REPORT BY THE

Comptroller General

OF THE UNITED STATES

Impact Of Work Cutbacks On Northeast Corridor Improvement Project

Work planned under the Northeast Corridor Improvement Project, to improve high-speed rail passenger service between Boston and Washington, has been cut back substantially to stay within the project's budget--now $2.5 billion. According to project officials, reductions in planned work from January 1979 to the present will likely reduce ontime reliability; passenger comfort; and passenger, crew member, and public safety; and increase Amtrak maintenance costs. These officials believe that additional work cutbacks will probably be necessary.

This is an interim report on a forthcoming broader view of the Northeast Corridor Improvement Project. A previous report (CED-79-38, Mar. 29, 1979) covered changes in the project's planned work up to and including January 1979.

CED-81-23
OCTOBER 31, 1980

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-201019

The Honorable John L. Burton
Chairman, Subcommittee on Government
Activities and Transportation
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

This is our interim report on the work you requested concerning the Northeast Corridor Improvement Project. As agreed with your office, this interim report discusses the deletion from the project of a number of previously planned improvements and the general effects of these deletions. The information in this interim report will be included in our broader, final report on this assignment to be issued early in 1981.

At your request, we did not take the time to obtain agency comments. As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time, we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,

Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE SUBCOMMITTEE
ON GOVERNMENT ACTIVITIES
AND TRANSPORTATION
COMMITTEE ON GOVERNMENT
OPERATIONS
HOUSE OF REPRESENTATIVES

IMPACT OF WORK CUTBACKS ON NORTHEAST CORRIDOR IMPROVEMENT PROJECT

D I G E S T

The $2.5 billion Northeast Corridor Improvement Project was initiated to improve high-speed rail passenger service between Washington, New York, and Boston. (See p. 1.) Implementation is being handled primarily by the Department of Transportation's Federal Railroad Administration, but Amtrak will operate and maintain the Corridor when construction is completed. (See p. 2.)

Substantial reductions have been made in the project's planned work scope since the Secretary of Transportation's January 1979 redirection study report. Changes in the planned work through the time of the Secretary's report were discussed in an earlier GAO report (CED-79-38, Mar. 29, 1979). At the time of GAO's latest review, the work was still being reduced to stay within the project's budget in the face of additional cost overruns and, according to project officials, more reductions are possible as later estimates are developed. According to project personnel, the reductions that have been made so far could result in reduced ontime reliability; reduced passenger comfort; reduced safety for passengers, crew members, and the public; and increased future Amtrak maintenance costs, as compared with the project described in the January 1979 report. (See p. 5.)

The project's 11 work areas (nearly all of which have been reduced in scope), their budgets as of March 1980, and how the reductions affect these areas are shown below.

CED-81-23

	March 1980 budget	Possible adverse effects of reductions: Service reliability	Passenger comfort	Safety	Future maintenance
	(millions)				
Route realignment	$ 70.1				
Track structures	809.1	x	x		x
Bridges	255.4	x		x	x
Electrification	298.4	x			x
Signaling and traffic control	391.3	x		x	x
Communications	9.3				
Fencing	21.3	x		x	
Grade crossings	16.0			x	x
Stations	195.0		x		x
Service facilities	148.1				x
Tunnels	30.6			x	x
Total	2,244.6				
Program management and systems engineering	281.3				
Total	$2,525.9				

For example, in the track structures area, about $41 million in planned track preparation work has been eliminated. This work primarily involves improving the track roadbed to make the rails more stable. Project officials said that these eliminations will increase future maintenance, make it difficult to maintain the high speeds planned for the corridor, decrease operational reliability, and diminish passenger comfort. (See p. 8.)

Also, in the electrification area, the $39 million reduction in rehabilitation work on the overhead wires that provide power for trains between Washington and New York could result in additional future maintenance of the wires and could make high speeds difficult to maintain in hot weather. Project personnel gave different opinions as to the severity of these adverse effects, but one official said that, if problems subsequently develop, as much as $90 million could be required to correct them. (See p. 20.)

In addition, in the fencing area, all planned fencing between the tracks at stations was eliminated. This work had been planned to deter pedestrians from walking across the tracks. An Amtrak document stated that, as a result of the eliminated work, additional fatalities can be expected. (See p. 32.)

The following issues are not addressed in this interim report, but they will be addressed in GAO's final report to be issued early in 1981:

--Possibility that Amtrak will have to perform, with its own funds, some of the work eliminated from the Northeast Corridor Project.

--Priorities established by the Passenger Railroad Rebuilding Act of 1980 (Public Law 96-254 Title II, May 30, 1980) for selecting the improvements to be made under the project.

--Basis for the project's current cost estimates (inquiry into this subject could provide an indication as to the extent of further work reductions that will be necessary to stay within the project's budget).

--Extent to which GAO's prior recommendations on the Northeast Corridor Project have been implemented.

--Amtrak productivity on track work under the project.

The requester asked GAO not to hold up issuing this interim report to obtain agency and Amtrak comments on its contents.

Contents

ABBREVIATIONS

Amtrak	National Railroad Passenger Corporation
DCP	DeLeuw, Cather/Parsons and Associates
DOT	Department of Transportation
FHWA	Federal Highway Administration
4R Act	Railroad Revitalization and Regulatory Reform Act of 1976
FRA	Federal Railroad Administration
GAO	General Accounting Office
Hz	hertz
kv	kilovolt
NECIP	Northeast Corridor Improvement Project

CHAPTER 1

INTRODUCTION

BACKGROUND

The Northeast Corridor Improvement Project (NECIP) was authorized by the Railroad Revitalization and Regulatory Reform Act of 1976 (45 U.S.C. 801), commonly known as the 4R Act. Under the 4R Act, $1.75 billion was authorized to improve rail passenger service between Boston, Massachusetts; New York, New York; and Washington, D.C., so that regularly scheduled, dependable service would be established by February 1981. Rail service would operate on schedules of 2 hours 40 minutes between Washington and New York and 3 hours 40 minutes between Boston and New York. The act directed the Secretary of Transportation to implement NECIP, and the Secretary delegated the responsibility to the Federal Railroad Administration (FRA).

On January 15, 1979, the Secretary announced the results of a redirection study which had been initiated in January 1978 to place greater emphasis on serving the users--intercity passenger, commuter, and freight service--of the Northeast Corridor 1/ and overcoming potential conflicts among intercity passenger, commuter, and freight operations. The study report stated that an additional $654 million in Federal funding would be required for NECIP--increasing the total to $2.4 billion--and that NECIP construction would not be completed until the end of 1983.

On December 7, 1979, the Secretary of Transportation sent letters to several congressional committee and subcommittee chairmen and Members of Congress informing them that FRA had reevaluated the impact of a $2.4 billion program and concluded that this level would barely provide the reliability and amenities needed to improve ridership. The Secretary stated that the new assessment showed that a $2.5 billion program level--an increase of $750 million over the 4R Act--would accommodate all major features essential to meeting the goals of the 4R Act and at the same time maintain an appropriate balance for reliability, trip time, and passenger comcomfort for all users of the improved corridor.

In proposing a $2.5 billion program, the Secretary also recommended that $360 million in projects be deferred and

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1/The Northeast Corridor is the 456-mile spine railroad system between Boston, New York, and Washington.

left for the National Railroad Passenger Corporation (Amtrak) to do after NECIP was completed. This recommendation increased the cost estimates for the work in the redirection study report by $456 million ($96 million in the requested additional authorization plus $360 million for deferred work). The Secretary attributed the increase to inflation and cost reestimations. The Secretary indicated that the Department would support future budget requests by Amtrak to do the deferred work.

The Passenger Railroad Rebuilding Act of 1980 (Public Law 96-254 title II, May 30, 1980) increased the authorization for NECIP by $750 million to a total of $2.5 billion and extended the project completion date to September 30, 1985. The act provides that all authority and responsibility for the project will be transferred to Amtrak effective October 1, 1985, and that authority and responsibility for the contracting of construction solely related to track improvements will be transferred to Amtrak within 90 days after the date of enactment. The act also provides that NECIP's goals are to be achieved to the extent compatible with the $2.5 billion authorization, and it established priorities for the selection and scheduling of specific improvements.

While FRA has overall responsibility for implementing NECIP, two other entities play major roles in the project--Amtrak and DeLeuw, Cather/Parsons and Associates (DCP), FRA's principal architect and engineering contractor.

Under a contract with FRA, Amtrak has a dual role. As owner of most of the Northeast Corridor and operator of the intercity passenger service on the corridor, Amtrak is supposed to participate in program and project development and in construction supervision, testing, and acceptance. Amtrak was also designated as construction manager for much of the construction work under NECIP.

DCP is responsible for management support, system engineering, design, work package definition, cost estimates, and construction supervision and inspection. DCP is a joint venture, the principal firms of which are DeLeuw, Cather and Company and the Ralph M. Parsons Company.

OBJECTIVE, SCOPE, AND METHODOLOGY

This review was requested by the Chairman of the Subcommittee on Government Activities and Transportation, House Committee on Government Operations. Because of the interim nature of this report, we believe that conclusions and recommendations at this time would be premature. We plan to

include conclusions and/or recommendations in our final report as appropriate.

Our objective was to determine what reductions have been made to the work planned under NECIP since the January 1979 redirection study report, how the reductions were selected, and the impacts of these reductions. We chose the redirection study as the starting point for determining the project's scope because we had issued an earlier report on NECIP ("Problems in the Northeast Corridor Railway Improvement Project," CED-79-38, Mar. 29, 1979) that discussed the changes in work plans and their impacts from the inception of NECIP through the January 1979 redirection study report. We had originally planned to use the March 1980 Corridor Master Plan as the cutoff for our work because it is supposed to be the baseline documentation for NECIP's work scopes, schedules, and budgets. Because many changes in planned work have been made since the master plan, however, we decided to include all major changes made up to the time of our work rather than stopping at March 1980.

We compared the January 1979 work plans with the latest available work plans for each of the 11 major NECIP work elements and identified the major changes. We then ascertained, to the extent practicable, the reasons why the specific reductions were selected and the impacts of these reductions on Northeast Corridor operations after NECIP is completed. These impacts reflect changes from what FRA intended to accomplish at the time of the January 1979 redirection study report and do not consider what was originally intended under NECIP or what the situation on the corridor is today or was before NECIP began.

