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Vigilance in Aircraft Galley and Service Procedures Preserves Margin of Safety

Incidents reported by pilots and flight attendants show the need for caution in galley-related duties — particularly when stowing or operating food-and-beverage-service carts, and when smoke or unusual odors are emitted by warmers, ovens and coffee makers.

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FSF Editorial Staff

Time limitations, variation in levels of service purchased by passengers and disruptions can cause inconsistent adherence to safe aircraft-galley procedures. Galley-related practices that seem efficient, but may compromise safety, also may evolve over time.

Airlines provide food and beverage services ranging from snack packets, box lunches and soft drinks to freshly prepared entrees and wines. Beyond providing routine service, cabin crewmembers also must accommodate passengers who have special requests. Moreover, an increasing number of travelers carry their own prepared foods and beverages to consume aboard the flight.¹

Reports to the Aviation Safety Reporting System (ASRS) of the U.S. National Aeronautics and Space Administration (NASA) during a 10-year period² show a few recurring types of galley-related incidents, such as:

- Aircraft damage and/or injuries to crewmembers and passengers caused by unsecured carts or malfunctioning carts used for food and beverage service;
- Unusual odors, fire or smoke from ovens, coffee makers and other galley equipment; and,



- Turbulence-related injuries to crewmembers in the galley-service environment and injuries involving specific items of galley equipment.

A summary of Flight Safety Foundation safety audits, first published in 1990, said, "We continue to find a high number of hazardous situations within the cabin involving equipment, such as galley appliances ..."³ Several papers presented at the International Aircraft Cabin Safety Symposium in recent years also contain galley-safety recommendations.⁴

Overall, the ASRS reports, FSF safety audits summary and cabin-safety symposium proceedings suggest that preventing and coping with galley incidents require vigilance, properly maintained equipment and effective communication. Especially important is a consistent, attentive approach to safety equipment, cabin security and galley checks/cross-checks. This includes tasks such as double-checking that doors on galley equipment have been closed and locked, for example. Flight crewmembers and cabin crewmembers recalled accomplishing tasks to secure galleys but the tasks later were found to have been overlooked.

Galley incidents can cause personal injury or property damage during any phase of flight, but in-flight galley incidents have

the greatest potential to trigger a chain of events leading to unexpected consequences. For example, in one galley incident reported to ASRS, a piece of burning paper was found in an oven. The paper produced cockpit smoke that prompted the flight crew to declare an emergency and divert to an alternate airport. In another galley fire, the flight crew dumped 11,000 pounds (5,000 kilograms) of fuel in preparation for landing at the departure airport.

In other reports, seemingly minor galley incidents caused electrical problems affecting flight instruments and emergency interphone communications. The problems distracted flight crews during high-work-load periods and led to missed checklist items and altitude deviations.

The reports suggested that standard operating procedures must consider nonroutine situations, such as preparing an aircraft for positioning, ferry or maintenance flights when the aircraft has been returned too late to be decatered and the galley is not staffed. Without such procedures, galley-equipment tasks may not be accomplished and could result in safety problems.

Galley-equipment Regulations Focus on Safety Basics

Regulations governing transport-aircraft galley installations, equipment and operation focus primarily on two issues: certification of equipment to function safely in normal operations and to protect occupants to the extent possible during an accident; and adequate seats, seat belts, latches, locks, brakes and other equipment to enable cabin crewmembers to secure themselves and galley equipment to prevent injury during taxi, takeoff and landing, and in-flight turbulence.⁵

The U.S. National Transportation Safety Board (NTSB), in a 1981 report on cabin safety in accidents, said, "Flight attendants, whose main duty is to provide direction and assistance to passengers in emergencies, were seated in their designated positions at the exits where the galleys were located. In several instances, hot liquids from containers splashed onto the flight attendants. Although these injuries were minor, the potential for serious injury was present. The potential is also great for injury to flight attendants when galley drawers come open and the flight attendants, whether restrained or not, come into contact with the sharp edges of these opened drawers or with objects released from them. Although these injuries may be minor, they can seriously compromise the flight attendants' ability to assist passengers during emergencies." The report also indicated that securing food, eating utensils and waste material in galley storage areas is important because these materials have blocked aircraft exits in accidents.⁶

Basic cabin safety requirements — such as checking that all fire extinguishers, personal breathing equipment and oxygen supplies are on board, correctly located and serviceable — are important to crewmembers assigned to galley positions.

