U.S. Department
of Transportation

Federal Railroad
Administration

Federal Railroad Administration Action Plan for Addressing Critical Railroad Safety Issues

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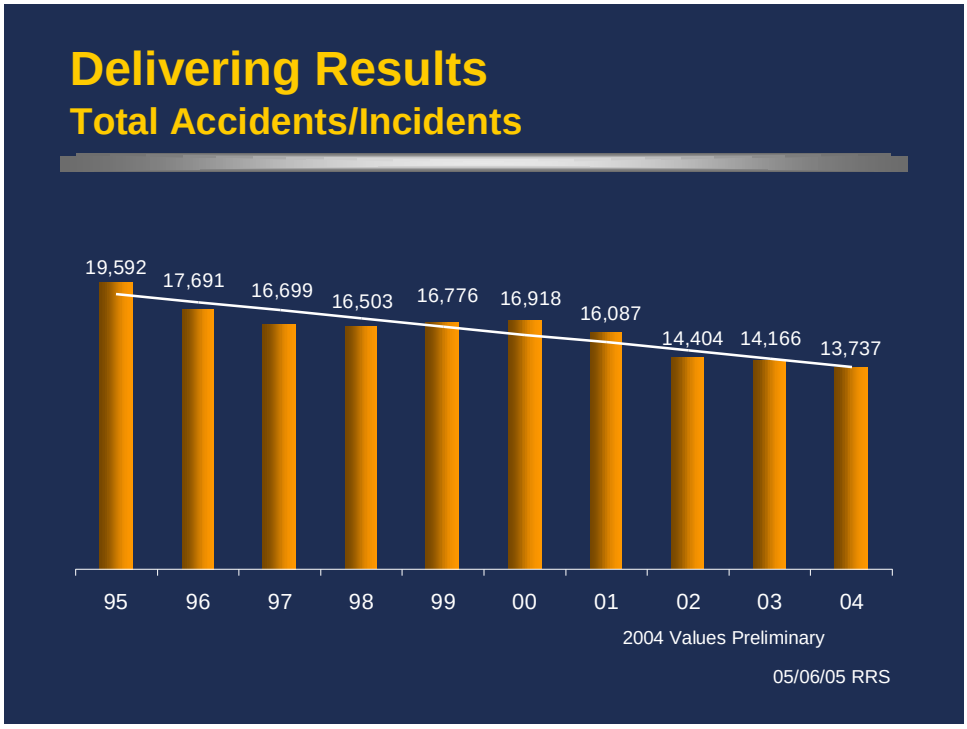
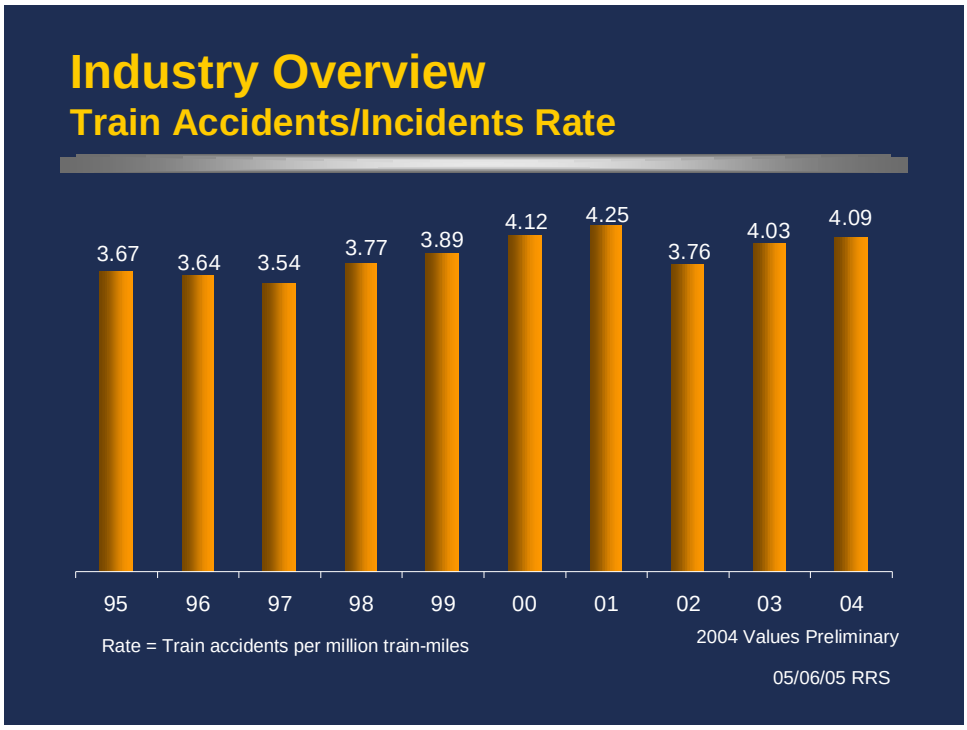
Introduction