In doing our work, we used available documentation, but because many of the specific decisions and impacts were not documented, we also had to rely to a large extent on discussions with FRA, Amtrak, and DCP officials. We performed our work primarily at FRA, Amtrak, and DCP offices in Washington, D.C., and at Amtrak's project office in Philadelphia, Pennsylvania.

This interim report does not address two issues related to the work deletions because information on those issues has not been fully developed. The first issue is the possibility that Amtrak will have to do much of the deleted work on its own after the project is completed in 1985. Amtrak estimates that its cost to do essential deleted work will exceed $800 million, with inflation, but we have not verified this estimate. The second issue concerns the priorities for selecting project improvements established by the Passenger

Railroad Rebuilding Act of 1980. We will address both of these issues in our final report on this assignment.

As part of our review of NECIP, we will also be reviewing the basis for the project's current cost estimates. This work should indicate the extent of further project work reductions that will have to be made because previously underestimated costs may increase. We plan to include this issue in our final report on this assignment. That report will also discuss how our prior report's recommendations have been implemented and Amtrak's productivity in performing track work under the project.

CHAPTER 2

NECIP WORK REDUCTIONS AND THEIR IMPACTS

Substantial reductions have been made in almost every project work area since the January 1979 redirection study report. The work is still being reduced as cost overruns develop, and, according to project officials, additional reductions likely will be made in the future. Moreover, some of the individual work projects are still only in the conceptual design stage and have not been planned in detail. The reductions made so far could result in reduced ontime reliability; reduced passenger comfort; reduced safety for passengers, crew members, and the public; and increased future maintenance costs for Amtrak as compared to the project anticipated in January 1979. The project FRA turns over to Amtrak on October 1, 1985, will be a corridor improved to a much lesser extent than was envisioned in January 1979.

NECIP's planned work has been reduced frequently since the August 1977 draft implementation master plan, the first plan for meeting the completion dates and funding levels specified by the 4R Act. In March 1979, we reported that the work in the January 1979 redirection study report had been reduced from what was originally intended, resulting in increased future maintenance costs and reduced passenger comfort, ontime reliability, and safety. We also noted that the work planned in some project elements continued to change even though the redirection study report had just been issued. There have been further reductions since then.

The January 1979 redirection study report stated that the total estimated cost for NECIP was $2.404 billion. In July 1979, NECIP reestimated the cost of the work included in the January 1979 redirection study at $2.869 billion. As a result, the Secretary of Transportation's December 1979 proposal that the Congress fund NECIP at $2.5 billion required that at least $369 million worth of improvements included in the January 1979 redirection study be dropped. (The Dec. 1979 proposal cited a figure of $360 million for this change.) Shortly afterward, NECIP reestimated that what the Secretary proposed in December would actually cost $2.693 billion. Therefore, NECIP reduced its work scope by another $167 million to arrive at its $2.526 billion March 1980 Corridor Master Plan, still $26 million over NECIP's authorized ceiling. As discussed below, NECIP's work plans have changed further since March 1980.

We were able to obtain documentation showing what work reductions had been made since January 1979, but we could find little documentation showing why NECIP chose to eliminate specific work, or what effects specific reductions would have on the finished project. Accordingly, we had to rely primarily on discussions with FRA, Amtrak, and DCP officials for this information. In general, FRA and DCP officials said the reductions were based on the collective engineering judgment of FRA, Amtrak, and DCP as to which reductions would have the least impact on NECIP's goals. However, none of the officials could quantify the impacts of the reductions. The Project Director told us that some of the impacts were too small to quantify. Amtrak also stated that, even with the reductions, it believes passenger, crew, and public safety will be adequate under the current NECIP work plans.

NECIP has 11 major work areas (subsystems), each of which is discussed in some detail in the following sections. The March 1980 budget, including the amount for management and engineering, and the possible effects of the reductions we identified in each subsystem are shown in the following table:

Project subsystem	March 1980 budget	Possible adverse effects of reductions: Service reliability	Passenger comfort	Safety	Future maintenance
	(millions)				
Route realignments	$ 70.1				
Track structures	809.1	x	x		x
Bridges	255.4	x		x	x
Electrification	298.4	x			x
Signaling and traffic control	391.3	x		x	x
Communications	9.3				
Fencing	21.3	x		x	
Grade crossings	16.0			x	x
Stations	195.0		x		x
Service facilities	148.1				x
Tunnels	30.6			x	x
Subtotal	2,244.6				
FRA and DCP program management and systems engineering	281.3				
Total	$2,525.9				

ROUTE REALIGNMENTS

Although the work plan for the route realignments subsystem is not in final form, it seemed to have no significant changes. DCP documents showed that the budget had been reduced by $14.5 million since January 1979 and attributed this to better estimates of the work required. For example, FRA's general engineer for the NECIP systems engineering group and the NECIP head systems engineer of Bechtel Incorporated--an FRA consultant--identified five curves whose work descriptions were changed from realignment to best fit 1/ on the basis of more accurate architect/engineer drawings.

TRACK STRUCTURES

Reductions of $102.9 million in track structures work will probably result in reduced ontime reliability, reduced passenger comfort, and increased future Amtrak maintenance costs. These reductions were made primarily to stay within budget ceilings, although some were due to work plan refinements and reductions related to other subsystems.

The track structures subsystem includes work on the track itself, such as installation of ties and rail, as well as a number of other related items, such as improvements to interlockings, 2/ installation of track at service facilities, track work in tunnels, improvement of drainage ditches, and certain allocated costs for Amtrak's program management.

Generally, FRA, Amtrak, and DCP officials said that the track work deleted from NECIP needs to be done and Amtrak plans to request funds from the Congress to do most of this work sometime in the future. However, there is some confusion about the specific reductions and impacts because NECIP documents and FRA, Amtrak, and DCP officials all seem to differ.

1/Best fit work involves shifting the track no more than 6 inches and can be done with track surfacing equipment; curve realignments are more extensive.

2/An interlocking is an arrangement of signal appliances and special track work, such as switches, which allows trains to move from one track to another.

DCP listed the following reductions that occurred in the track structures subsystem from January 1979 to March 1980:

Work category	Amount (millions)
Track preparation:	
Undercutting a/	$ 37.0
High-speed surfacing b/	3.3
Shoulder ballast cleaning c/	0.6
Rail grinding d/	0.2
Total	41.1
Interlockings	3.8
Amtrak program management	22.1
Material procurement, distribution, and pickup and service facility track	28.4
Other work	7.5
Total reductions	$102.9

a/Undercutting involves removing ballast--crushed gravel or rock laid to form a bed for the railroad--from below the tracks while the rails and ties remain in place, cleaning the ballast, and replacing it. This process improves drainage and helps stabilize the track.

b/Surfacing involves aligning the rails' profile (vertical positioning) and cross section (distance between the two rails of a track) to an established plane, including final adjustment of the ties in the established ballast.

c/Shoulder ballast cleaning is the cleaning of only that part of the ballast which is beyond the ends of the ties.

d/Rail grinding is a process used to smooth the surface of the rails.

Track structures, with a budget of $809.1 million in the March 1980 Corridor Master Plan, is the largest and most important subsystem under NECIP. The January 1979 redirection study report stated that a sound track structure is a primary requirement for operating a reliable high-speed rail transportation system. Our comparison of documents supporting the redirection study report and the March 1980 Corridor Master Plan; findings from other FRA, DCP, and Amtrak documents; and

our discussions with NECIP officials showed that planned track work has been reduced substantially since January 1979. There were a number of differences, however, between our calculation of the work reductions based on the official project documents and the comments made by NECIP officials. These differences are discussed on page 13.

Undercutting

Large reductions in undercutting could result in increased future maintenance costs, decreased ontime reliability, and difficulty in maintaining speeds needed to meet trip time goals. The January 1979 redirection study report stated that all high-speed tracks and at least one adjacent non-high-speed track would be undercut to remove material that is preventing good drainage from the track structure. This work makes the track easier to maintain because good drainage reduces the need for periodic surfacing and helps prolong the life of the track structure. If additional surfacing is required, ontime reliability could suffer because of the disruptions this work could cause.

Our analysis showed that undercutting was deleted on 353 track miles, about 37 percent of the miles planned for undercutting in the redirection study. According to an April 23, 1980, internal memorandum to the President of Amtrak, 236 miles of the undercutting deleted was on high-speed track.

NECIP officials told us reduced undercutting could result in Amtrak's inability to maintain high speeds over the corridor, less operational reliability, and higher maintenance costs. For example:

--DCP's deputy manager for engineering support said that all the tracks need to be undercut, or additional future maintenance will be required.

--An Amtrak staff engineer said that all high-speed tracks would have to be undercut to maintain high speed over the corridor.

--DCP's chief of systems planning said that Amtrak would have to pick up the reductions or the corridor goals might be jeopardized.

Shoulder ballast cleaning was substituted for undercutting in some areas to eliminate some of the effects of the undercutting reductions, according to a February 1980 DCP document explaining the Corridor Master Plan. DCP's deputy manager for engineering support noted, however, that future

higher maintenance costs would result from the substitution because shoulder ballast cleaning is not as effective as undercutting in maintaining the precise track profile and cross section needed for high-speed operation.

NECIP's Project Director told us that the undercutting work which was done had proved to be more difficult and time consuming than had been originally anticipated. He also said that shoulder ballast cleaning would be more cost effective in some situations and that, in any case, the undercutting work deleted from NECIP will eventually be done by Amtrak as part of its maintenance work.

High-speed surfacing

At the time of the January 1979 redirection study, 962 miles of track were supposed to be surfaced. There is some confusion about the extent of the reduction since then (see p. 13.), but as much as 608 miles may have been dropped from the surfacing plans.

High-speed surfacing is required about 6 months after undercutting because loose ballast resettles after the process, according to FRA's track structures engineer. According to that official, DCP's chief of systems planning, and DCP's deputy manager for engineering support, high-speed surfacing was deleted from both high-speed and non-high-speed tracks.