Such equipment must be immediately accessible in the galley area in case of fire.

The regulatory requirements for passengers and cabin crewmembers to be seated and to fasten seat belts during takeoff and landing must be enforced and reinforced by airline procedures and training. Flight attendants who have galley-related duties near the beginning or end of a flight otherwise might continue performing galley duties and delay taking a seat and fastening their seat belts. Cabin crew injuries have resulted from failure to remain seated with seat belts fastened during taxi (before and after a flight), said some reports.

Reports said that disregard by flight attendants for seat belt signs and a tendency to place passenger service above personal safety have led to some galley injuries. In some instances, flight attendants have unfastened their seat belts and vacated their seats to secure dislodged carts and loose galley items during braking, turbulence and similar occurrences.

Preflight Briefings Offer Opportunity To Anticipate Galley Problems

Galley safety combines situational awareness and mental preparation for nonroutine occurrences. Several reports said that cabin crewmembers should have advance notice of the need to interrupt food-and-beverage service because of weather or air traffic delays, and when to resume service.

Ideally, preflight planning and briefing before takeoff enable cabin crewmembers to adjust service times if necessary based on forecast weather en route. Several crewmembers have reported that good cabin-cockpit rapport established during preflight briefings was a positive factor in successfully handling service rescheduling and emergencies.

Preflight briefings provide an opportunity for anticipating potential problems and resolving apparent conflicts in duties that might arise from differences in the flight crew's priorities and the cabin crew's priorities on a given flight. Common understanding of galley safety helps to promote a working environment less conducive to human errors or less prone to disregard for standard operating procedures. Procedures reinforced by preflight briefings also enable correct cabin crewmember action if inadvertently unsecured galley items open or shift position.

A common occurrence in several galley-related events reported to ASRS was rushing to finish food-and-beverage service. Several reports, for example, said that cabin crewmembers prematurely reported the cabin and galley secure and ready for takeoff — compromising safety. Reports indicated that timing of service has safety implications. The following galley topics warrant preflight discussion:

- Acceptance of catering and in-flight stores;

- Alternative plans when catering arrives late at the departure gate;
- Use of ovens or warmers prior to takeoff; and,
- Any effect on galley procedures of a hot aircraft or a cold aircraft.

Food, Beverage Service Carts Require Constant Attention

In 1990, an aerospace committee of the Society of Automotive Engineers in the United States updated the recommended industry standards for aircraft food-and-beverage-service carts.⁷ Various safety features and procedures — such as cart restraint by a double-latch system and the galley structure — are used, but ASRS reports and FSF safety audits show that carts must be used with caution. The following observations have been made:

- Crewmembers should be aware of safety issues whenever carts — some weighing 300 pounds (136 kilograms) — are not in stowed positions;
- Carts believed to have been stowed securely in aft areas of aircraft were dislodged from stowed positions, rolled down an aisle and broke through the cockpit door during landing. Crewmembers said that keeping the cockpit door closed at all times may prevent damage or possible loss of aircraft control that could be caused by a dislodged cart striking the flight deck. Minor scrapes to back injuries have occurred when cabin crewmembers were pinned against a door, seat or floor by an unrestrained cart;
- Forces induced by turbulence have prevented cabin crewmembers from changing their body positions to reposition, restrain or secure a cart, or to perform other galley safety duties. Stopping and restraining a cart in motion may not be possible under some flight conditions, some reports said;
- Reports also have said that having more carts or fewer carts than accommodated by the load manifest affects weight and balance. One report said that reconfiguration of the cart stowage location was believed to have led to an uncommanded aircraft rotation and a tail strike;
- Improperly loaded carts have overturned in flight and have been lifted several feet off the floor in severe turbulence;
- Carts have not been secured for landing because of time pressure. Crewmembers said that a cross-check of cart security — using primary and secondary latches, locks and brakes — should be required before every