The railroad industry's overall safety record has improved over the last decade and most safety trends are moving in the right direction. However, significant train accidents continue to occur, and the train accident rate has not shown substantive improvement in recent years. Moreover, recent train accidents have highlighted specific issues that need prompt government and industry attention, and the strong growth of rail and highway traffic continue to drive up exposure at highway-rail grade crossings. The Federal Railroad Administration (FRA) is aggressively addressing these critical issues and implementing the plan outlined below to improve railroad safety.





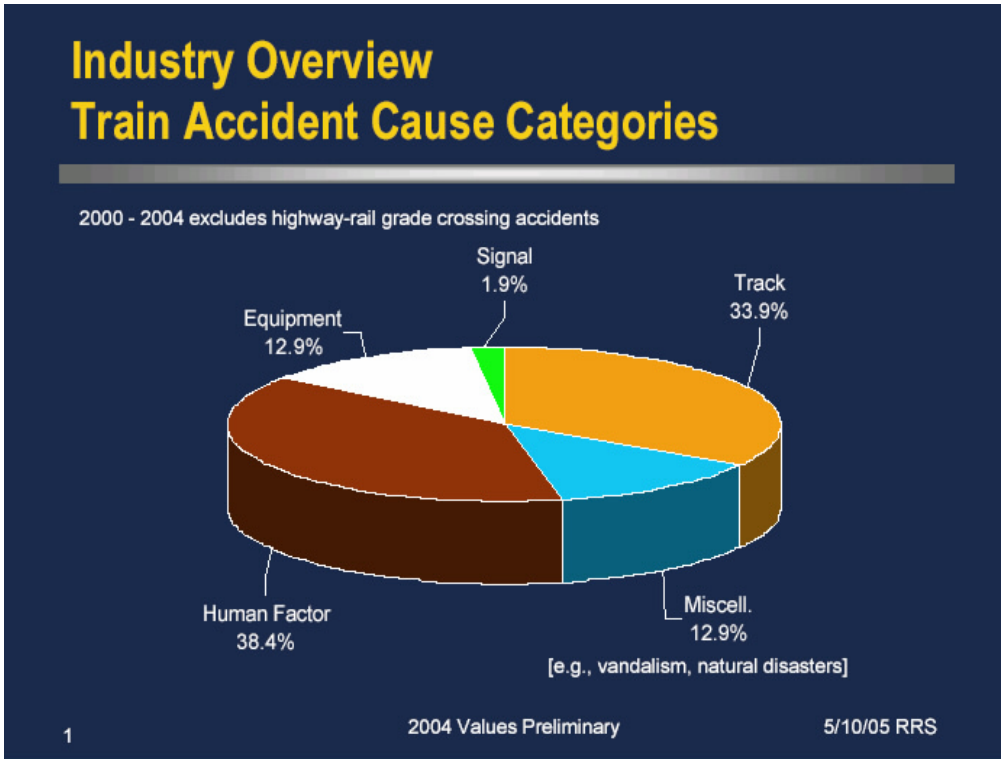
The FRA's safety program is increasingly guided by careful analysis of accident, inspection, and other safety data. FRA attempts to direct both its regulatory and compliance efforts toward those areas involving the highest safety risks. This proactive approach to managing risks is constantly being honed and improved. This action plan embodies that approach and will:

- Target the most frequent, highest risk causes of accidents;
- Focus FRA's oversight and inspection resources; and
- Accelerate research efforts that have the potential to mitigate the largest risks.