According to FRA's track structures engineer, surfacing is needed to assure that the track profile and cross section meet specifications. He said that not doing the high-speed surfacing could result in slower train speeds and affect attainment of corridor goals if the track conditions were allowed to get far enough out of specification. An Amtrak staff engineer stated that if the deferred high-speed surfacing was not done, operating a high-speed railroad would be practically impossible.

NECIP's Project Director said that Amtrak will do high-speed surfacing on all of the track deleted from NECIP as part of Amtrak's maintenance program.

Interlockings

Reductions in the number of interlockings to be reconfigured and renewed could reduce ontime reliability. NECIP officials varied in their assessment of how significantly ontime service would be affected. (See p. 13.)

Our analysis of FRA documents showed that reductions in interlocking reconfigurations included changing 21 crossover tracks to slower speed or hand-operated crossovers. An FRA engineer in the Office of Engineering said that if a train was diverted through these crossovers to avoid a track outage, time would be lost because of the slower speeds required to negotiate the changed crossover track and, in some cases, the need for someone to get off the train to throw the switch. NECIP's Project Director told us that the specific reductions were proposed by Amtrak and DCP and pointed out that these interlockings are all north of New York, where traffic is not heavy.

Some interlockings were downgraded from replacement of all involved track (renewal) to replacement of only worn parts (rehabilitation), according to various FRA, DCP, and Amtrak officials and documents. The July 17, 1979, FRA cost reduction candidate document showed that 20 interlockings were changed from renewal to rehabilitation and that this change would result in increased future maintenance costs. DCP's deputy manager for engineering support told us that the time spent on maintenance of the rehabilitated track will result in reduced operational flexibility. FRA's track structures engineer stated that the interlockings affected will have to be replaced 5 to 15 percent earlier.

Amtrak program management

Amtrak's total $131.4 million program management budget for NECIP as of March 1980 is allocated to four subsystems--track structures, bridges, electrification, and signaling. This budget includes such things as Amtrak's management and systems engineering costs; training people to work on NECIP and operate installed features; insurance; and watchmen, flagmen, and survey crews. The total budget had been reduced by $22.1 million, all of which was deleted from track structures.

According to a November 1979 letter from FRA's Project Director to Amtrak, the training budget was reduced by $12 million. A staff member of FRA's program control board, which is responsible for reviewing changes, told us that fewer people would have to be trained and would have to be trained less frequently than previously estimated.

The other $10 million was eliminated largely because of reductions in other subsystems. These costs are figured on the basis of a percentage of work in other subsystems, according to the FRA staff member of the NECIP program control board, and so the cuts in other subsystems were also reflected in program management.

Material procurement, etc.

Material procurement cuts were possible because of corrected planning assumptions and reductions elsewhere. A March 1980 letter from DCP's general manager to the NECIP Project Director showed that the reductions included ballast procurement associated with high-speed surfacing, tie plates and anchors used to secure rails to cross ties, service facility cross tie procurement, and reduced sales tax set-aside.

Amtrak and DCP documentation showed that 50 percent of the 1982, 1983, and 1984 material distribution and pickup budgets were dropped. DCP's chief of systems planning said this was because, initially, needs were assumed to be the same every year while actually, as work progresses, they decrease. Correcting those assumptions caused the reductions. Amtrak's NECIP resources logistics manager stated that the major reason for the reductions was that DCP overestimated the number of people involved. FRA's NECIP track structures engineer said that although some of the reductions might have been the result of initial estimate corrections, this work category was a support area and reductions were due to work reductions in other areas.

Reductions in other subsystem elements

The reductions in the remaining work elements generally involved relatively small dollar amounts. Some brief examples of these reductions follow.

About 283 track miles of rail grinding were deleted. In general, the comments we obtained from NECIP officials indicated that the deletion would increase noise and vibration, which would reduce passenger comfort and accelerate track deterioration. NECIP's Project Director said that he is sure that Amtrak will do this work as part of its maintenance program if problems develop.

About 11 miles of used rail will be substituted for new rail near Boston. NECIP officials generally said this substitution would not have much of an impact because traffic is light in that area.

The largest reduction in these other subsystem elements was $5.2 million, which is only identified as "undefined scope" in the available document. We did not follow up on this item because of the limited time available for our work.

Inconsistencies between project documents and officials' statements

In determining the extent of reductions in track work and the impacts of these reductions, we found a number of inconsistencies. Documents and/or project officials differed on the extent of reductions and on the impact of such reductions.

The official program document that describes the planned NECIP work is the Program Requirements Document. Comparing the requirements document for the January 1979 redirection study with the requirements document for the March 1980 Corridor Master Plan shows the changes in work for individual items, such as undercutting and shoulder ballast cleaning. However, the changes we identified did not agree in many cases with other program documents and with officials' understanding of the work reductions. For example:

--Our comparison of the Program Requirements Documents for shoulder ballast cleaning showed an increase of about 164 miles, whereas a March 24, 1980, letter from DCP to the FRA Project Director showed a reduction of 94.8 miles. In addition, the September 1979 requirements document that covered the redirection study showed a total of about 235 miles of shoulder ballast cleaning, whereas an October 23, 1978, document explaining the redirection study work showed 519 miles.

--Our comparison of the Program Requirements Documents showed that 608 miles of high-speed surfacing were deleted, but attachments to a March 1980 letter from DCP's general manager to the FRA Project Director showed that only 305.5 miles of surfacing were deleted.

--An Amtrak track design engineer stated that most of the track work deletions were made to non-high-speed tracks. However, FRA's NECIP track structures engineer told us that undercutting reductions were made on both high-speed and non-high-speed tracks. Our analysis showed that about 353 miles of planned undercutting were deleted and, according to an Amtrak April 1980 internal memorandum, 236 miles of this undercutting were on high-speed tracks.

We received differing comments about the effects of some of the track work reductions. We could not determine if the differences simply represented differing viewpoints or if the effects of the changes cannot be accurately quantified.

For example:

--NECIP officials did not agree on the effect of interlocking reconfigurations deleted from the project. DCP's director of systems planning and an Amtrak track design engineer said that reconfiguration deletions would have minimal effect on train operations. DCP's deputy manager for engineering support said that, while not significant with the present volume of traffic, reliability would be affected with anticipated increases in traffic volume. An FRA engineer in the Office of Engineering said that corridor capabilities and ontime reliability would suffer, but that the overall effects were not quantified.

--NECIP officials differed in their assessment of the effects of shoulder ballast cleaning eliminations. DCP's director of systems planning said that ballast cleaning deletions would have a minimal effect on corridor goals; exact effects depend on the location. An Amtrak staff engineer said that deleting the ballast cleaning would result in poor track drainage. DCP's deputy manager for engineering support said that not cleaning ballast on outside tracks would prevent the inside high-speed track from draining as freely as desired.

BRIDGES

NECIP has cut out about $61 million in bridge improvements, and planned work may have to be reduced further because recent cost estimates on some bridge projects exceed the March 1980 Corridor Master Plan budget by $37 million.

According to FRA and DCP records, bridge work reductions included (1) downgrading planned work from replacement or major improvement to minimum repairs, deletion of all improvements, or a reduction in the scope of improvements on 68 bridges, (2) not sandblasting and painting 10 bridges, and (3) eliminating improvements to walkways and refuge bays 1/ on some bridges.

According to DCP's assistant deputy project manager and other DCP personnel, reductions in bridge work were based on the knowledge and judgment of DCP engineers and were

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1/A refuge bay is a platform extending outward from the side of the bridge, which allows a worker on the bridge to get out of the way of passing trains.

agreed to at meetings between FRA, DCP, and Amtrak. The FRA bridge program manager stated that there was no single set of criteria used to decide on the cuts. He said representatives of FRA, Amtrak, and DCP used field inspections of the bridges and a priority listing of bridges prepared by DCP to decide what work to cut.

Movable bridges

According to a March 24, 1980, DCP letter to FRA, work planned for 13 of 15 movable bridges 1/ on the corridor has been reduced by $28.8 million.

Planned rehabilitation work on the Dock bridge at Newark, New Jersey, was deleted, according to DCP's deputy project manager and other DCP personnel, because it is the newest (about 40 years old) and is in the best condition of any movable bridge on the corridor. Planned rehabilitation work on two other bridges was reduced although they still will be rehabilitated.

Other reductions involved changing plans for replacement or major rehabilitation of two bridges to what FRA's bridge program manager termed "minimum essential repairs." NECIP had previously planned to replace the Niantic bridge in Connecticut with a new structure and rehabilitate the Devon bridge in Connecticut (renovate the existing structure to a like new condition using new components where needed). According to FRA's bridge program manager and DCP's assistant deputy project director and other DCP personnel, a DCP-prepared priority ranking was used in making these two cuts to the movable bridge budgets, but our analysis showed that the list was not followed.

When the final round of program cuts was made, the first bridge on the list--the Niantic--was reduced from replacement to minimum essential repairs for a reduction of $7.9 million, but the next two listed bridges were skipped and the budget on the fourth bridge--the Devon--was reduced by $7.7 million. According to the FRA bridge program manager, the priority list was not followed because the amount of funds needed to be cut from the overall bridge budget approximated the amount that could be cut from the Devon bridge.

The FRA bridge program manager told us the reliability of train operations may be affected by the deletion of work

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1/A bridge over a waterway which has a section that can be moved out of the way to allow the passage of vessels.

on movable bridges. According to a May 14, 1980, internal DCP memorandum, reducing bridge work to minimum essential repairs, as was done on the Niantic and Devon bridges, sacrifices improvements in the operating reliability of the movable spans. NECIP's Project Director told us, however, that he did not agree that operating reliability would be affected by the work reductions. He said the impact would be reduced longevity of the bridges.

Planned sandblasting and painting was deleted on the 10 movable bridges that were to be replaced or rehabilitated under the March 1980 program. DCP bridge engineers stated that in their judgment the funds scheduled for sandblasting and painting would be better used to put "new steel" into these bridges. According to a July 16, 1979, DCP document on bridge program reductions, the deletion of painting will result in continued corrosion damage due to the marine or semimarine environment, shortening the remaining useful life of the bridges.

