

**Department of Transportation
Federal Railroad Administration**

INFORMATION COLLECTION SUPPORTING STATEMENT
Experimental Investigation of Automation-induced Human Error in the Locomotive Cab
OMB CONTROL NUMBER 2130-NEW

Summary of Submission

- This information collection request is a new submission. The proposed assessment is intended to identify and evaluate the potential for human error within the operation of system and automation in locomotive cabs.
- The estimated total number of burden hours requested for this submission is 45 hours.
- The estimated total number of responses for this submission is 30.
- The required 60 and 30 Day Federal Register Notice were published in the Federal Register on May 2, 2017 (see 82 FRA 20530) and September 13, 2017 (see 82 FRA 43078), respectively. .
- Comments were received from the Association of American Railroads outlining some concerns with the research approach in the human error study. A reply was made clarifying the research approach. All documentation can be found in this submittal package.

INTRODUCTION

This is to request the Office of Management and Budget's (OMB) to issue a three-year approved clearance for the information collection entitled, "Experimental Investigation of Automation-induced Human Error in the Locomotive Cab".

Part A. Justification

1. Circumstances that make the collection of information necessary.

The purpose of this work is to identify and evaluate the potential for human error associated with the operation of systems and automation in the locomotive cab. This research addresses the Department of Transportation (DOT) strategic goal of safety. If more is understood about the nature and risk of human error in the operation of automated systems, then error mitigating steps can be taken to provide safer systems and reduce risk of accidents or incidents involving use of these systems. Particular statutes, legal or administrative requirements are not applicable.

2. How, by whom, and for what purpose is the information to be used.

Through the use of a locomotive simulator laboratory, contracted researchers will conduct research aimed at answering the following specific questions regarding human-automation interaction and any associated human errors:

- (1) How does communication affect the notice of a change in automation?
What impact does a “failure to notice” have on performance?
Where is the operator looking, or what are they doing, if they fail to notice the events?
- (2) How frequently do operators notice an error in automation systems programming?
- (3) How frequently are operators able to stop in time for the “stop and protect” procedure?

Results of this research will be used by the agency to aid in recommending training, operational procedures, or automation design requirements that will improve the safe operation of automated systems.

Simulator-Laboratory research.

The work will be conducted through a contracted research organization responsible for experimental design, recruitment of human subjects, conduct and analysis of the research. Human subjects will be recruited as compensated volunteers from railroad participation, the operating unions, and retired operators with the necessary locomotive operating knowledge and experience. Through use of the Cab Technology Integration Lab (CTIL), a full-sized locomotive cab simulator in Cambridge, Mass., a maximum of 15, 2-person locomotive operating crews will be asked to operate the simulator given a particular set of scenarios. The scenarios include voice communication with the crew to simulate the dispatcher.

Objective measures of the crew’s performance will be observed and collected. This data will include the number and types of human errors, if any, observed while operating. Experimenters will sit near the simulator to observe and take notes on the crews’ performance during the scenarios.

3. Extent of automated information collection.

Automated event logs from the simulator and videos of the crew (overview of the cab, and from behind), the engineer, views of the displays of the locomotive automated systems, and eye-tracking data. No other form of automated data collection is planned or needed.

4. Describe efforts to identify duplication.

Not applicable. Laboratory research being conducted. The data and/or information that will be obtained from this study is not currently available through any other known resources.

5. Efforts to minimize the burden on small businesses.

Not applicable. Laboratory Research.

6. Impact of less frequent collection of information.

Not applicable. This proposed study will be a one-time research study conducted. Therefore, a less frequently conducted study is not feasible.

7. Special Circumstances.

No special circumstances. Not applicable. Laboratory research being conducted.

8. Compliance with 5 CFR 1320.8(d).

The required 60 and 30 Day Federal Register Notice were published in the Federal Register on May 2, 017 (see 82 FRA 20530) and September 13, 2017 (see 82 FRA 43078), respectively.

FRA received comments from the Association of American Railroads (AAR) which outlined some concerns with the research approach in the Human Error Study. The AAR preferred to see a study that examined human performance with automation versus without automation, however, the FRA study is designed to identify human errors that may be induced by the design of the automation. Design-induced error has caused many accidents in other modes of transportation. A reply from the FRA was made clarifying the research approach.

9. Payment or gifts to respondents.

Participants will be offered a form of incentive to participate in laboratory research. Participants in this research will be paid with a gift card. The amount is to be negotiated but it is expected to be an equivalent day’s wage amount. It is estimated that the average gift card to be provided to each person/participant will be \$400.00.

10. Assurance of confidentiality.

The research will be presented to an independent/institutional review board for approval as required by 45 CFR 46. The review is required as protection from harm and confidentiality of human subjects of biomedical and behavioral research. Identity of human subjects is not reported. Performance of human subjects in the simulator laboratory is kept anonymous. No laboratory research involving human subjects will be conducted without this approval.

11. Justification for collection of sensitive information.

Not applicable. No sensitive information to be collected.

12. Estimate of burden hours for information requested.

	Respondent Universe	Total Annual Responses	Average Time per Response	Total Annual Burden Hours
Simulator Experience	30 Engineers	30	1.5 hours	45 hours

15, 2-person crew x 3 scenarios x 30 min each scenario = 2700 minutes or 45 hours total

[Per the Bureau of Labor and Statistics, Occupational Employment and Wages, May 2016, \(53-4099\) Rail Transportation Workers, All Others](#), the median hourly wage is \$29.05 per hour.

Therefore, the cost would be \$29.05 x 45 hours = \$1307.

However, participant travel to the simulator site and expenses, loss of day’s wages, the estimate

is \$400 per subject or \$12,000. The real cost driver is the loss of day's wages. Professional locomotive engineers are hard to get for research, so loss of wages on average must be compensated or we may not be able to recruit participants.

13. Estimate of the total annual costs burden.

Not applicable. Laboratory research conducted.

14. Estimates of costs to the Federal Government.

Per question 9 above, there will be a payment to the participants in the estimated amount of \$400. Therefore, the total cost for participants is estimated at \$12,000 (\$400 x 30 participants).

Total cost to the Government for this study, based on contractor proposal, is estimated at \$475,000 including the costs for participants (\$12,000) above.

15. Explanation of the program change or adjustments.

Not applicable. No changes or adjustments needed.

16. Publication of results of data collection.

Not applicable. Laboratory research. Results will be published as FRA technical reports

17. Approval for not displaying the expiration date of OMB approval.

None needed. Not applicable

18. Exceptions to the certification statement.

None. Not applicable.