The FRA's plan includes initiatives in several areas: reducing human factor-caused train accidents; acting to address the serious problem of fatigue among railroad operating employees; improving track safety; enhancing hazardous materials safety and emergency preparedness; better focusing FRA's resources (inspections and enforcement) on areas of greatest safety concern; and improving highway-rail grade crossing safety

As illustrated by the following graphic, the great majority of train accidents are caused by track and human factors, and human factor accidents are growing in number. The causes of train accidents are generally grouped into five categories: human factors, track and structures, equipment, signal and train control, and miscellaneous. Two categories of accidents–those caused by defective track and those caused by human factors–comprise more than 70 percent of all train accidents and a very high percentage of serious train accidents are, accordingly, the major target areas for improving the accident rate. In recent years, most of the serious events

involving train collisions or derailments resulting in release of hazardous materials, or harm to rail passengers, have been caused by human factor or track causes.



Reducing Human Factor Accidents

Human factors constitute the largest category of train accidents, accounting for 38 percent of all train accidents over the last five years. Based on preliminary findings, and subject to revision when the investigation is complete, the tragic accident in Graniteville, South Carolina on January 6, 2005, stemmed from a human factor: the failure of a train crew to properly line a switch for mainline movement when the crew was going off duty. The next train to traverse that main track hours later was directed onto the wrong track, where it collided with a standing train. As a result, chlorine was released from a tank car in the moving train; nine people died from inhaling the chlorine vapor, and 529 people sought medical care. FRA acted immediately by issuing a Safety Advisory on January 10, 2005, strongly urging all railroads to adopt revised procedures to guard against such a human mistake. Railroads responded swiftly and favorably by adopting those recommendations.

Address leading human factor causes. The FRA's analysis of train accident data has revealed that a small number of particular kinds of human errors are accounting for an inordinate number of human factor accidents. For example, the top ten human factor causes accounted for 58 percent of all human factor accidents in 2004. The leading cause was improperly lined switches, which alone accounted for more than 16 percent of human factor accidents in the last four years. Other leading causes include shoving cars without a person on the front of the move to monitor

conditions ahead, leaving cars in a position that obstructs (fouls) a track, and failure to secure a sufficient number of handbrakes.

Top Human Factor Causes (Train Accidents)[1]

Four-Year Totals (2001 – 2004)

Cause code	Number	Percent of human factor train accidents
H702 Switch improperly lined	751	16.4
H306 Shoving movement, absence of person on point	510	11.2
H307 Shoving movement, failure to control	193	4.2
H302 Cars left out to foul	190	4.2
H704 Switch previously run through	181	4.0
H018 Failure to secure hand brake	163	3.6
H020 Failure to apply sufficient hand brakes	163	3.6
H312 Passed couplers	137	3.0
Total		50.2

At present, few of these kinds of mistakes are prohibited by FRA regulations. (In the examples given above, only the failure to secure a sufficient number of handbrakes is covered by a regulation.) Instead, they are addressed by each railroad's operating rules, which subject employees who violate them to discipline, including dismissal. FRA's regulations require railroads to train their employees on these rules and to test them periodically on their compliance with those rules.

The frequency with which these sorts of operating rule violations result in accidents requires a concentrated effort to reduce such violations. FRA believes a federal regulation prohibiting such actions will provide heightened visibility and operational focus leading to a reduction in their frequency. Even though the vast majority of these accidents occur on low speed tracks and do not often involve loss of life, they always create the potential for serious injury and death and, as the Graniteville accident illustrates, can sometimes occur on higher speed track with tragic consequences. Accordingly, FRA will ask its chartered advisory committee, the Railroad Safety Advisory Committee (RSAC), to develop recommendations for a rule that would address these sorts of human errors. FRA will set a tight but reasonable timetable for receiving those recommendations. Should RSAC not accept the task or produce timely recommendations, FRA will act without RSAC's advice. The result should be regulations (or, perhaps, a non-regulatory

[1]Omits certain causes for which determining compliance objectively would be difficult (e.g., buff/slack action excessive).

alternative) that go to the heart of the leading causes of human factor accidents. FRA conducted a Human Factors Workshop on April 14 with principal railroad and labor organizations to set the stage for presentation of this task to the RSAC on May 18. **Target for proposed rule:** September 2006.

