II. JP-2 was intended to be easier to produce than JP-1 since it had a higher freezing point, but was never widely used.[31] JP-3 was an attempt to improve availability of the fuel compared to JP-1 by widening the cut and loosening tolerances on impurities to ensure ready supply. In his book Ignition! An Informal History of Liquid Rocket Propellants, John D. Clark described the specification as, "remarkably liberal, with a wide cut (range of distillation temperatures) and with such permissive limits on olefins and aromatics that any refinery above the level of a Kentucky moonshiner's pot still could convert at least half of any crude to jet fuel".[32] It was even more volatile than JP-2 and had high evaporation loss in service.[31] JP-4 was a 50-50 kerosene-gasoline blend. It had lower flash point than JP-1, but was preferred because of its greater availability. It was the primary United States Air Force jet fuel between 1951 and 1995. Its NATO code is F-40. It is also known as avtag. JP-5 is a yellow kerosene-based jet fuel developed in 1952 for use in aircraft stationed aboard aircraft carriers, where the risk from fire is particularly great. JP-5 is a complex mixture of hydrocarbons, containing alkanes, naphthenes, and aromatic hydrocarbons that weighs 6.8 pounds per U.S. gallon (0.81 kg/L) and has a high flash point (min. 60 °C or 140 °F).[33] Because some US naval air stations, Marine Corps air stations and Coast Guard air stations host both sea and land based naval aircraft, these installations will also typically fuel their shore-based aircraft with JP-5, thus precluding the need to maintain separate fuel facilities for JP-5 and non-JP-5 fuel. Similarly, China named their navy fuel RP-5.[34] Its freezing point is −46 °C (−51 °F), and it does not contain antistatic agents. JP-5 is also known as NCI-C54784. JP-5's NATO code is F-44. It is also called AVCAT fuel for Aviation Carrier Turbine fuel.[35] The JP-4 and JP-5 fuels, covered by the MIL-DTL-5624 and meeting the British Specification DEF STAN 91-86 AVCAT/FSII (formerly DERD 2452),[36] are intended for use in aircraft turbine engines. These fuels require unique additives that are necessary for military aircraft and engine fuel systems. JP-6 was developed for the General Electric YJ93 afterburning turbojet engines used in the North American XB-70 Valkyrie for sustained flight at Mach 3. It was similar to JP-5 but with a lower freezing point and improved thermal oxidative stability. When the XB-70 program was cancelled, the JP-6 specification, MIL-J-25656, was also cancelled.[37] JP-7 was developed for the Pratt & Whitney J58 afterburning turbojet engines used in the Lockheed SR-71 Blackbird for sustained flight at Mach 3+. It had a high flash point required to prevent boiloff caused by aerodynamic heating. Its thermal stability was high enough to prevent coke and varnish deposits when used as a heat-sink for aircraft air conditioning and hydraulic systems and engine accessories.[38] JP-8 is a jet fuel, specified and used widely by the U.S. military. It is specified by MIL-DTL-83133 and British Defence Standard 91-87. JP-8 is a kerosene-based fuel, projected[as of?] to remain in use at least until 2025. The United States military uses JP-8 as a "universal fuel" in both turbine-powered aircraft and diesel-powered ground vehicles. It was first introduced at NATO bases in 1978. Its NATO code is F-34. JP-9 is a gas turbine fuel for missiles, specifically the Tomahawk cruise missile, containing the TH-dimer (tetrahydrodimethyldicyclopentadiene) produced by catalytic hydrogenation of methylpentadiene dimer. JP-10 is a gas turbine fuel for missiles, specifically the AGM-86 ALCM cruise missile.[39] It contains a mixture of (in decreasing order) endo-tetrahydrodicyclopentadiene, exo-tetrahydrodicyclopentadiene (a synthetic fuel), and adamantane. It is produced by catalytic hydrogenation of dicyclopentadiene. It superseded JP-9 fuel, achieving a lower low-temperature service limit of −65 °F (−54 °C).[39] It is also used by the Tomahawk jet-powered subsonic cruise missile.[40] JPTS was a combination of LF-1 charcoal lighter fluid and an additive to improve thermal oxidative stability officially known as "Thermally Stable Jet Fuel". It was developed in 1956 for the Pratt & Whitney J57 engine which powered the Lockheed U-2 spy plane.[41] Zip fuel designates a series of experimental boron-containing "high energy fuels" intended for