takeoff and landing, and in preparation for turbulence encounters. Vigilance is necessary for possible unlocking or dislodging of carts early in each flight (such as during taxi turns); and appropriate training must be provided for securing and operating the specific models of carts in service (not just a single model);

- Overloading of carts and unintended uses of carts — such as for stacking items of duty-free merchandise — present an occupational safety risk, and could lead to excessive maintenance of aircraft floor panels and carts;
- If a cart causes damage, affected equipment may require repair or modification to reduce hazard to passengers during the remainder of the flight, and a placard may be required;
- Routine cart maintenance reduces the need to apply extreme force to overcome worn wheel bearings, latches, brake mechanisms and other components; and,
- Injuries also may result when a crewmember or passenger strikes a stationary cart during turbulence or a loss of balance.

Galley Fires Require Quick, Effective Response

ASRS reports about galley fires included the following safety observations:

- Most of the reported oven fires would have been prevented by carefully inspecting the oven interior and food items placed in ovens *every time* before turning on the oven;
- Oven fires can be prevented by carefully handling, storing and tracking items such as paper napkins, stirrers, wrappers, aluminum foil, adhesive labels, matches, purses, cleaning products, documents and similar items near meal-storage areas and around ovens. One report, for example, said that a package of beverage napkins — believed to have become stuck to a meal rack — burned;
- Some incidents occurred after crewmembers used equipment placarded out of service, misinterpreted which equipment was out of service, or believed that although they could not cook meals in a malfunctioning oven, they could safely heat water in that same oven;
- Alertness to galley status, which can be more difficult during meal service, is important for the early detection of fires. Cabin crewmembers also should be aware of whether galley smoke detectors are present and functioning. Symptoms such as sudden headache or sore throat among crewmembers or passengers sometimes preceded any visible smoke or detectable odor;

- Identifying overheated equipment or structures (such as bulkheads) by touch — or by noticing a malfunction — sometimes was necessary because smoke, flame, odors and other expected indications of fire were not present. Training helped cabin crewmembers detect combustion in equipment such as ovens, coffee makers, catering equipment and trash bins;
- Electrical anomalies such as flickering lights and open circuit breakers provided the first cues to galley problems in some events; switches and circuit breakers in the galley and flight deck typically were used to isolate and eliminate sources of heat;
- Unauthorized procedures — such as attempts to speed cooking or warming by using higher-than-normal oven settings — were believed to be responsible for some galley fires;
- Some items — such as plastic soup bowls — are safe for oven use when used properly but can melt when used improperly, contacting heating elements and igniting;
- Careful monitoring for reignition after extinguishing the initial galley smoke/fire source is important. In one report, for example, a flight attendant extinguished four or five reignitions of fire in galley equipment;
- In addition to using personal breathing equipment and fire extinguishers, cabin crewmembers employed all firefighting equipment and techniques at their disposal;
- Cabin crewmembers and flight crewmembers coordinated the rapid evacuation of smoke, residual fire extinguisher gases and odors from the cabin air;
- Many aircraft crews had difficulty identifying and localizing the source of unusual odors ranging from burning coffee sludge to acrid burning insulation, chlorine-like odors, burned food, jet fuel, hydraulic fluid, windshield rain repellent and overheated air conditioning packs;
- Many investigations of odors that began in the galley determined that the odor's source was located elsewhere. In other reports, odors from multiple sources added complexity. In one report, for example, the flight crew smelled an odor of overcooked sweet rolls from the galley but did not realize at first that this odor masked a smoldering fire in a fluorescent light fixture. Another report said that an unusual galley-type odor could not be isolated in flight, but maintenance personnel later found roasted bird parts in the aircraft's pneumatic system; and,
- Flight crews said that intermittent electrical fumes/odors recurred during flight even though circuit breakers had deactivated power to the affected galley.