Develop close call data to reveal reasons for human failures. In other industries such as aviation, implementation of "close call" reporting systems that shield the reporting employee from discipline (and the employer from punitive sanctions levied by the regulator) have contributed to major reductions in accidents. In March of 2005, FRA completed an overarching memorandum of understanding with railroad labor organizations and management to develop pilot programs to document close calls, i.e., unsafe events that do not result in a reportable accident but very well could have. Participating railroads will be expected to develop corrective actions to address the problems that may be revealed. The aggregate data may prove useful in FRA's decision-making concerning regulatory and other options to address human factor-caused accidents. Experiences on the Norwegian railway (Sernbaneverket), showed a 40 percent reduction in accidents after three years of implementation of a similar program. In a manufacturing environment, Syncrude, a mining company, experienced a 33 percent reduction in lost time frequency after one year of implementing a close call system. **Target to commence pilot project on one or more railroads:** February 2006.

Addressing Fatigue

Fatigue has long been a fact of life for many railroad operating employees, given their long and often unpredictable work hours and fluctuating schedules. The hours of service law sets certain maximum on-duty periods (generally 12 hours for operating employees) and off-duty periods (generally 8 hours, or if the employee has worked 12 consecutive hours, a 10-hour off-duty period is required).

FRA's knowledge of the industry's work patterns and the developing science of fatigue mitigation, combined with certain National Transportation Safety Board investigations showing employee fatigue as a major factor, have persuaded FRA that fatigue is very likely at least a contributing factor in a significant number of human factor accidents. To try to obtain better information on the subject, FRA revised its own accident investigation procedures in 2004 to ensure that FRA investigators collect information on employees' sleep/rest cycles and evaluate fatigue as a factor.

Accelerate research. FRA is accelerating its ongoing research aimed at validating and calibrating a fatigue model (which has already been proven in the laboratory by the Department of Defense) that can be used to (I) more precisely determine the role of fatigue in human factors accidents and (ii) improve crew scheduling by evaluating the potential for fatigue given actual crew management practices. When the model is properly validated, it will be made available to railroads and their employees as foundation for developing crew scheduling practices based on the best current science. The work plan for model validation will also provide a much more

precise accounting of the role of fatigue (including acute fatigue, cumulative fatigue, and "circadian" or time-of-day effects) in train accidents. **Target for final report**: December 2005.

Improving Track Safety

Track-caused accidents comprised 34 percent of all train accidents over the last five years. However, the trend is positive. The absolute number of such accidents was down considerably in 2004, as was the rate of track-caused accidents. FRA believes that one important factor in reducing this rate was the agency's conscious attempt, starting in 2003, to focus its track inspectors on the areas of highest risk, and to encourage them to take enforcement action on the kinds of regulatory violations that are the leading causes of track-caused accidents. This data-based approach has shown great benefits and will continue.

Deploy technology for track safety. However, some of the leading causes of accidents in this area are very difficult to detect in normal railroad inspections. Broken joint bars, for example, are a leading cause, but the kinds of cracks in those bars that foreshadow a derailment-causing break are very hard to spot with the naked eye in normal inspections. Similarly, broken rails account for some of the most serious accidents, but the internal flaws that lead to many of those breaks can be detected only by specialized equipment. FRA is conducting research to enhance the detection capability in both of these areas. For example, FRA is conducting research and demonstration to develop a system that can capture images of joint bars from a hy-rail vehicle or other on-track equipment and analyze the images to detect cracks. FRA is also researching technologies that will alert train crews to broken rails before they approach them. In both these cases, FRA's research will include analysis of the costs and safety benefits of adopting these methodologies. FRA has identified both a way to accelerate the development of these projects and funds with which to do so. **Target for demonstration of joint bar imaging system:** October 2005.

Subtle track geometry defects are also difficult to identify in walking or hy-rail inspections. The FRA is procuring two additional track geometry cars to complement the existing state-of-the art vehicle (T-2000). This additional capability will permit FRA to cover major hazardous materials and passenger routes, while also having the ability to follow up more quickly on routes where safety performance is substandard. **Target for second car (towed) to be operational:** September 15, 2006. **Target for third car (self-propelled) to be operational:** December 15, 2006.