Seawater Into Jet Fuel". International Business Times. ^ Tozer, Jessica L. (April 11, 2014). "Energy Independence: Creating Fuel from Seawater". Armed with Science. U.S. Department of Defense. Archived from the original on November 4, 2019. Retrieved November 4, 2019. ^ Koren, Marina (December 13, 2013). "Guess What Could Fuel the Battleships of the Future?". National Journal. ^ Tucker, Patrick (April 10, 2014). "The Navy Just Turned Seawater Into Jet Fuel". Defense One. ^ Ernst, Douglas (April 10, 2014). "U.S. Navy to turn seawater into jet fuel". The Washington Times. ^ "World First – Synthetic Kerosene Takes to the Air". Retrieved 2022-03-31. ^ Sirak, Michael (2010-01-27). "B-2 Goes Synthetic". Air & Space Forces Magazine. Retrieved 2023-01-15. ^ Dowdell, Richelle (February 10, 2011). "Officials certify first aircraft for biofuel usage". The Official Website of the U.S. Air Force. Archived from the original on December 12, 2012. Retrieved March 7, 2012. ^ a b c d Morales, Alex; Louise Downing (October 18, 2011). "Fat Replaces Oil for F-16s as Biofuels Head to War: Commodities". BusinessWeek. Archived from the original on February 26, 2012. Retrieved March 7, 2012. ^ "UOP To Develop Technology to Produce Bio JP-8 for Military Jets". Green Car Congress. June 28, 2007. Retrieved March 7, 2012. ^ "Air Force jets perform first flyover using alternative fuel". Air Force. 31 March 2011. Retrieved 2022-03-27. ^ "Beginner's Guide to Aviation Biofuels" (PDF). Air Transport Action Group. May 2009. Retrieved 2009-09-20.[permanent dead link] ^ "A Promising Oil Alternative: Algae Energy". The Washington Post. 2008-01-06. Retrieved 2010-05-06. ^ "Gfi Home". Greenflightinternational.com. Archived from the original on 2011-01-25. Retrieved 2010-11-28. ^ "Tecbio". Tecbio. Archived from the original on 2011-01-23. Retrieved 2010-11-28. ^ "Crop this: Virgin takes off with nut-fuel - 26 Feb 2008 - NZ Herald: New Zealand Business, Markets, Currency and Personal Finance News". The New Zealand Herald. 2008-02-26. Retrieved 2010-11-28. ^ "2008 Environment Report". Boeing. Retrieved 2010-11-28. ^ "Velocys press release, "Partnership formed, aimed at waste-to-jet-fuel plants in UK". September 18, 2017. Archived from the original on January 5, 2018. Retrieved January 5, 2018. ^ Koch, Wendy (November 7, 2011). "United flies first US passengers using fuel from algae". USA Today. Retrieved December 16, 2011. ^ "United Airlines Flies First U.S. Commercial Advanced Biofuel Flight". United Continental Holdings, Inc. Archived from the original on April 12, 2013. Retrieved November 7, 2011. ^ Price, Toby (November 10, 2011). "Solazyme completes first commercial flight on biofuel". Renewable Energy Magazine. Retrieved 13 February 2013. ^ "More airlines fold as fuel prices soar: IATA". News.asiaone.com. Archived from the original on 2011-07-03. Retrieved 2010-11-28. ^ "Revised ASTM Standard Expands Limit on Biofuel Contamination in Jet Fuels | www.astm.org". www.astm.org. Archived from the original on 2020-03-08. Retrieved 2020-09-14. ^ "Jet fuel consumption on Index Mundi". Retrieved 19 November 2014. ^ a b c Jasper Faber and Aoife O'Leary (November 2018). "Taxing aviation fuels in the EU" (PDF). CE Delft. Transport and Environment. p. 16. Archived from the original (PDF) on 13 November 2020. Retrieved 20 June 2020. The Chicago Convention provides no obstacle to placing a tax on domestic or intra-EU aviation fuel. The Convention bans parties from imposing taxes on fuel already on board an aircraft when it lands in another country but it contains no prohibition on taxing the fuel sold to aircraft in a country. Further, the Chicago Convention is not applicable