Recurrent Training Updates Crew Knowledge of Galley Systems

Some cabin crewmembers and flight crewmembers said that they had difficulty maintaining current knowledge of galley systems for two basic reasons: variation in galley installations among different aircraft and within the same type of aircraft, and crewmember qualification on multiple types of aircraft. ASRS reports and FSF safety audits suggest that airlines consider the following:

- There may be a need to reinforce knowledge of galley-safety issues among flight crewmembers who customarily do not operate galley equipment. Some flight crewmembers said that they had no training or inadequate training in galley operations, particularly details of securing food-and-beverage-service carts. Some flight crewmembers said that their aircraft flight manuals did not provide details or enough details for safe operation of carts;
- Flight crewmembers especially need checklists, hands-on training and awareness to secure galleys prior to positioning, maintenance and ferry flights, which may operate with no cabin crew or minimal cabin crew;
- Flight crewmembers suggested improved galley checklists for flight attendants, or the introduction of such checklists if they have not been previously available;
- Recurrent training should include switch positions, markings and diagnosis of galley-equipment failures; aircraft utility buses; alternating current (AC) and direct current (DC) circuit breakers located in galleys and on the flight deck; galley master power switches on the flight deck; and warning systems in the galleys and the flight deck under normal and unusual conditions. One report said that a circuit breaker that normally could be used to remove electrical power from galley equipment was defective, requiring alternate means of removing electrical power;
- Flight-attendant training should emphasize keeping equipment clean and removing food spills and residues before charring and burning odors occur (including spills in areas not readily visible); awareness of liquids around electrical devices; identification of failures of heating elements, thermostats and other galley items that can cause overheating; recognition of short circuits in equipment; recognition of refrigeration-system anomalies; and procedures for galley ventilation-fan operation;
- Cabin crewmembers must use extra caution near unserviceable equipment, heeding inoperative or out-of-service placards (with clarification from maintenance personnel and maintenance logbooks if

there is any doubt about the meaning), disconnected wiring and missing overheat protective devices. One report said that a cabin crewmember did not recognize that a heat shield was missing from a forward-galley oven; this led to an in-flight fire when the oven was used normally. Further investigation found an aft-galley oven missing a heat shield; other cabin crewmembers on the flight said that they believed that ovens missing heat shields were usable because they had observed colleagues using such ovens, said the report;

- Training should include familiarization with the location of exhaust ducting from the galley and access to ducts as an aid in locating an unknown source of smoke or odors. One report said that smoldering melted plastic and burned foil were found in a ventilation duct;
- Training should include diagnosing suspicious malfunctions. A defective switch in the OFF position, for example, may continue to provide electrical power to a heating element. One report said that a coffee pot remained hot after being switched off, and smoldering coffee sludge generated fumes that reached the flight deck, prompting declaration of an emergency and evacuation of the aircraft after landing;
- A basic understanding of the aircraft water-supply system, possible safety risks from major leaks and wastewater disposal should include knowledge of access points, shutoff valves and basic tools that may be necessary to stop a leak even before maintenance personnel have access to the aircraft. One report said that the aircraft crew lacked appropriate tools and procedures, and had difficulty reaching the water-shutoff valve to a leaking coffee maker;
- Correct procedures for disposal of items such as food waste, paper and plastic products and utensils must be followed;
- Flight attendants working galley positions should not make assumptions about preparation of new food items instead of checking procedures. One report said cookies that only should have been *warmed* before serving were placed in ovens at baking temperatures, leading to ignition of the cookies;
- Typically, passengers' requests for special foods or beverages will be accommodated by advance arrangements with the airline; nevertheless, any last minute changes in catering may require attention to accompanying packaging, labeling or preparation; and,
- Handling alcoholic beverages in bottles, cups and glasses requires attention; some of these liquids could be ignited by high-temperature galley equipment.