Improving Hazardous Materials Safety and Emergency Response Capability

Generally, the rail industry's record on transporting hazardous materials is very impressive. The industry transports roughly 1.7 million shipments of hazardous materials annually, ordinarily without incident. During the period 1994 through 2004, a total of nine fatalities resulted from the release of hazardous materials in train accidents. In 2003, there were 27 train accidents involving the release of hazardous materials, which is the second lowest number ever recorded; in 2004, there were 29 such events. However, the Graniteville accident, which involved nine

deaths as the result of the release of hazardous materials, demonstrates the potential for serious consequences from train accidents. FRA is engaged in a variety of activities intended to both reduce the likelihood that a train accident will result in a hazardous materials release and to ensure that, if a release occurs, local emergency responders will be fully prepared to minimize the damage and loss of life that might occur.

Identify promising technologies for reduction of train accident risk in dark (non-signaled) territory where hazardous materials are transported, particularly materials toxic by inhalation. FRA is reviewing technological options for reducing risk on lines where traffic levels would not support installation of signal or train control systems. Options include switch position detection tied to various means of communication, low-cost circuits to detect broken rails, and procedural changes in the railroads' operations.

Ensure that emergency responders have timely access to hazardous materials information. Railroads and hazardous materials shippers are currently subject to hazard communication requirements of the Hazardous Materials Regulations, and in addition these industries work through the American Chemistry Council's Responsible Care Program (and the affiliated TRANSCAER® effort) to familiarize local emergency responders with railroad equipment and product characteristics. The Association for American Railroads (AAR) also offers hazardous materials incident response training at the Transportation Technology Center (Pueblo, CO), including hands-on familiarization with railroad tank car valves and fittings and a full-scale derailment simulation exercise with actual rolling stock. The Pipeline and Hazardous Materials Safety Administration (PHMSA) (in concert with sister agencies in Canada and Mexico) publishes the Emergency Response Guidebook, with the intention that it may be found at virtually every firehouse and in every response vehicle on the North American continent**. On March 1, 2005, with FRA encouragement, the AAR amended its Recommended Operating Practices for Transportation of Hazardous Materials (Circular No. OT-55-G) to expressly provide that local responders, upon written request, will be provided with a ranked listing of the top 25 hazardous materials transported through the community.** This is an important step, which establishes a procedure for bona fide planning and response organizations to receive this information. However, these efforts alone have not been sufficient for some local responders to gain confidence in handling hazardous materials incidents.

Despite requirements that train crews possess current hazardous materials information, including 24-hour shipper contact information, despite the fact that every hazardous materials car is placarded using an internationally recognized system, and despite the fact that the American Chemistry Council maintains a 24-hour "CHEMTREC" service that provides expert advice on handling these events, including direct links to product manufacturers, issues occasionally arise regarding the availability of information following a major train accident or non-accident release. FRA is currently undertaking a project to provide avenues that enhance emergency response information availability to personnel responding to an accident/incident involving hazardous materials. Recognizing the strong interest in establishment of a redundant system that could be employed if other information delivery methods fall short during the early minutes following an accident, FRA has approached the AAR and requested that it utilize its RAILINC subsidiary to

"push down" train consist information, including hazardous materials information, to emergency responders using a system such as the following:

- Participating railroads (who are responsible for greater than 85 percent of the transportation in question) would, upon receiving notice of a derailment involving hazardous materials, notify all emergency response dispatchers in the area (directly or through existing mutual help channels) and invite them to download, from a secure web site maintained by RAILINC, current consist and hazmat information;
- Responders would use existing internet access and receive the documents in a standard format, such as a "pdf" or rich text file; and
- The transmission would include a railroad operations contact number for follow-up.
- Alternatives options are being considered to identify stake-holders' needs.

This type of system could also be used to "pull down" hazardous materials information in a case where the response organization has identified an apparent non-accident release of which the railroad is unaware. **Target for pilot start-up for new hazmat information delivery program:** July 2005.

Accelerate tank car structural integrity research. FRA has already begun research arising from the Minot, North Dakota, accident in 2002, which resulted in one death and 11 injuries due to the release of anhydrous ammonia. Current research involves a 3-step approach to assess the consequences of tank cars involved in derailments. The first phase is development of a physics-based model to analyze the kinematics of rail cars in a derailment. The second phase is development of the dynamic structural analysis models. The third phase is an assessment of the damage created by puncture and entails the application of fracture mechanics testing and analysis methods. The Volpe National Transportation Systems Center is doing the modeling work now. Work on tank car structural integrity will also be applicable to the MacDona, Texas, accident (a release of chlorine that killed three people in June 2004) and the Graniteville accident. **Target for completion of research:** As early as December 2006, if necessary additional funding is made available, but not later than July 2008.