Fixed bridge reductions

Based on our comparison of the planned work in the January 1979 and the March 1980 programs, we estimate that planned improvements were eliminated entirely or were reduced on about 62 fixed bridges. FRA's bridge program manager did not have a count, but said our number sounded about right.

According to a July 17, 1979, FRA document on cost reduction candidates, reductions to the work on fixed bridges will lead to major increases in future Amtrak maintenance, but will not affect safety or reliability if the required maintenance is done. Two Amtrak engineers told us that because of safety concerns, bridges with low load ratings--categorized as critical in a pre-NECIP bridge study--probably would require more frequent inspections than the annual inspections Amtrak's present procedures require. One engineer also said maintenance costs would increase, but he could not say exactly how much.

Safety walks and refuge bays

Work planned on walkways and refuge bays proposed in accordance with approved safety criteria was reduced, according to a February 1980 DCP document. According to DCP's assistant deputy project director and other DCP personnel, plans in the January 1979 redirection study provided for construction of additional walkways and refuge bays as well as the upgrading of some existing walkways to improve worker safety when trains pass over the bridges.

Additional reductions may occur

There is an increasing overrun in the bridge budget and FRA has not decided how to fund it. The May 1980 shortfall of $22.8 million for major bridge projects had grown to $37.4 million by August 1980. According to available documents, the budget overrun was mainly caused by the difference between inflation rates used to arrive at the bridge budgets in the March 1980 Corridor Master Plan and the rates used later by DCP to estimate the cost of improvement work. According to a March 1980 DCP paper explaining the development of the master plan, FRA directed DCP to use an escalation rate of 7 percent starting with the 1979 work season for everything but Amtrak labor. The actual national inflation rate recently has been far above 7 percent. As of September 9, 1980, FRA had not determined how it was going to provide the funds needed to do this work.

Speed restriction on Susquehanna River bridge

Speed on the Susquehanna River bridge in Maryland is currently restricted to 80 miles per hour as compared to the 90 to 105-mile-per-hour speed that FRA's train performance calculations show is needed to meet the trip time goal. According to FRA analyses, the lower speed would add 12 seconds to the corridor running times. No structural improvements were planned for this bridge either in the January 1979 redirection study report or at the time of our work.

In May 1979, Amtrak's NECIP project manager asked FRA to authorize a comprehensive engineering investigation and analysis of the bridge to determine the reason for the speed restrictions. He noted that inspections of the bridge by a joint Amtrak, DCP, and FRA team had documented many problems, including corrosion and side sway under load. In an August 1979 memorandum, the FRA Project Director notified Amtrak that FRA would authorize an engineering study of the bridge, but said that if anything is wrong with the bridge, FRA will not pay to fix it. A contract to study the problem was to be awarded by DCP as of July 1980.

ELECTRIFICATION

Reductions in work on the system that supplies power for the corridor's electrically powered trains may limit the corridor's capacity and work against its reliability and maintainability. The reductions--totaling $113.6 million--affect the Washington to New York segment of the corridor and are primarily the result of a decision to defer converting

the voltage and frequency of the power supply system on that part of the corridor. Planned work for catenary 1/ improvements and rehabilitation was also reduced.

The January 1979 redirection study provided for full electrification of the corridor by constructing a new 25-kilovolt (kv) 60-hertz (Hz) 2/ power supply and catenary system for the segment between New Haven and Boston, which was previously unelectrified, and converting the existing 11.5-kv/25-Hz power supply and catenary system between Washington and New Rochelle, New York, 3/ to 25 kv/60 Hz. Conversion included replacing the existing power supply system with a virtually new one, upgrading the catenary to provide for increased operating speeds, and eliminating deferred maintenance. It also included other work such as increasing clearances between the top of the vehicle and the overhead wires and between the wires and the overhead structure at bridges and in tunnels, and converting electric-powered commuter vehicles which use the corridor to allow operation on the new power system.

As part of its reductions in developing the March 1980 Corridor Master Plan, FRA deleted conversion of the power supply between Washington and New York while leaving the new electrification system between New Haven and Boston substantially unchanged. Many other improvements to the system south of New York were deleted or substantially reduced, although funds for rehabilitating the existing 11.5-kv power supply were added.

As shown in the following table, the largest reductions were caused by the decision to defer converting the power supply south of New York.

1/The catenary is the system of overhead wires which provides electric power for the trains.

2/A unit of frequency equal to one cycle per second. Most electricity distributed in the United States is 60 Hz.

3/The area between New Rochelle, New York (a suburb northeast of New York City), and New Haven, Connecticut, is not owned by Amtrak and was not scheduled for improvements to the electrification system under NECIP. The existing 11.5-kv/60-Hz power system in this area is being converted by State organizations to 12.5 kv/60 Hz.

	Conversion	Other reductions	Total
	----------(millions)---------		
Power supply and control	$26.0	$ -	$ 26.0
Vehicle conversion	33.8	-	33.8
Catenary work	6.9	39.6	46.5
Bridge and tunnel clearance work	2.9	3.7	6.6
Design	-	0.7	0.7
Total	$69.6	$44.0	$113.6

Power supply conversion

FRA's decision not to convert the power supply south of New York was apparently made for several reasons. In December 7, 1979, letters to several Senate and House committee and subcommittee chairmen, the Secretary of Transportation said that he was recommending the deletion because the work was largely based on forecasts of future increases in ridership which were not yet proven or on earlier decisions to correct deferred maintenance which Amtrak inherited with its acquisition of the corridor properties. The Secretary recommended that the conversion be deferred until traffic levels justify Amtrak's consideration of further improvements or systematic correction of deferred maintenance.

FRA's Project Director, in a June 1980 letter to a committee of commuter operators, said that one reason for eliminating the power supply conversion was that the commuter operators had expressed concern that the power and frequency level selected would lead to operational problems for the Southeastern Pennsylvania Transportation Authority and the New Jersey Department of Transportation, whose commuter trains run on the corridor. DCP's project manager said that two factors focused attention on the south end and the possibility of achieving substantial program reductions by retaining the existing system there: the pressure to make electrification reductions in response to a $2.5 billion funding limitation for all of NECIP and the fact that the new construction north of New Haven could not be done except as a complete package.

Corridor capacity will be limited because the additional capability offered by a 25-kv system will not be available. In an August 1979 letter to us, the Department of Transportation (DOT) stated that the performance of the existing system limited train size to six-car Metroliners or one

AEM-7 locomotive 1/ pulling eight cars. It said that growth much beyond 18 million passengers annually 2/ would require longer trains and a higher voltage power supply, that the six-car train sizes recommended in the January 1979 redirection study report were for 1983 and 1985 high-speed service levels, and that the service must be capable of improvement and expansion when needed. DOT concluded that conversion to a 25-kv/60-Hz system would eventually be necessary but said that the exact timing of the conversion was open to review. As late as January 1980, FRA was projecting that the power capacity of the existing system would be fully used before 1990, but the chief of FRA's planning and analysis division said that FRA is taking another look at its ridership projections. NECIP's Project Director said that using more frequent short trains was also being considered as an option for increasing passenger capacity with the existing system.

In its letter to us, DOT said that because the existing system had been operated well beyond its design life, its reliability was questionable. DCP's project manager agreed that the reductions would have a long-term impact on the power supply's reliability. FRA's project coordinator for electrification and Amtrak's engineer for electric traction design stated that the added work to rehabilitate the existing power supply system would extend its useful life for another 10 to 20 years.

Catenary improvements and rehabilitation

The reductions in catenary improvements could have an adverse impact on the electrification system's maintainability and reliability. Some of the deleted work was intended to improve the high-speed performance of the catenary system, while other deleted work would either have improved general performance or corrected deferred maintenance. Many reductions were based on engineering judgments that certain work could be deferred for a short time. Others, however, were across-the-board percentage cuts and went beyond the reductions that were recommended based on engineering judgment.

1/AEM-7 locomotives will be the locomotives used--in addition to Metroliners--for high-speed corridor service.

2/DOT said that it expected ridership to increase to 24.6 million by 1995. Actual ridership during fiscal years 1977-79 was 9-10 million each year.

FRA's project coordinator for electrification and DCP's project manager told us that DCP's associate firm and consultant for electrification engineering, Electrack Incorporated, recommended specific reductions for the consideration of top FRA and DCP management. FRA's electrification project coordinator said, however, that Electrack was not given formal criteria to follow in making its recommendations. Electrack's vice president told us that the first reductions it recommended were for work which could be deferred for 3 to 5 years based on engineering judgment that deferral would not affect performance of the catenary system.

We compared documents prepared by Electrack and DCP to assess the sequence of recommendations and reductions. Initial electrification reductions were completed in November and December 1979. These reductions, which corresponded to the reductions Electrack said could be made based on engineering judgment, included work which was no longer needed because of the decision not to convert the power supply south of New York. The reductions also eliminated some leveling of the catenary at approaches to bridges, repairs to catenary poles and foundations, and work necessary to allow movement of oversize loads under live catenary. Electrack's vice president told us that any work reductions beyond these would eliminate work that should be done based on engineering criteria, in Electrack's judgment.

According to a March 1980 memorandum from DCP's general manager to FRA's NECIP Project Director, additional reductions in catenary work--beyond those Electrak had recommended earlier--were necessary because of increased cost estimates for the new catenary work north of New Haven and the additional costs to accommodate rehabilitation of the existing power supply system south of New York. To offset these and other increases within the electrification subsystem, DCP said an additional $24.4 million in catenary work south of New York was eliminated. We examined documents prepared by Electrack on these reductions and discussed the reductions with Electrack's vice president and DCP's electrification project engineer. It appears that most of the reductions were made by taking percentage decreases--a result that would not be expected if the reductions were based on engineering analysis. The two officials confirmed that the reductions were not based on engineering analysis but stated that the work categories had been ranked so that lower priority work would receive greater cuts.

Many of the later reductions may not have an immediate impact on the electrification system's performance because the work was needed mainly to cure deferred maintenance or improve long-term reliability. Replacement/repair of

damaged catenary pole foundations and guy stubs, 1/ for example, was reduced by about 80 to 100 percent south of New York. Although NECIP documents show that some foundations are in a severe state of disrepair, Electrack's vice president and DCP's electrification project engineer said that this condition will not impair catenary performance until some future time when the foundations no longer provide support. Amtrak's engineer for electric traction agreed that the deleted work was not necessary to maintain operations.

