

Development of a Website-Based Apron Movement Control Reporting Logbook System at Radin Inten II Airport, Lampung

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Abstract

The development of a web-based logbook reporting System for Apron Movement Control (AMC) at Radin Inten II Airport Lampung is an innovative effort to improve the efficiency of recording and reporting apron operational activities. The urgency of this study stems from problems related to the previous manual System, which was prone to data loss, input errors, and delays in reporting. These issues negatively impacted coordination effectiveness and daily operational documentation. This study aims to produce a digital logbook System that replaces the conventional method with a more effective, efficient, and real-time accessible web-based approach for Apron Movement Control (AMC) personnel. The research adopts a Research and Development (R&D) methodology using the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation) as proposed by Borg and Gall (1983). The results show that the developed web-based digital logbook System significantly improves data accuracy, accelerates reporting processes, and facilitates easier monitoring of daily operational activities. User validation confirms the System is well accepted in terms of interface design, ease of use, and functionality. The contribution of this study lies in providing a digital technology solution for operational management within the (Apron Movement Control) AMC unit, and it serves as a foundation for the development of other information Systems within the airport environment. The System is also adaptable for other units to support work efficiency and technology-based operational documentation.



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1 INTRODUCTION

Technology continues to advance, keeping pace with the industrial revolution. Indonesia is now entering the Industry 5.0 era. Technological advancements can provide benefits and advantages, particularly in terms of efficiency in work. One of the efficiencies of technological development is the delivery of information. Using technology to deliver information can provide clearer, more up-to-date information, enabling collaboration and the exchange of ideas between parties more quickly and efficiently (Yasin, 2023) (Raj et al., 2022).

Technological developments in line with the industrial revolution have brought Indonesia into the Industry 5.0 era. This progress offers various benefits, particularly in increasing work efficiency. One form of this efficiency is evident in the

information delivery process, where the use of technology allows for clearer, more up-to-date information, and supports rapid and effective collaboration and exchange of ideas (Maria et al., 2020).

Airports are crucial infrastructure in the air transportation sector, serving as hubs for departures and arrivals, as well as for the boarding and disembarkation of passengers and cargo. In accordance with Law Number 1 of 2009 concerning Aviation (Undang-Undang Republik Indonesia Nomor 1 Tahun 2009 Tentang Penerbangan, 2009), airports must have safety, security, and other supporting facilities. Aviation safety is crucial for ensuring the comfort and safety of passengers and workers, and for preventing and reducing the risk of workplace accidents that may occur within the airport area (Melsy Fransiska Permata Mutiarani & Anita Nur Masyi'ah, 2023).

Airports also serve as gateways to a region's economy, playing a crucial role in facilitating trade, tourism, and connecting one region to another. Airports that host flight operations must have facilities that support safety and security, especially in the aviation sector. Flight safety is paramount and must be strictly adhered to. Aviation security professionals, who are responsible for various aspects of security at the airport and during flight operations, play a crucial role in ensuring flight safety (Maynard Oloan Sitompul et al., 2024). One unit that supports flight safety for aircraft is the Apron Movement Control unit.

Apron Movement Control (AMC) is a work unit at an airport responsible for ensuring flight safety by overseeing flight operations, including aircraft, passengers, and cargo, ground handling services, and the condition of the apron, including parking stands (Hermawan, 2021). According to PM Regulation Number 37 of 2021, "One of the duties of airport personnel is to supervise traffic and all movements within the apron area, ensuring the cleanliness and good condition of the apron facilities." One of the movement controls regulated by Apron Movement Control (AMC) is the allocation of aircraft parking stands on the apron (Kementerian Perhubungan, 2021).

To support an optimal air transportation system, various airports have been built throughout Indonesia, managed by State-Owned Enterprises (BUMN). PT Angkasa Pura Indonesia, also known as InJourney Airports, is a state-owned enterprise responsible for managing 37 commercial airports in Indonesia, including Radin Inten II Airport in Lampung. This company operates in the airport services sector, with the primary goal of providing quality air transportation services and enhancing comfort for passengers and flight users. This facilitates users in completing various activities and tasks, thereby increasing productivity (Salaam & Iskandar, 2024).