Communicating In-flight Galley Problems Requires Clear, Complete Messages

Accurately describing the status of an aircraft galley to flight crewmembers is important during all normal flight operations. Effective communication is especially important when an unusual situation occurs.

In a few reports, pilots said that careful questioning of cabin crewmembers was necessary to assess a galley problem, which sometimes involved risks more serious or less serious than a cabin crewmember's assessment. For example, one pilot understood that a flight attendant had reported "we've burned the cookies," but further investigation found a galley oven fire. In another report, steam from two overheated coffee-makers was reported to the flight deck as "white smoke and some heat coming from the aft-galley trash-bin area."

When there is any doubt about the serviceability of galley equipment, questions should be answered by maintenance personnel or the flight crew before using the equipment. Dealing with unknown elements added complexity to galley-related communication. Some reports said that the cause of galley problems could not be diagnosed until the maintenance evaluation after landing. Based on such reports, the following communication practices by cabin crewmembers may help prevent serious galley incidents:

- Immediately report time-critical facts about galley-related anomalies to the flight deck. (Flight crews and cabin crews said that joint recurrent training on observation of problems, interpretation of evidence and decision making had been helpful.);
- Keep the flight deck apprised of any circuit breakers that have been tripped, pulled and/or reset in the galley (as well as lavatories and other cabin areas);
- Continue observation of galley equipment that has overheated or emitted smoke or unusual odors, even though power has been turned off (by a switch or circuit breaker) or a fire extinguisher has been used;
- Recognize that in some phases of flight, the flight crew may need to give full attention to overall safety of the flight, and may not be able to participate immediately in the investigation of a galley problem;
- When using a predetermined series of chimes or other nonverbal signal to alert flight crewmembers to an urgent galley problem, recognize that the message may not have been received or understood unless explicitly acknowledged. Such delays in communication could result in a worsening problem;

- Maintain communication between the flight deck and the cabin after a galley anomaly has been reported. Reports said that in several galley incidents that were handled successfully, interphone communication until resolution of the problem was helpful. Nevertheless, some pilots said that because the interphone sometimes was a weak link in emergency communication, they favored discussion in the cockpit;
- Consider possible limitations of public-address-system announcements by flight crewmembers to cabin crewmembers. One report said that flight attendants did not hear important information because they were providing food-and-beverage service in sections of the cabin other than those where speakers had been selected by the captain;
- Provide recurrent training on deciding when to break the FAA's "sterile cockpit rule"⁸ to report galley anomalies. In some reports, galley-related communication later was considered essential; in others, the communication later was considered nonessential (such as requests for noncritical information from the flight crew while operating below 10,000 feet). One lead flight attendant advised the flight crew that "the smoke was under control and we did not need to land" while the aircraft was at 800 feet above ground level approaching the runway for a precautionary landing, but smoke reappeared in the cabin during the landing rollout and the aircraft was evacuated;
- Use ground resources to resolve galley anomalies. During cruise flight above 10,000 feet, flight crews may have adequate time to help diagnose galley problems and use voice radio or datalink to communicate with airline maintenance engineers who can help resolve galley problems (for example, a jammed oven door in one report);
- Review emergency and urgency communication during galley-related events in flight-crew training. There was variation among flight crews who filed ASRS galley-related reports in their decisions to declare or not to declare an emergency or urgency condition, to request priority from air traffic controllers and to divert flights;
- Consider passenger apprehension about galley anomalies. Although some galley anomalies were resolved without passenger awareness, most flight crews explained the anomalies to passengers. In some events, flight crewmembers advised passengers that "all is OK," but did not explain the precautionary reasons why aircraft rescue and firefighting personnel, nevertheless, would be waiting by the runway for the aircraft; and,
- Provide accurate, understandable details of galley anomalies in aircraft logs to help technicians resolve the anomalies, and to prevent repetition of a problem.