Other reductions, in contrast, may have a more immediate impact on Amtrak's ability to achieve NECIP trip-time and reliability goals. These reductions affected work intended to improve the performance of the pantograph, which extends from the roof of a locomotive or self-propelled Metroliner car 2/ and collects current by pushing upward against the catenary. According to a December 1976 Electrack study, a February 1980 memorandum from DCP's electrification project engineer to the manager of engineering, and discussions with Electrack's vice president and other officials, the existing catenary system may be susceptible to problems in maintaining continuous contact with the pantograph. This condition may lead to such things as loss of motor power and additional wear to electrical components, under the following combination of conditions:

--High temperature.

--A six-car Metroliner train with three pantographs in contact with the catenary.

--High speeds.

Although all of these could occur on the corridor, there is disagreement as to exactly when train performance would be noticeably affected and to what extent, as discussed later in this section.

1/A guy stub is the foundation into which a guy wire is anchored. Guy wires are used to restrain the movement of catenary poles.

2/Each self-propelled Metroliner car has one pantograph, located at one end. When coupled to another car, only one pantograph is used for each pair of cars.

Several categories affected by the $24 million in percentage reductions south of New York, such as the introduction of mechanical overlaps, 1/ involved work intended to improve system performance by reducing the potential for loss of pantograph contact due to variations in catenary tension or sudden changes in the mechanical rigidity of the catenary. According to Electrack's vice president, catenary wires stretch and require retensioning about every 3 years. He told us that existing corridor catenary has continuous segments about 10 miles long. Because such long segments are not mechanically manageable, retensioning is done in several phases, which takes a long time to complete and results in inaccurate tensions. The introduction of mechanical overlaps, which was reduced about 60 percent from the level remaining after the November and December reductions, was intended to overcome these problems by shortening continuous catenary wire lengths to about 2 miles.

Electrack's vice president said that another important factor in improving catenary current collection was introducing higher wire tensions, which would reduce sagging of the wire in hot weather. This work was reduced 50 percent, however, as part of the $24 million cutback.

According to Electrack's December 1976 report on electrification systems and standards, the catenary wire in the existing system sags in hot weather, causing the pantographs of trains to set up oscillations in the wire. The oscillations cause the pantographs to momentarily lose contact with the wire and interrupt the power supply to the train. Electrack's vice president, citing these findings, told us that with the existing catenary a six-car Metroliner could experience unsatisfactory performance at 120 miles per hour in temperatures well below 100 degrees Fahrenheit and that performance could decline at speeds as low as 80 miles per hour on very hot days. He said that unreliable operation could be expected in the hot summer months due to the catenary reductions. DCP's electrification project engineer said, in a February 1980 memorandum, that wire temperatures high enough to interfere with train performance were not unusual on a hot day.

Other officials we talked to said the reductions would not substantially impair service. FRA's project coordinator for electrification said that the catenary reductions may

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1/A wiring configuration used to keep lengths of catenary wire mechanically independent of each other while maintaining electrical continuity.

have some adverse impact on reliability in extreme temperatures but that the potential problems were not significant enough to warrant sacrificing other higher priority corridor work. Amtrak's engineer for electric traction said that although the improvement would be desirable, budget permitting, deferring the catenary improvements would not preclude satisfactory operation of six-car Metroliners at the 120-mile-per-hour speeds necessary to achieve the corridor trip time goal. The same official told us, however, that if 120-mile-per-hour speeds could not be maintained, a constant tension 1/ catenary system would have to be installed. Amtrak estimates that a constant tension system could cost as much as $90 million.

Amtrak's NECIP project manager said that he had no information suggesting that six-car Metroliner operation within the established trip-time and reliability goals would suffer. However, Amtrak's engineer for electric traction told us that Amtrak was using its own funds to install 100 miles of new catenary wire to improve system reliability to cover work deleted from NECIP.

We do not have the technical expertise to resolve the differences between the comments of Electrack and other NECIP officials.

Future Amtrak costs

Several factors affecting future Amtrak costs on electrification are uncertain. As noted previously, commuter agencies have questioned the basic specifications of the planned new power supply system--voltage and frequency. FRA documents we reviewed show that FRA is proposing a detailed study to recommend a system that would best serve all users. If the power supply system is eventually converted, based on the study, Amtrak will have to pay for it. Secondly, DOT believes that conversion should be undertaken only when demand requires it, but there appears to be no reliable estimate of when this might be. Finally, estimates of how long the present system will operate reliably vary considerably and, as discussed above, the reliability of the catenary system is questionable. FRA's electrification project coordinator

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1/In a constant tension catenary system, wires are terminated in a way that automatically corrects for the effects of expansion and contraction due to temperature changes. This is done, for example, by the use of counterweights instead of fixed wire terminations.

said that the leadtime necessary for Amtrak to plan and implement the conversion of the electrification system could be 5 years or more.

If conversion is undertaken later, the financial and management burden on Amtrak may be substantial. All of the uncertainties discussed above could affect the future cost of installing a converted system. Amtrak's NECIP project manager said that regardless of current planning, whatever accommodations were required to protect the interests of other corridor users would also be Amtrak's responsibility, because Amtrak cannot make physical changes in the corridor without the concurrence of other operators affected by the change. According to preliminary estimates compiled by Amtrak staff, conversion costs could run as high as $160 million, including the $90 million for the constant tension catenary system, with an additional $100 million or more required for converting non-Amtrak vehicles, some of which may have to be paid by other users of the Northeast Corridor.

SIGNALING AND TRAFFIC CONTROL

Work estimated to cost $34 million was deleted from the signaling and traffic control subsystem, which may affect safety, ontime reliability, and Amtrak maintenance after NECIP is completed. FRA's Safety Board has not approved the proposed signaling for the corridor and some of the deletions may have to be reinstated to obtain the Board's approval.

The signaling and traffic control system encompasses the various types of equipment required to safely control the movement of trains. The equipment includes such things as signals along the right-of-way and in locomotive cabs, devices for detecting the presence of trains on the tracks, and controls for operating interlockings.

Reductions in the signaling program amounted to about $34.3 million, as summarized below.

	Reductions (millions)
Compatibility with 60-Hz electrification	$14.1
Reverse signaling a/	3.7
Remote control interlockings b/	4.2
Switch heaters	3.2
Centralized traffic control	9.1
Total	$34.3

a/Reverse signaling is an automatic system which provides for the safe movement of trains going in the opposite direction from the normal direction of traffic on a particular track.

b/Remote control interlockings can be operated from a location physically removed from the interlocking.

The reductions, according to DCP documents, were offset by work additions of $23.8 million and increases due to reestimations of previous costs of about $36.7 million. The net result was an overall increase in the signaling program of $26.2 million from the revised redirection study estimate of $365.1 million to the March 1980 Corridor Master Plan estimate of $391.3 million.

According to a March 1980 letter from DCP's general manager to FRA's NECIP Project Director, the work additions and reestimations were generally necessary to (1) correct inadequately defined scopes of work and errors in previous estimates, (2) revise quantity estimates based on more refined plans, (3) correct errors in the data base DCP used in preparing program plans, (4) account for additional costs because actual inflation exceeded the projection, and (5) account for revisions to the schedules for doing the work. For example, the letter said that over $18 million was added because previous budgets had not included funds for electromagnetic interference shielding of signal cable. DCP's project engineer for signaling stated that shielding is necessary for compatibility with the future 60-Hz electrification system and should be done concurrently with signal circuit rehabilitation. In another case, over $3 million was added for new signal bridges 1/ required because signals

1/Signal bridges are structures spanning one or more tracks for the purpose of supporting signals.

were respaced. DCP's chief of systems planning told us that the signal bridges had been erroneously omitted from previous estimates.

Reductions in planned work

We discussed the reductions with FRA's project coordinator for signaling, DCP's project engineer for signaling, and an Amtrak communication and signaling engineer, as well as other DCP and Amtrak engineers and officials. The largest reduction, amounting to about $14 million, related to work that would be necessary if a 60-Hz electrification system were installed south of New York. Most of the other reductions resulted from changing the original plans for across-the-board installation of some improvements to selective installation. The engineers and officials we talked to at FRA, DCP, and Amtrak generally said that the reductions would not have too bad an effect on corridor operations.

Scope reductions in reverse signaling amounted to about $3.7 million, which included $1.6 million for deleted electric switch locks. Reverse signaling provides greater flexibility by facilitating the use of a track for trains moving in either direction. Electric locks prevent unauthorized operation of hand-operated switches. Reverse signaling and associated electric locks were deleted from the two non-high-speed tracks in several sections between Philadelphia and New York. The work was retained for the two high-speed tracks which would still allow for flexibility in routing traffic. DCP and Amtrak signaling engineers said that electric locks were retained on the higher priority switches.

Planned work to provide for remote control of some interlockings was reduced because it had been planned for interlocking reconfiguration work that was deleted from the track structures program. Therefore, this reduction had no adverse impact other than the impact, if any, of deleting the interlocking. (See p. 10.)

DCP originally planned to replace all switch heaters on the corridor but found that many of the existing heaters were in good condition. According to DCP officials, the March 1980 Corridor Master Plan approach is to replace kerosene heaters, which are not considered to be adequate. Electric and propane heaters will not be replaced, but indication devices will be provided to confirm ignition on remotely ignited propane heaters. Electric heaters will be installed on all critical turnouts as agreed

by Amtrak. FRA's project coordinator for signaling said that these work reductions may have some impact on Amtrak maintenance because propane heaters were not as reliable as electric heaters and require more effort because the propane has to be resupplied by hand.

Of the $9.1 million in reductions for centralized traffic control, 1/ $2.7 million resulted from deleting computer programing which would have provided the capability for dispatching trains automatically, rather than manually, and combining equipment planned for this system with equipment planned for another system. DCP officials said that automatic dispatching was not an essential capability and that its effectiveness had to be assessed on a site-by-site basis, but that no such studies had been conducted. Also, $1 million for testing the centralized traffic control system at FRA's test track in Pueblo, Colorado, was deleted, but funds for oncorridor testing were added to the program.