to domestic aviation. It is often suggested that the Chicago Convention exempts aviation fuel from taxation. However, the Chicago Convention only exempts fuels already on-board aircraft when landing, and retained on board when leaving, from taxation. Article 24 states: 'Fuel... on board an aircraft of a contracting State, on arrival in the territory of another contracting State and retained on board on leaving the territory of that State shall be exempt from customs duty, inspection fees or similar national or local duties and charges.' Therefore, Article 24 does not prohibit the taxing of fuel taken on board in a particular country but rather prohibits the taxation of fuel that was already on board the aircraft when it landed, i.e. Member States cannot tax aviation fuel purchased in another country that arrives on board the aircraft. The purpose of this Article is to prevent double taxation. ^ "Council Directive 2003/96/EC of 27 October 2003, restructuring the Community framework for the taxation of energy products and electricity". Official Journal of the European Union. Eur-Lex. 27 October 2002. Retrieved 20 June 2020. Member States shall exempt the following from taxation... energy products supplied for use as fuel for the purpose of air navigation other than in private pleasure-flying. ^ Mattie, David R.; Sterner, Teresa R. (2011-07-15). "Past, present and emerging toxicity issues for jet fuel". Toxicology and Applied Pharmacology. 254 (2): 127–132. Bibcode:2011ToxAP.254..127M. doi:10.1016/j.taap.2010.04.022. ISSN 1096-0333. PMID 21296101. ^ a b c Ritchie, Glenn; Still, Kenneth; Rossi III, John; Bekkedal, Marni; Bobb, Andrew; Arfsten, Darryl (2003-01-01). "Biological And Health Effects Of Exposure To Kerosene-Based Jet Fuels And Performance Additives". Journal of Toxicology and Environmental Health, Part B. 6 (4): 357–451. Bibcode:2003JTEHB...6..357R. doi:10.1080/10937400306473. ISSN 1093-7404. PMID 12775519. S2CID 30595016. ^ Robledo, R. F.; Barber, D. S.; Witten, M. L. (1999). "Modulation of bronchial epithelial cell barrier function by in vitro jet propulsion fuel 8 exposure". Toxicological Sciences. 51 (1): 119–125. doi:10.1093/toxsci/51.1.119. ISSN 1096-6080. PMID 10496683. ^ Harris, D. T.; Sakiestewa, D.; Titone, D.; Robledo, R. F.; Young, R. S.; Witten, M. (2000). "Jet fuel-induced immunotoxicity". Toxicology and Industrial Health. 16 (7–8): 261–265. Bibcode:2000ToxIH..16..261H. doi:10.1177/074823370001600702. ISSN 0748-2337. PMID 11693943. S2CID 42673565. ^ Knave, B.; Persson, H. E.; Goldberg, J. M.; Westerholm, P. (1976). "Long-term exposure to jet fuel: an investigation on occupationally exposed workers with special reference to the nervous system". Scandinavian Journal of Work, Environment & Health. 2 (3): 152–164. doi:10.5271/sjweh.2809. ISSN 0355-3140. PMID 973128. ^ Morata, Thais C.; Hungerford, Michelle; Konrad-Martin, Dawn (2021-08-18). "Potential Risks to Hearing Functions of Service Members From Exposure to Jet Fuels". American Journal of Audiology. 30 (3S): 922–927. doi:10.1044/2021_AJA-20-00226. ISSN 1059-0889. PMC 11934069. PMID 34407375. ^ Kaufman, Laura R.; LeMasters, Grace K.; Olsen, Donna M.; Succop, Paul (2005). "Effects of concurrent noise and jet fuel exposure on hearing loss". Journal of Occupational and Environmental Medicine. 47 (3): 212–218. doi:10.1097/01.jom.0000155710.28289.0e. ISSN 1076-2752. PMID 15761316. S2CID 1195860. ^ Bendtsen, Katja M.; Bengtsen, Elizabeth; Saber, Anne T.; Vogel, Ulla (2021-02-06). "A review of health effects associated with exposure to jet engine emissions in and around airports". Environmental Health: A Global Access Science Source. 20 (1): 10. Bibcode:2021EnvHe..20...10B. doi:10.1186/s12940-020-00690-y. ISSN 1476-069X. PMC 7866671. PMID 33549096. Schmidt, Eckart W. (2022). "Jet Fuels". Encyclopedia of Liquid Fuels. De Gruyter. pp. 3497–3592. doi:10.1515/9783110750287-030. ISBN 978-3-11-075028-7. History of Jet Fuel MIL-DTL-5624U MIL-DTL-83133H Aviation Fuel Properties 1983 Archived 2012-07-22 at the Wayback Machine Retrieved from "