Radin Inten II Airport, Lampung, is one of the airports managed by PT Angkasa Pura Indonesia through InJourney Airports. In its operations, particularly at the Apron Movement Control (AMC) unit, daily logbooks are maintained to document aircraft movements and other operational activities. This recording is carried out as part of Standard Operating Procedures (SOPs) that refer to applicable regulations. One of the regulations that forms the basis for daily logbooks at the Apron Movement Control (AMC) is Minister of Transportation Regulation (PM) Number 37 of 2021 concerning National Airport Order, which governs operational management at airports to ensure the safety, security, and efficiency of flight services. regulating personnel at the airport, one of the duties of the Apron Movement Control (AMC) unit is to supervise traffic and all movements in the apron area, ensuring cleanliness and that the facilities on the apron are in good condition.

One aspect of movement supervision that falls under the responsibility of Apron Movement Control (AMC) includes determining and allocating aircraft parking positions on the apron. Parking stands are part of the apron that serve as stopping points for aircraft to carry out operational activities such as passenger boarding and disembarkation, baggage loading and unloading, refueling, and other procedures related to aircraft operations. Parking stand allocation is crucial, and Apron Movement Control (AMC) must consider the type and needs of the aircraft parked at the stand, as well as the stand's specifications (Trenggono et al., 2021).

In carrying out its duties, the Apron Movement Control Unit adheres to the Standard Operating Procedures (SOPs) established at Radin Inten II Airport, Lampung, including the obligation to record daily reports in a logbook. Based on available documentation, the daily log recording process at Radin Inten II Airport, Lampung, is still carried out manually, using notebooks. This has led to several challenges, such as difficulties in data recapitulation, delays in reporting daily activities, and a lack of transparency in recording and distributing operational information, which poses a risk of damage, loss, and difficulty in retrieval of historical data.

Based on the background outlined above, this research focuses on two main issues. First, how the development of a website-based digital logbook can be implemented to improve the efficiency of Apron Movement Control (AMC) reporting at Radin Inten II Airport, Lampung. Second, how the design of the website-based digital logbook can be designed to support the AMC reporting process more effectively, quickly, and accurately, thereby simplifying operational data management within the airport environment.

2 METHOD

This study employed a Research and Development (R&D) methodology with the primary goal of developing an innovative product in the form of a website-based digital logbook to support the efficiency of Apron Movement Control (AMC) reporting at Radin Inten II Airport, Lampung, while simultaneously testing the product's effectiveness in operational practice. The R&D methodology was chosen because it is applicative and oriented toward creating solutions that can be used directly in the field. As Sugiyono (2013) explains, "R&D is a research method used to produce a specific product and test its effectiveness." Similarly, Okpatrioka (2023) argues that R&D is an effort to develop a product that is effective for use, not merely to test theory (Winaryati, 2021).

In its implementation, this study employed the ADDIE development model introduced by Dick and Carey (1996). The ADDIE model was chosen because it provides a systematic and flexible framework that can guide researchers through product

development in stages, from planning to evaluation. According to (Rusmayana, 2021), almost all classic instructional design models are variations of ADDIE, so this model has proven to be an effective approach in technology-based product development.

The ADDIE model consists of five main stages:

1. Analyze

This stage aims to identify the needs, problems, and objectives of developing a website-based digital logbook. An analysis was conducted of the existing AMC reporting system at Radin Inten II Airport, Lampung, including the obstacles encountered in the manual recording and reporting process. User requirements were also thoroughly reviewed to ensure that the product developed truly meets operational needs in the field.

2. Design

After the needs were identified, the design phase was carried out to develop a detailed product plan. Design included determining the system workflow, designing the user interface, planning key features, and determining technical specifications. At this stage, a blueprint or initial prototype was created to serve as a reference throughout the development process.

3. Development

At this stage, the design is realized into a usable website-based digital logbook product. The development process includes programming, feature integration, and initial functionality testing (alpha testing). Adjustments and improvements are made based on the results of the initial testing to ensure the product meets the expected quality standards.

4. Implementation

The implementation phase involves deploying the product into the AMC operational environment at the airport. Involved users will receive brief training to ensure they can optimally utilize the digital logbook features. During this stage, the product's ability to replace manual reporting methods and improve work efficiency is assessed.