The remaining $5.4 million in reductions represented a cutback in automatic train control devices designed to ensure operation of a locomotive's automatic control system. These devices would be installed at track side and would prevent trains from entering the corridor unless the train's automatic speed control equipment is turned on, thus ensuring that speed restrictions are complied with. The number of entry points for installation of the devices was reduced from 108 to 14. DCP's signaling project engineer told us that there will be no significant adverse impact from the reduction because the capability is only needed at major entry points, and Amtrak had identified the critical entry points. An Amtrak signaling engineer stated that there may be a minor impact on safety but agreed that the critical entry points had been identified.

Unresolved safety issues

Even though program officials believe the reductions in signal work will have no substantial impact, as discussed above, some of the reductions may have to be reinstated before the full system will be approved for use. FRA's Safety

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1/A system which provides for the control of train movements on long sections of railroad from one location. The present corridor has 77 manned control towers for controlling train movements. Centralized traffic control would permit all corridor movements to be controlled from only a few central locations.

Board, acting on the recommendation of the Office of Safety staff divisions, approves any departure from FRA's safety regulations. In connection with the design of the corridor signal system, Amtrak petitioned FRA in June 1979 to approve proposed system modifications and to waive certain FRA safety regulations applicable to the system for a short segment of the corridor to be used as a test case. FRA's project coordinator for signaling told us in July 1980 that contracts had been let for design and delivery of the signaling system even though Safety Board approval had not yet been obtained. He said that any changes necessary to obtain approval were expected to be minor. The Chief of the Office of Safety's Division of Signaling and Traffic Control told us in September 1980, however, that the signal work reductions had not been referred to his office even though it was still reviewing Amtrak's petition.

Because the division chief had not been informed of the reductions, an assessment of their impact on Amtrak's petition or potential impact on future petitions was impossible. The division chief believed, however, that several of the deleted items were material to the petition and could be required for Safety Board approval. The items he questioned account for over $7 million in reductions. Electric locks, for example, which cost about $1.6 million, could be required on hand-operated switches on the corridor, and automatic train control devices costing about $5.4 million could be required at all entry points.

NECIP's Project Director told us that the work changes had not been submitted to the Office of Safety because none of them affected the segment of the corridor covered by Amtrak's petition.

COMMUNICATIONS

The major change in the communications subsystem was the deletion from NECIP and transfer to Amtrak of responsibility for funding and installing the main communication system. 1/ Amtrak's ability to fund this work is uncertain, however, even though NECIP officials believe a new system is essential. The NECIP budget for communications was reduced from $33.1 million in the revised redirection study cost estimate to $9.3 million in the March 1980 Corridor Master

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1/The communications system will provide telephone, radio, and data transmission circuits for use by operating, maintenance, security, and management personnel.

Plan, primarily because of the deletion of $19.4 million for the communication system.

The January 1979 redirection study report provided for purchasing and installing either a fiber optics or a microwave communications system. Also in January 1979, DCP issued its final report on communications system development, which said that a fiber optics cable 1/ system was the most cost-effective method of providing a communications transmission system for the corridor. Citing reduced, and possibly zero, initial costs, DCP recommended that Amtrak negotiate with interested telecommunications common-carrier firms to install a privately funded fiber optics system on the corridor right-of-way in exchange for the use of that right-of-way. In July 1979, Amtrak's vice president/chief engineer notified FRA that DCP's suggestion was being followed and that it appeared that NECIP funds would not be required. FRA's Project Director in August 1979 notified Amtrak that the NECIP budget was being adjusted to delete this item of work.

In a series of letters between Amtrak's vice president/chief engineer and FRA's Associate Director, Office of Engineering in March and April 1980, Amtrak informed FRA that plans to obtain a communications system at no cost to the project had not worked out. FRA's signaling program manager, who is also responsible for communications, told us that the Project Director decided not to reinstate funding for the communications system because (1) Amtrak had decided to fund the system from its own resources and an increase in cost should not invalidate the original decision and (2) there was no way to absorb the increase of about $30 million that would be required without reducing work in other critical areas.

If the deleted work is not done, Amtrak will not have improved its communications system. According to DCP's final report on communications system development, the present system was installed piece by piece at various times and consists of both railroad-owned facilities and leased circuits. Due to lack of funds, and consequent neglect, owned facilities were replaced with leased facilities as troubles developed. DCP's report stated:

1/A fiber optics cable contains glass fibers rather than metal wires. Data and voice communications are transmitted by beams of light traveling along the glass fibers.

"As a result of the piece-by-piece installation and replacement, there is no real communications system, but merely a patchwork of subsystem elements and individual circuits. Compounding this situation are the separation of Conrail and Amtrak facilities, the relocation and addition of new facilities along the NEC [Northeast Corridor], and the installation of new automated systems for centralized traffic control (CTC) and for supervisory control of electric traction power. There is an obvious need to address, on a systems basis, the communication services required to support a modern, safe, high-speed railway operation in the NEC."

Program officials agreed that a new system is important. FRA's signaling project coordinator and Amtrak's NECIP project manager told us that the new system was essential to corridor operations. In a March 1980 letter to Amtrak's vice president/chief engineer, FRA's Associate Director for Engineering stated that several NECIP program elements--such as the centralized traffic control system and a central control for the electrification system--were dependent on the completed communications system for their effective operation.

As of August 1980, Amtrak's ability to fund the system was still uncertain. Amtrak's NECIP project manager told us that the communications system would have to compete with non-NECIP projects in Amtrak's capital budget and the final cost was still uncertain. He said that the project could displace previously programed Amtrak projects and Amtrak might have to build the system piecemeal. NECIP's Project Director told us that he understands that Amtrak plans to ask for funds for the communication system when it submits its fiscal year 1982 budget.

FENCING

Reductions in fencing represent a potential reduction in safety and ontime reliability. All fencing between tracks in station areas has been eliminated as has all fencing along the sides of the right-of-way, except where the right-of-way borders parklands and those areas that Amtrak is under a court order to fence.

There was also an increase in the number of overhead bridges to be fenced because many bridges were omitted from the earlier estimate. Reductions to the fencing budget totaled $25.3 million from the January 1979 redirection study report to the March 1980 Corridor Master Plan. Additional reductions have been made since March 1980, and more changes may have to be made.

According to the January 1979 redirection study report, fencing between tracks was to have been provided at about 56 commuter and passenger stations to provide pedestrian safety and reduce delays to Amtrak, commuter, and freight operations due to the presence of pedestrians on the tracks. The report also stated that right-of-way fencing would be installed at selected locations where added security was needed, parklands, and service facilities to ensure public safety as well as to deter crime and vandalism.

Fencing between tracks

All fencing between tracks at stations was eliminated from the project which is in the March 1980 Corridor Master Plan. According to a February 1979 FRA interoffice memorandum to the Project Director, there is a danger at stations that pedestrians may walk across tracks being used by high-speed trains to get to or from the station. According to an August 15, 1979, letter from FRA's Project Director concerning work reductions, the deletion of intertrack fencing will permit continued unauthorized crossing of tracks by pedestrians.

An Amtrak internal memorandum dated November 1, 1979, from the director of police and security to the NECIP project manager commented on the possibility that intertrack fencing would be eliminated at stations. The memorandum stated that the fencing was proposed to deter commuters from crossing tracks and that Amtrak can expect additional fatalities which would be prevented if the program to install intertrack fencing remained. It also noted that, if intertrack fencing is eliminated, a strong alarm signal to warn of approaching trains should be installed.

Right-of-way fencing

Reductions to right-of-way fencing included in the March 1980 Corridor Master Plan eliminated all right-of-way fencing except at selected parkland areas and along the Hell Gate line part of the corridor in New York City. Amtrak is under a court order to fence the portion of the Hell Gate line in Bronx County. According to FRA's fencing program manager, the areas planned for fencing in the March 1980 plan totaled about 10 miles along parks plus the unfenced portions of the 15-mile Hell Gate line, compared to a total of 150 miles of right-of-way fencing under the January 1979 redirection study program.

According to the redirection study report, right-of-way fencing was to be installed at selected locations for security purposes. Amtrak's assistant director for asset protection

said that the criteria used in selecting areas to be fenced in the redirection program included

--high population density along the track,

--close proximity of schools and other areas with a concentration of children, and

--areas with a history of trash dumping, trespassing, and vandalism.

According to FRA's fencing program manager, fencing planned for the section of the Hell Gate line in Queens County, New York, has recently been eliminated from the program because cost estimates exceeded the budget. He said that because of a court order, the Hell Gate line will be fenced in Bronx County. FRA's fencing program manager and a DCP system planning task manager said that eliminating fencing in Queens County will leave an area unfenced that has the same potential for problems as the area in Bronx County. Amtrak's assistant director for asset protection said the fencing cuts in Queens County are critical due to the high density of population along the right-of-way in this area.

According to a DCP system planning task manager, the quantity of right-of-way fencing to be installed at parkland areas has been reduced by almost 50 percent to about 79,000 linear feet from the 157,000 linear feet of fencing shown in the March 1980 Corridor Master Plan. DCP's assistant deputy project manager said that a May 1980 DCP survey of fencing conditions in parkland areas, which involved walking along the actual right-of-way, found previously unidentified fencing that was already in place from non-NECIP sources and other inaccuracies in the information on which the March 1980 plan was based. A DCP system planning task manager stated that the current estimate for parkland fencing is $1.7 million, which is a decrease of $958,000 from the estimate contained in the March 1980 Corridor Master Plan.

FRA's fencing program manager and DCP's assistant deputy project manager and other DCP personnel told us that right-of-way fencing reductions will result in a continuation of unsafe situations at certain locations. Amtrak's assistant director for asset protection said the deletions in fencing will affect safety, but the extent of the impact cannot be determined until the events actually occur. He said that debris on the track is a constant problem and the police have had to remove railroad ties, rail, old appliances, etc., on

a daily basis. He said the most likely problem from such occurrences is train delays rather than accidents.