Falls, Protruding Objects Lead to Galley Injuries

Training generally prepares cabin crewmembers to perform their duties safely and efficiently in the relatively confined work environment of aircraft galleys. Nevertheless, the following safety observations have been made:

- Assist handles should be installed and used to help maintain balance while working in galleys;
- Falls in and near galleys can be caused by floor surfaces contaminated by spilled liquids and because of the need to use excessive bodily force to release cart brakes; and,
- Hot utensils, beverage containers and galley equipment should be handled carefully at all times to avoid risk of burns. For example, one crewmember flying as a passenger aboard an aircraft operated by another airline made the following observation: "After takeoff, the breakfast service was followed by the serving of tea and coffee. . . . The five cabin attendants appeared by the cabin each with a full tea or coffee pot in each hand. Service was effected by resting the nonrequired pot on the headrest of either the seat in front of or behind the seat of the passenger being served. Passengers in window seats were directed to hold their cups over the laps of the passenger of the center seat of each row in order to be served. . . . Furthermore, when support from the galley was required, the tea or coffee pot was used on two witnessed occasions to press the call button. The practice described above was carried out in light turbulence and was, in my opinion, highly dangerous."⁹

Inappropriate Storage Decisions Create Galley Problems

Some reports cited the following safety problems involving inappropriate storage of galley items:

- Mistiming of food-and-beverage service on a short flight made it necessary to instruct passengers to place meal trays under their seats in preparation for landing;
- Rapid cabin cleanup was necessary for safety after turbulence caused unsecured meal trays, cups, bottles and other items to fall to the floor;
- Catering and cabin-service items not stored in approved locations blocked exits. Crewmembers also reported that storage of inappropriate items in galleys (such as duty-free merchandise offered for sale to passengers) has interfered with safe galley procedures; and,
- Unsecured doors of bins caused breakage of glass bottles that shifted or fell during turbulence, braking and flight maneuvers.

Crew Ideas Contribute To Safer Galleys

A number of reports indicated that potential safety problems had been noted by cabin crewmembers long *before* an event occurred. The reports included the following observations:

- Periodic review of galley design, condition of equipment and procedures helps prevent galley injuries. For example, fire extinguishers protruding at eye level and inadvertent release of galley fire extinguishers from their supporting clamps have been observed;
- Airlines should solicit, collect, consider and implement appropriate suggestions from flight crewmembers and cabin crewmembers for improving galley safety. Exchange of information among crewmembers can help identify safety issues; and,
- Flight attendants have been encouraged by their professional associations and NASA to report galley-related safety events to ASRS as well as to the affected airline to increase industry awareness.

After Some Galley Incidents, Medical Care May Be Needed

Galley-related incidents may require first aid and emergency or follow-up medical attention. Reports noted that oxygen sometimes was administered in flight to crewmembers who inhaled smoke or vapors, with medical follow-up after landing for abnormal blood-gas levels, documentation of exposure and other care. In some reports, critical-incident stress counseling also was recommended for personnel involved in galley incidents.

As in other aspects of transport-category flight operations, human factors play a significant role when damage and injuries occur in food-and-beverage service, indicating a need for continuing research into galley-safety issues. ♦

Notes and References

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7. Society of Automotive Engineers. *Safety Considerations of Food and Beverage Service Carts*. Aerospace Recommended Practice no. ARP4171, Sept. 20, 1990.
8. U.S. Federal Aviation Regulations 121.542(b) and 135.100(b) state that no flight crewmember shall perform "any duties during a critical phase of flight except those duties required for the safe operation of the aircraft." Critical phases of flight include "all ground operations including taxi, takeoff and landing, and all other flight operations conducted below 10,000 feet, except cruise flight." "Nonessential communications" between cabin crews and flight crews are prohibited during a critical phase of flight.
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