5. Evaluation

Evaluation is conducted to assess the product's success in various aspects, such as functionality, ease of use, speed of reporting, and effectiveness in supporting AMC operational activities. The evaluation includes formative evaluation (conducted during the development process for incremental improvements) and summative evaluation (a comprehensive assessment after implementation) to ensure the product meets its stated objectives.

By following the ADDIE steps procedurally, this research is expected to produce a website-based digital logbook product that not only functions as expected but also has a high level of efficiency and reliability in the context of AMC reporting. This systematic approach makes the development process more focused, so that the final results obtained can make a real contribution to improving the quality of operational services at Radin Inten II Airport, Lampung.

3 RESULTS

Analysis Results

The analysis phase is the initial stage in the ADDIE development model, which aims to identify needs, problems, user characteristics, and the relevant operational environment for the system development process. In this study, the analysis phase was conducted to determine the extent of the need for a website-based Apron Movement Control (AMC) reporting logbook system and the problems encountered with the current recording system. This analysis serves as a basis and benchmark for identifying the shortcomings and constraints of the manual logbook recording system, which will then serve as a reference in the design and development of the digital system.

Current System Analysis

Based on the results of the initial design implementation conducted by the author, several findings were obtained that serve as the primary basis for developing a digital logbook information system for the Apron Movement Control (AMC) unit. These findings were obtained through direct observation of the Apron Movement Control (AMC) unit's work environment and interviews with several personnel and supervisors involved in recording operational activities on the apron at Radin Inten II Airport, Lampung. Currently, the process of recording Apron Movement Control (AMC) activity reports on the apron is still done manually using logbooks. The recorded information includes activity reports and Apron Movement Control (AMC) service reports. However, in its implementation, this manual recording system has several limitations. Based on interviews, the most common problems faced by Apron Movement Control (AMC) personnel are:

1. Difficulty reading handwriting.
2. Delays in recording due to busy apron conditions.
3. Risk of errors in data recording due to work pressure.
4. Difficulty searching for historical data due to having to manually open each page.

Based on observations made during On-the-Job Training at Radin Inten II Airport, Lampung, the author identified problems that occurred, particularly in the Apron Movement Control (AMC) unit. These problems were related to the use of manual

logbooks. As a solution, the author proposed the development of a digital logbook system. To support this proposal, the author conducted interviews with Apron Movement Control (AMC) personnel to identify the need for digital logbook development for Apron Movement Control (AMC) personnel.

The interviews aimed to explore respondents' experiences using the manual logbook system they currently use and to identify their perceptions and expectations regarding the web-based digital logbook system (AMC-LOG) that has been developed. The interviews revealed that a stable internet network is a key factor in ensuring optimal system performance. Therefore, strengthening the network or providing offline storage options is a crucial input for future system development.

As a solution to the challenges faced, AMC personnel expressed their hope for the implementation of a web-based digital logbook system, which they believe will improve work efficiency. This system is expected to speed up the recording process, improve data accuracy, and facilitate information retrieval with automatic search features based on date, airline, or activity type. Furthermore, centralized data storage via a server is considered to provide greater data security and tidiness. User expectations for this system include real-time data recording, easy historical data retrieval, graphical presentation of activity summaries, notifications for incomplete data, access rights settings based on user roles, and the availability of training to ensure optimal system utilization. In conclusion, there is a real need to transform from manual recording methods to a website-based digital system to increase efficiency, minimize errors, and support the operational effectiveness of AMC personnel in the field.

Design Results

The design phase of the ADDIE method is a crucial process aimed at designing the system structure, workflow, and user interface based on the results of the previous requirements analysis. In developing the "AMC-LOG" reporting logbook system, the design focused on ensuring the system was easy to use, supported smooth operations, and aligned with the workflow of the Apron Movement Control (AMC) unit at Radin Inten II Airport, Lampung. The application system structure was designed taking into account the functional needs of users in carrying out operational activities in the apron area, thus assisting personnel in digitally recording, storing, and reviewing daily activity data. With this approach, "AMC-LOG" is expected to replace the manual recording method currently used. All designed features prioritize ease of use, workflow efficiency, and easy access to stored data, ensuring that each function within the system plays a strategic role in supporting work effectiveness and reporting accuracy.