In October 1979, the director of Amtrak police and security commented on proposed reductions to the January 1979 redirection study program. He stated that in view of the in-depth surveys and careful evaluation of fencing made onsite, there was no way in good conscience that his Department could recommend reductions since each reduction would increase the life safety threat. The director again wrote in November 1979 that

> "There is no doubt in our mind such reduction will realize fatalities and injuries in areas where fencing was proposed and is now eliminated."

Amtrak's assistant director for asset protection provided the following statistics, which he said would indicate the magnitude of the problem that fencing would help to control. For the 4-month period March through June 1980 there were about 1,294 acts of vandalism and 964 trespassers ejected from the Northeast Corridor.

Overhead bridge fencing

The March 1980 Corridor Master Plan showed that construction of fencing and barriers was planned for 205 overhead bridges, an increase of 80 over the 125 overhead bridges to be fenced under the January 1979 redirection study report. According to DCP's assistant deputy project manager and other DCP personnel, the reason for the large difference was that DCP erred in counting and listing the overhead bridges to be fenced for the January 1979 redirection study.

Possible further changes

Funds set aside 1/ for the 50-percent Federal share of costs for right-of-way fencing in the State of Massachusetts, which amounted to $2.8 million in the January 1979 redirection study report, were deleted from the March 1980 program.

1/Section 704(a)(2) of the 4R Act authorized up to $150 million in 50-percent matching Federal funds for nonoperational improvements to fencing and certain other facilities. The other 50 percent of these costs is to be borne by States or local or regional transportation authorities.

According to FRA's station program manager, who is responsible for negotiating the Massachusetts fencing agreement, the State has funds available for its share of the fencing cost, but has withheld the funds because Amtrak and the State disagree about who will be responsible for maintenance of the fencing after construction. According to a December 1979 letter from the FRA Project Director to the Massachusetts Bay Transportation Authority Chairman, funding for the NECIP share of the fencing was to be reallocated if FRA was not advised by January 15, 1980, as to the Authority's plans for cost sharing and maintenance of the fence.

The FRA station program manager said that as of July 22, 1980, the question on maintenance is unresolved. If the question is resolved and the Massachusetts fencing is to be added back to the program, FRA will have to allocate funds for this work, which may mean that other work will be deleted.

GRADE CROSSINGS

A recent decision by the Secretary of Transportation not to seek additional funding will reduce the number of at-grade highway crossings on the corridor to be eliminated. This work is administered primarily by the Federal Highway Administration (FHWA). This reduction could seriously affect the safety of the public, passengers, and train crews and could result in additional future track maintenance.

The elimination of all public ground-level rail-highway crossings between Washington and Boston was originally authorized by the Highway Safety Act of 1970 (23 U.S.C. 322). Subsequent legislation resulted in the removal of seven public crossings in Connecticut from the 49 originally planned to be eliminated under the project.

FRA entered into memorandums of understanding with FHWA to administer programs to eliminate both private and public grade crossings on the corridor. Originally, NECIP's plans showed that public grade crossing eliminations were to be funded by FHWA, but the Secretary of Transportation subsequently decided that NECIP should provide the funds. However, the House and Senate Conference Report on the Department of Transportation's fiscal year 1979 NECIP appropriation stated that,

> "* * *no funds under this appropriation shall be used for the elimination of rail grade crossings without the prior approval of the House and Senate Appropriations Committees."

Before that restriction, NECIP funds totaling $16 million had been allocated for grade crossing elimination--$4 million for private crossings and $12 million obligated in fiscal year 1978 for public crossings. All other costs for grade crossings have since been funded by non-NECIP sources.

The total funding available for eliminating grade crossings was increased from $78 million in January 1979 to $106.9 million currently. 1/ According to the FHWA Associate Administrator for Engineering and Traffic Operations, a cost estimate developed in April 1980 (using an inflation rate of 20 percent through completion in fiscal year 1983) totaled $161.9 million for the present public grade crossings work plan. According to the FRA program coordinator for grade crossings, FHWA officials said the 20-percent rate was justified based on current escalation in similar projects nationwide.

On July 11, 1980, the Secretary of Transportation sent a memorandum saying that funding would remain at the $106.9 million level and directing FRA and FHWA to jointly resolve the priorities among grade crossing separations. He asked that they assess the "operational and safety related impacts" of not separating all the crossings to effectively select the highest priority crossings. According to the FRA program coordinator, this assessment is being done in cooperation with FHWA, its regional offices, and State authorities.

A review of the grade crossing program prepared by the FHWA Associate Administrator for Engineering and Traffic Operations in June 1980 showed that holding the public grade crossing program to the present funding level would mean that work on 15 of the 42 crossings may not be undertaken. A similar funding shortfall exists with the much smaller effort to eliminate private grade crossings, according to the same FHWA associate administrator. Although the NECIP funding for eliminating private grade crossings is limited to $4 million, the FHWA Associate Administrator said the planned work was recently estimated at $7.24 million.

In justifying the then recommended program for NECIP, the January 1979 redirection study report stated that grade crossings are a potential hazard to train operations, present track maintenance problems, and contribute to track

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1/The grade crossing elimination program also includes one crossing which is not located in the Northeast Corridor, for which $5.9 million has been obligated. The estimated cost overrun for this crossing is $2 million.

deterioration. This last effect, if uncorrected, can cause ride discomfort and create slow orders, the report states.

Amtrak's president, in a June 23, 1980, letter to the Secretary of Transportation, said that the reduction of work "would be very detrimental to the overall project." He said that Amtrak was concerned about the public crossing situation because it "relates to the safety of the public as well as our passengers."

The Secretary's July 30, 1980, reply stated that funding would not be increased beyond the current authorization "consistent with the approach for completion" of the rail facilities improvement. Therefore, he said the work "will be scaled down to provide the maximum amount of protection" within the present funding.

STATIONS

Reductions made in the work on stations may have adverse effects on the longevity of the structures and their maintenance requirements and may reduce passenger comfort and capacity. However, there is some uncertainty as to what deletions have actually been made and what specific work is still included under NECIP. Also, further reductions may have to be made to offset additional cost increases.

Because the Program Requirements Document for stations is very general and may not be accurate, it was not possible to identify all the specific changes which have been made since the January 1979 redirection study report or what specific work is in the current program. Some of the station work plans are only in the preliminary conceptual design phase and so there is no way yet of knowing what specific work is included in the current program. Also, FRA's station subsystem manager told us the Program Requirements Document and related documents were unreliable.

Another factor which makes it difficult to define the scope of station work is that 50 percent of the costs for non-operational parts of the stations that are not safety related are to be borne by the station owners or local authorities. The status and scope of these cost-shared facilities, such as parking areas, change frequently because of continuing negotiations on local preferences and financing, according to FRA's station subsystem manager and DCP's station subsystem architect.

These same FRA and DCP officials seem to agree that the greatest impact of any deletions known thus far will be on the longevity of the station buildings themselves, because

needed repairs to buildings and related structures will not be done under NECIP.

Examples of building repairs deleted from NECIP include the repair of the Baltimore station plaza drive deck structure, 1/ waterproofing and reroofing of Baltimore's high-speed rail platform canopy, platform edge repairs at Philadelphia, and repairs to the bridge structure at Wilmington. 2/ A cut made generally to all stations was the deletion of one or two escalators to the high-speed rail platform(s). The FRA station subsystem manager said that in each case one escalator remains to operate in the predominant direction of passenger flow.

According to FRA's June 1979 System Performance Specification document, which specifies the performance requirements for a completed NECIP, the stations on the National Register of Historic Places and others determined to have significantly unique architectural value, shall be restored and refurbished to assure an extended life span for the basic building structure. Although most of the stations under NECIP are on the register, the FRA station subsystem manager said repeatedly that the deletions will not affect high-speed rail passengers and that he sees the main purpose of the NECIP station program as being to accommodate passengers and not to improve Amtrak's real estate.

Since the March 1980 Corridor Master Plan was issued, many changes have been made to the station subsystem. A $1.1 million cost overrun at the New Carrollton station in suburban Washington, D.C., has resulted in a cut of the same amount from the Route 128 station near Boston, according to the FRA station subsystem program manager. He attributed the overrun to poor original cost estimates and cost escalation.

At about the same time, FRA approved another program change which transferred an additional $950,000 from Route 128 to the new station at Stamford, Connecticut. The FRA station subsystem program manager said that the Route 128 station was lowest priority (the station is a brick structure

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1/The entrance to the Baltimore station is above the tracks, and this structure supports the driveway leading to the entrance.

2/The tracks and platforms at Wilmington are on a bridge over a street.

built in 1965) and was in a very preliminary design stage. He said that, as a result of these cuts in the Route 128 budget, FRA decided to change the station scope from a new station to a "minimal" improvement plan, which is not yet defined.

Because of the decision to change the work to be done on the Route 128 station, the FRA station subsystem manager said the following additional cuts were possible from the Route 128 station budget to fund other station projects--$199,000 for additional planned work and design at Boston South Station, $1.2 million for a Stamford parking garage, and $25,000 for the Newark, New Jersey, station's arts program. DCP's station architect and FRA's station subsystem program manager said that the $1.2 million transferred to the Stamford parking garage was available because no local matching funds were forthcoming for Route 128 parking. The DCP architect said that $1.2 million represented 120 to 150 spaces, but they were unlikely to be built at Route 128 because parking was a low priority with the local authority that owns the station.

DCP's station architect said that about 20 percent of work planned for the nine station projects designed and ready for bidding this year is in the form of "additives," which are features that may or may not be built, depending on the size of the bids received. The additive design process in the station subsystem began in January 1980, according to the DCP architect, as a result of DCP being told by FRA to "design to budget," meaning that the station costs must not exceed the $195 million in NECIP funds available for them.

FRA's station subsystem manager and a staff member of the program control board said the total funding available for the station subsystem, unlike others, had not been adjusted up or down since the January 1979 redirection study report. This occurred, they said, because of an oral directive from the Secretary of Transportation to, in effect, "build a wall" around the stations' budget.

Despite this protection, the amount of work on stations is likely to be reduced further as costs continue to escalate. Within this framework, the DCP station architect said that the only remedy for escalating costs is to identify cuts or delete additives to allow a usable station to be completed within budget. Such deletions will translate into a future maintenance and capital improvement burden for the station owners and may further reduce passenger comfort and capacity.