Strengthening the FRA Compliance Program

Make better use of data. The Office of the Inspector General (OIG) has recommended that FRA submit to the Secretary a comprehensive plan for implementing a program that makes meaningful use of available data to focus inspection activities, assess whether traditional enforcement techniques should be substituted for a partnership approach, and determine appropriate fines where warranted. FRA's response to OIG contains the essential elements of the plan. As the OIG recognized, FRA had begun developing a new National Inspection Plan (NIP) process prior to the subject audit. FRA has also made extensive use of accident and inspection data to target compliance problems. FRA agrees that integration and extension of this effort is desirable and should be useful to help make our programs more efficient and effective.

Important attributes of the plan are as follows:

- Beginning with the operating practices (human factors), track and motive power and equipment disciplines, FRA will implement a new NIP. The NIP is an inspection allocation program that uses predictive indicators to distribute inspection activities within a region by railroad and by State;
- Following validation of the NIP through evaluation of experience under the new allocation formulas, FRA will review resource allocation among the regions and technical disciplines. Pending NIP validation, FRA will employ conscious priorities based upon observed, quantitative outcomes to allocate human resources;
- Within the NIP inspection allocations, FRA will specify major program priorities based on analysis of available data. Reduction of human factors- and track-caused train accidents will constitute the initial areas of emphasis; and
- FRA will specify additional leading indicators and outcomes to be tracked by headquarters and regional specialists and will begin to build standard queries to simplify data dissemination and analysis.

Target met: On April 29, 2005, FRA regions commenced use of the core features of the new NIP for allocation of inspection effort. This initial implementation covers track and human factors (operating practices), the areas responsible for over two-thirds of train accidents.
Target for full implementation in all disciplines: January 2006.

Fostering Further Improvements in Highway-Rail Grade Crossing Safety

Deaths in grade crossing accidents are the second-leading category of deaths associated with railroading (trespasser fatalities are the leading category). The number of grade crossing deaths has declined substantially in recent years. For example, 331 persons died in these accidents in 2003, as compared to 615 in 1994. The decline over that decade was steady. However, the growth in rail and motor vehicle traffic continues to present challenges, as evidenced by an increase in crossing fatalities in 2004 over 2003. The Secretary's 2004 Action Plan for Highway-Rail Crossing Safety and Trespass Prevention sets forth a series of initiatives in the fields of engineering, education and enforcement. In the near-term, FRA will stress the following actions that are consistent with the themes of the Plan.

Build partnerships with State and local agencies; call railroads' attention to their crossing safety duties. FRA will issue and widely disseminate information concerning its capabilities to obtain locomotive event recorder data and to evaluate the sound functioning of warning systems, so that local crossing investigations are supplemented, as needed, with information from the rail side. FRA will also disseminate information derived from recent accidents that indicates the need for action by the railroads to review warning circuitry and train their employees. **Target met:** A Safety Advisory addressing issues related to grade crossing safety was published in the Federal Register on May 2, 2005. FRA will disseminate this advisory through national law enforcement organizations and through contacts with local agencies. On May 18, FRA will separately brief the RSAC on safety issues related to circuit design and crew performance related to warning device functioning.

FRA is also working with the State of Louisiana to assist the State in developing its own Action Plan for highway-rail crossing safety. This effort was launched by the Governor at the Emergency Crossing Safety Conference during March 2005**.** Among other ideas, FRA will offer for consideration the new "corridor risk index" approach to resource allocation that was developed for use in the final rule on Use of Locomotive Horns at Highway-Rail Grade Crossings, published on April 27, 2005. **Target for development of Louisiana State Action Plan:** August 2005.

In addition, FRA will work with the grade crossing safety community to determine appropriate responses to the growth in pedestrian fatalities at highway-rail crossings, which accounted for a substantial portion of the increase in crossing fatalities in 2004.

Conclusion

The FRA's action plan sets the course for continuing the improving trends in railroad safety that has occurred over the last decade. The plan is based on analysis of relevant safety data, FRA's extensive experience on safety issues, and additional needs identified as the result of recent accidents.