Tabel 1. Key Features of the AMC-LOG System

No	Feature Name	Description Function
1	<i>System Login</i>	Used for user authentication. Only registered Apron Movement Control (AMC) personnel can access the system.
2	<i>Dashboard</i>	The initial view after logging in. Presenting a summary of features and quick access to the main menu.
3	<i>Daily Logbook</i>	The main module for inputting daily operational activities of Apron Movement Control (AMC) personnel on the apron, such as aircraft schedules, parking locations, and task descriptions.
4	Service Report	Used to record reports on special service activities that are non-routine or on a special scale.
5	Personnel Data	Menu for managing Apron Movement Control (AMC) personnel information, including name, position, and login account.
6	Logbook History	Provides access to previously entered logbook data. Users can search and review older records.
7	Monitoring & Comments	Validation feature and providing notes/comments by supervisors on the logbook that has been inputted.

To understand the workflow of the web-based digital logbook system in the Apron Movement Control (AMC) unit, a clear and systematic process mapping is required. The following flow diagram illustrates the main steps a user takes, from logging in to using the system's main features.

This diagram also shows the different flows based on user roles, namely Assistant Manager and regular AMC Personnel. This flowchart aims to provide a visual representation of the system's navigation structure and facilitate future system implementation and testing. The system's workflow can be explained as follows:

1. The user accesses the system through the login page by entering a username and password.
2. The system authenticates the user account.
3. If authentication is successful, the system authorizes access rights based on the role (Assistant Manager or Apron Movement Control (AMC) Personnel).
4. The Assistant Manager will be directed to a dashboard with the following features:
 - a. Daily Logbook Monitoring
 - b. Service Report Monitoring
5. AMC personnel will be directed to a dashboard with the following features:
 - a. Logbook (enter personnel data and daily activities)
 - b. Service Reports
 - c. Logbook History (view and print previous reports)
 - d. Personnel (manage personnel data)

The AMC-LOG system's web-based architecture allows access via any internet-connected computer or laptop. Users log in through a browser, then a request is sent to the server for authentication and authorization according to their role (AMC or Assistant Manager). The server then accesses a database that stores logbook data, service reports, and personnel information, sending real-time responses for fast and efficient data input and access.

The following is a visualization of the AMC-LOG system architecture:

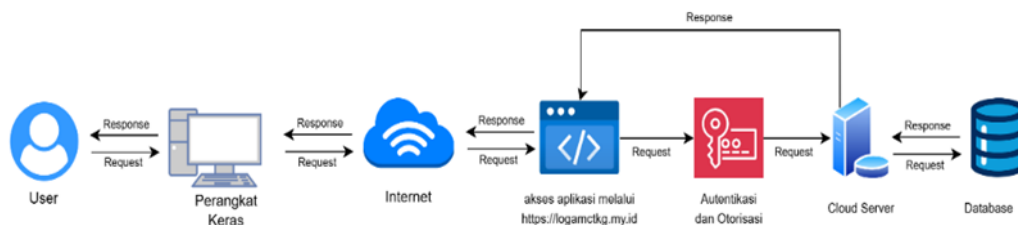


Figure 1. AMC-LOG System Architecture

This design allows the system to run centrally via a cloud server, with a better level of security and data integrity than manual recording methods.

Development Results

During the development phase, the AMC-LOG system was developed as a digital solution to replace the manual logbooks currently used by the Apron Movement Control (AMC) unit at Radin Inten II Airport, Lampung. This system was developed with the primary goal of improving the efficiency and accuracy of reporting daily operational activities in the field. System development was based on previous analysis and design results, which took into account user needs, the limitations of manual recording methods, and the actual workflow of Apron Movement Control (AMC) personnel. Technical Development Aspects:

1. Programming Language & Framework

The system was developed using the PHP programming language with the support of the Laravel framework. Laravel was chosen because this framework supports structured routing processes, efficient database management (through the Eloquent Document Object Model), and a built-in authentication-based security system.

2. Interface Display

For the user interface, a combination of HyperText Markup Language (HTML), Cascading Style Sheets (CSS), and a small amount of JavaScript is used to maintain a lightweight yet interactive display. The system display is designed to be responsive to the size of the computer screen used in the Apron Movement Control (AMC) operational area.

3. Database

The system stores data in a MySQL (Structured Query Language) database, which consists of several main tables, such as a user table, a logbook table, a supervisor comment table, and a duty report table. Each logbook entry is linked to the user who entered it and the time it was recorded.

4. System Feature Structure

The system consists of key features, including:

a. User login and authentication (personnel and supervisor roles)

A secure login and authentication system is essential to ensure that only authorized individuals can access the platform. The system should distinguish between different roles, such as personnel and supervisors, each having specific access rights and privileges. Personnel may be limited to submitting daily reports and reviewing their own history, while supervisors can review, comment, and evaluate personnel activities. This role-based access control ensures security, accountability, and efficient workflow management.

b. Daily logbook input form

The daily logbook input form serves as the primary tool for personnel to record their activities, tasks, and progress. This feature should be designed with a user-friendly interface, enabling quick and accurate data entry. Fields may include task descriptions, time spent, challenges faced, and achievements. Having a structured format ensures consistency in reporting and provides supervisors with clear and comprehensive insights into daily operations.

c. Logbook history that can be filtered by date/activity

The logbook history function allows users and supervisors to review past records systematically. By incorporating filtering options such as by date range or activity type the system enables more efficient tracking and retrieval of information. This feature is particularly useful for monitoring trends, evaluating performance over time, and identifying recurring challenges. It also enhances transparency by ensuring all submitted records remain accessible for audit or review purposes.

d. Supervisor comments on personnel activities

To foster effective communication and continuous improvement, supervisors should be able to provide comments or feedback directly on personnel logbook entries. This interactive feature supports mentoring, guidance, and performance evaluation. Constructive comments can help personnel refine their work habits, align with organizational standards, and stay motivated. Moreover, this feedback loop strengthens accountability and ensures that reported activities are being actively reviewed.

e. User management by the system admin

A system administrator should have the authority to manage all user accounts, including personnel and supervisors. This includes creating, modifying, deactivating, or deleting accounts as necessary. Proper user management ensures that the right people have access to the right tools at the right time. Admins can also oversee role assignments, maintain data integrity, and handle security concerns such as password resets or access restrictions.

f. Report printing feature for physical documentation purposes

Although digital systems streamline record-keeping, there may still be situations where physical documentation is required, such as audits, meetings, or compliance reporting. A report printing feature allows personnel, supervisors, or admins to generate structured reports in a printable format. This ensures that all stakeholders, even those who prefer or require hard copies, can access and review necessary records. Such reports can include summaries of activities, supervisor feedback, and performance evaluations, making them valuable for both internal and external documentation needs.

The main features developed at this stage include:

a. Daily Logbook Form

This menu is used to record daily personnel activities per shift, complete with columns for duty hours, activity descriptions, and uploading documentation photos.

Figure 2. Daily Logbook Form

b. Official Report

The "official report" menu in AMC-LOG is used to record important operational and non-operational events, such as technical issues, security incidents, extreme weather, or formal administrative reports. This feature keeps these records separate from the daily logbook, ensuring they are organized, archived, and easily accessible for supervisors to review, compile monthly reports, or submit to relevant authorities.

Figure 3. Official Report

c. Activity History

This menu is used to review previous activity data based on a specific date. Users can select the desired date and view previously recorded daily logbooks, including documentation and the names of the personnel on duty. This data can also be printed as a report if needed.

Figure 4. Activity History

d. Personnel Management

This menu allows you to add and manage the list of active personnel involved in Apron Movement Control operations. This feature allows users to add new personnel data, edit existing information, or delete data if necessary. This personnel data will be used as a reference when completing daily logbooks and official reports, ensuring that the system always records activities based on valid, registered personnel.

Nama	NIK	Jabatan	Aksi
FERU MARANDO	20344545	PENGAWAS	Surfing
JUNI JATISA PASOGA	20346748	PENGAWAS	Surfing
RAHMAT HIDAYAT	240902010778	PELAKSANA	Surfing
HABIB MUSTOKA		PELAKSANA	Surfing
FAJAR KHOIRI AMRI	20347747	PENGAWAS	Surfing
DENK ADRIAN	230102009133	PELAKSANA	Surfing
DINAS BAYU BADRA	210402980295	PELAKSANA	Surfing

Figure 5. Personel Management

5. System Testing

After the system was developed, initial internal testing was conducted to ensure all features functioned as intended. Testing was conducted using the Black Box Testing method, which focuses on the system's appearance and output without viewing the program code. This testing covered aspects of functionality, interface appearance, ease of navigation, and system speed.

The testing process was conducted by information systems experts, Mr. Dhani Chandra Yudho Pranoto, S.Pd., and Yudhis Tiro Kabul Yuniar, M.Kom., who are competent in information systems development and evaluation. Both experts assessed the system's reliability and suitability to user needs, ensuring that each feature performed according to its designed specifications. The following are the results of Black Box Testing of the main features of the AMC-LOG system.

Implementation Results

After undergoing development and validation testing, the AMC-LOG system began limited implementation within the Apron Movement Control (AMC) Unit at Radin Inten II Airport, Lampung. Implementation took place on July 9, 2025, in the form of a live trial by AMC personnel during operational duties. During this phase, personnel used the system to record daily activities through a digital logbook feature, complete duty reports for specific activities, and manage personnel data. Meanwhile, supervisors utilized the monitoring feature to review inputted reports and provide comments or verification as needed. This web-based system has been uploaded online and can be accessed at <https://logamctkg.my.id>. With this system, recording and reporting of AMC Unit operational activities has become more efficient, documented, and supports improved service quality.

Evaluation Results

The evaluation phase is the final step in the ADDIE development model. The purpose of this phase is to evaluate the success and acceptance of the AMC-LOG system, which has been developed and directly tested by end users, namely Apron Movement Control (AMC) personnel at Radin Inten II Airport, Lampung. The evaluation was conducted in two forms:

1. Validation of materials by expert field users
2. Expert validation by information systems experts

The evaluation respondents consisted of four active personnel in the Apron Movement Control (AMC) unit:

1. Mr. Feru Marando (AMC Supervisor)
2. Mr. Juni (AMC Supervisor)
3. Mr. Fajar Khoiri Amri (AMC Supervisor)
4. Mr. Rahmat Hidayat (AMC Implementer)
5. Mr. Latif Nur Sasongko (Airport Operations Service)

System Evaluation Validation Results

After the implementation of the AMC-LOG system, respondents were asked to complete a set of closed-ended evaluation questions aimed at measuring several key aspects of the system's performance. These aspects included ease of access, clarity of the interface display, operational feasibility in real work scenarios, and overall effectiveness in supporting the duties of Apron Movement Control personnel. The evaluation process was carried out immediately after respondents had firsthand experience using the system, ensuring that their feedback was based on direct interaction and actual use during field operations.

The responses revealed a consistently positive reception from the participants. All respondents unanimously agreed that the AMC-LOG system was easy to access, regardless of their previous experience with similar applications. This finding suggests

that the system's access procedures, from login to navigation, were intuitive and user-friendly. In terms of interface design, respondents stated that the display was sufficiently clear and well-structured, even for first-time users. This indicates that the layout, typography, and arrangement of features were designed in a way that reduced the learning curve and made the system more approachable for all levels of personnel.

Regarding operational feasibility, the majority of respondents reported that the AMC-LOG system functioned smoothly during the trial period and integrated well into their workflow. Four out of the five respondents stated that the system significantly improved work effectiveness in the field, particularly in terms of faster data entry, more organized reporting, and easier retrieval of information when needed. They also noted that the centralized nature of the system reduced the possibility of lost or misplaced records, which is often a risk in manual documentation.

However, one respondent expressed a more cautious perspective. While acknowledging the system's potential, this individual answered "no" to the fourth evaluation question concerning system effectiveness, explaining that its performance still relied heavily on the stability of the internet connection. According to this feedback, in situations where the network was unstable or unavailable, access to the AMC-LOG system could be disrupted, potentially slowing down reporting and data retrieval. Therefore, the respondent recommended that preventive measures be put in place, such as offline backup options or contingency procedures, to ensure continuity of operations in the event of network interruptions.

Discussion of Research Results

Based on the research results and system implementation, it can be concluded that the web-based digital logbook system for the Apron Movement Control (AMC) unit at Radin Inten II Airport Lampung was successfully developed using the ADDIE method and meets operational needs in the field. Its implementation demonstrated easy access and usability without the need for special training, while improving recording speed, data accuracy, and information retrieval, thereby enhancing the work effectiveness of AMC personnel.

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