SERVICE FACILITIES

Reduced work on service facilities used in maintaining fixed plant and equipment may result in increased future Amtrak maintenance costs because of a loss of efficiency. The total budget for service facilities was $148.1 million as of March 1980. Reductions of $31.4 million were made between the January 1979 redirection study report and the March 1980 Corridor Master Plan, as follows:

	Amount (millions)
Elimination of improvements to maintenance-of-way a/ bases at four locations (Wilmington, Sunnyside, Cedar Hill, and Readville) and of buildings at a fifth location (Providence).	$12.9
Elimination of all improvements to the Philadelphia maintenance-of-equipment facility.	5.2
Reduction in the size of maintenance-of-equipment facilities at Wilmington, New York, Boston, and Washington.	13.3
Total reductions	$31.4

a/Maintenance-of-way refers to the maintenance of fixed plant--tracks, bridges, signals, stations, etc.

The amount of work planned on service facilities has changed again since the Corridor Master Plan was issued in March 1980. Because many service facilities are being designed to stay within their budgets and detailed designs do not yet exist for them, the FRA task coordinator and operations staff chief and the Amtrak assistant chief mechanical officer were unable to tell us what features would be deleted or what the impacts would be. Further reductions may be needed to offset the cost of eliminating a pollution problem at the service facility in Wilmington, Delaware.

Maintenance-of-way bases

According to the FRA service facilities subsystem program manager and task coordinator, the effect of eliminating improvements at four of the nine maintenance-of-way bases is that required maintenance will cost more and will

not be accomplished as efficiently. The Amtrak NECIP project manager could not furnish an estimate of the cost of maintenance with only five improved bases, but he explained that part of the rationale used by Amtrak in chosing the bases to be cut was to retain one in each of Amtrak's Philadelphia, New York, and Boston divisions and two in the Baltimore division--one on each side of the Baltimore tunnels.

The FRA operations staff chief also said that he could not quantify the impact of the cut, but he said it was certain to have a negative effect on Amtrak's maintenance-of-way effort. He said that maintaining a 120-mile-per-hour railroad requires a very good maintenance-of-way base system, something that Amtrak does not have and will not have after NECIP. The operations staff chief said the effectiveness and efficiency of any maintenance-of-way program depends on how much money you pump in, but he added that traditionally this is one of the first areas to be cut in a crisis. The cuts in NECIP will result in more labor and transportation expenditures, and employee welfare facilities--locker rooms, showers, lunch rooms--will also be lacking, he said. The FRA service facilities subsystem task coordinator said the overall effect of the cuts is that Amtrak will have to use existing old facilities, thus decreasing the efficiency of the maintenance-of-way effort.

After the March 1980 Corridor Master Plan, $2.5 million was added to the budget for Providence to cover the cost of a building there. FRA offset this increase by a reduction of $2.5 million in the budget for the Wilmington maintenance-of-equipment service facility (see below).

Maintenance-of-equipment facilities

With the exception of the cutback in work at the Philadelphia facility, the scope and impact of reductions to equipment maintenance facilities is not definitely known, according to the FRA task coordinator for service facilities, because the facilities are only in the preliminary design stage. The cut of Philadelphia improvements means that the rolling stock terminating at Philadelphia will be rerouted to remaining facilities to ensure required inspection and servicing.

Although Philadelphia is not planned for regular use, the FRA task coordinator said that even with the deletion, the same service work could be accomplished at Philadelphia if needed, but much less efficiently. He said the lack of a modern facility there places more importance on the completion of the New York and Washington service facilities. The

Amtrak assistant chief mechanical officer said that Philadelphia had been Amtrak's lowest priority facility in the redirection study program and the existing facility there could be used but would be less efficient than using New York and Washington.

The DCP service facility project manager said that because the other maintenance-of-equipment facilities were in early design stages and because they must remain within the limited budget, it is difficult to predict what features will finally have to be deleted. He said that the allocation of the cuts to individual facilities was based on the "collective engineering judgment" of FRA, Amtrak, and DCP engineers.

A recent result of cost escalation and reallocations of funds away from the Wilmington equipment maintenance facility was the FRA NECIP Project Director's decision to rehabilitate the existing shop there instead of building a new one. Previously, both the task coordinator and the operations staff chief at FRA had said they would recommend the construction of a new heavy repair facility for rolling stock at Wilmington. The Amtrak assistant chief mechanical officer and chief architect recommended rehabilitating the Wilmington shop, especially if funding remained restricted. In a June 26, 1980, meeting with Amtrak and DCP, the NECIP Director decided that DCP should develop preliminary designs for Wilmington as a rehabilitation program. A DCP memorandum on the meeting states that there was agreement, based on recent estimates for work on the Washington equipment service facility, that the present budget for Wilmington was "insufficient to plan for a new service facility." The budget for Wilmington was $31.5 million as of August 28, 1980.

An unresolved question involving the Wilmington facility could result in additional funds being required for it, thus reducing the funds available for other work. Amtrak's manager of environmental and pollution control said that the dangerous chemical PCB was used there from 1939 until relatively recently as an insulator in the electric transformers of locomotives. The Amtrak environmental manager said that the Environmental Protection Agency banned the manufacture of PCB in 1977 and has set deadlines gradually restricting the PCB content in transformers. Years of use, movement, and spillage of the chemical at Wilmington have resulted in widespread ground contamination, he said.

According to the FRA task coordinator, the impact of the PCB contamination depends on the Environmental Protection Agency's interpretation of regulations and cleanup requirements. He said that funds that otherwise could be used for

functional improvements at Wilmington will be needed to clean up contamination.

TUNNELS

Although the total March 1980 budget of $30.6 million for tunnels remained about the same as in the January 1979 redirection study report, the work has been reduced by about $7.4 million to offset increased cost estimates for the work. As a result, future Amtrak maintenance may be increased and passenger and work crew safety may be decreased compared to what was planned in January 1979.

A brief description of the work dropped from tunnels follows:

--Union tunnels (old and new) at Baltimore: all work, including new lighting, improved drainage, lining 1/ and ballast wall 2/ repairs, replacing ladders and handrails; also bench wall/safety walk 3/ repairs in the old Union tunnel only.

--New York tunnels (East and North River): new lighting, bench wall/safety walk repairs, and chipping to allow more clearance for train pantographs.

--B & P tunnel at Baltimore: new lighting.

--East Haven tunnel at New Haven: new fire extinguishers and portal fencing.

As noted above, one deletion common to five of the six tunnels is the elimination of new tunnel lighting systems. The FRA design engineer and a DCP tunnel subsystem deputy project engineer said that this was low priority, noncritical work, although it is desirable because of the antiquated and, in some cases, unreliable existing systems.

1/Lining refers to the inner surface of the tunnel, which may be made of brick, concrete, cast iron, etc.

2/Low wall-type structures to keep the ballast in place in the old Union tunnel.

3/Benches are narrow, level structures built on the sides of the tunnels. In some areas, the top of the bench is used as a safety walk for workers in the tunnel.

The DCP engineer said that the lack of a good lighting system is not in accordance with general NECIP safety standards. The same FRA and DCP officials indicated that deleting a new lighting system meant there would be no improvement in safety for personnel who might be working on or inspecting tracks in the tunnels. For example, the DCP engineer said that the present condition of the lighting in the B & P tunnel presents a safety hazard to those unaccustomed to walking on the tunnel's uneven floor.

The FRA design engineer said that the work originally planned for the old and new Union tunnels was not related to track deficiencies but more to maintenance and "housekeeping items." The DCP tunnel subsystem deputy project engineer said that the Union tunnels were in "fairly credible" condition, and the original work was planned when a total upgrading was the goal of the project. He said DCP engineers still believe the original planned work should be done if funds are available.

The FRA design engineer said that the deleted repair of chipped concrete in the bench walls/safety walks in the New York tunnels would not seriously affect the structural soundness of the tunnels. He said further chipping of the concrete will not be prevented, but noted that the structure would still serve its safety purpose. The DCP tunnels subsystem deputy project engineer said that while the concrete was not severely affected, a major expenditure would be required to repair it due to the great length of the New York tunnels and thus the large amount of chipping present. He said that the original scope was to make the tunnels "last indefinitely" without major repairs. The DCP deputy project engineer estimated that, without minor repairs, the bench walls/safety walks would need major repairs in 10 to 15 years. He added that, although other items were higher priority, the DCP engineers believed the safety walks should be repaired to assure their necessary safety function.

Adding fire extinguishers and portal fencing at the East Haven tunnel was "desirable but not critical," according to the FRA design engineer. The DCP tunnel subsystem deputy project engineer said fire extinguisher installation was eliminated due to the high probability of theft. The DCP assistant deputy project manager said that the extinguishers were originally included in the plan in an attempt to meet the original fire safety standards.

Related to the requirement for fire protection and to the lack of a new reliable lighting system are unresolved questions about what emergency procedures are acceptable in the New York tunnels and what improvements to the facilities

are actually necessary. A long-standing, court-enforced fire department order requires the installation of a fireline standpipe system with valves and hose connections in the East River tunnel (because it is entirely within New York City). The reason for this order apparently is to provide for fighting a fire aboard a train while it is stopped in the tunnel--a situation the DCP tunnel subsystem deputy project engineer said has never occurred.

The FRA design engineer said that if a train stopped in a tunnel were on fire, a very unlikely occurrence, the lack of an adequate lighting system would have a serious impact on the safety of passengers who had to be evacuated. He said that long-standing railroad procedure for a disabled train in a tunnel is to use a standby locomotive to push or pull it out to an open area where the problem can be dealt with.

Whether firelines in the East River tunnel will actually be built is open to question because of a funding shortfall, still unresolved as of September 9, 1980, according to the DCP tunnel subsystem deputy project engineer. Of the total cost for this work, 43 percent was originally supposed to be provided by Amtrak and 57 percent by the other user of the tunnel--the Long Island Railroad. The latest construction estimate is $11.5 million for the firelines, according to a DCP document, while FRA's NECIP Director said that there can be no change in the project's $2.4 million budget for Amtrak's share of the costs.

The DCP and FRA tunnel subsystem engineers both said that besides the various safety questions raised, the one sure impact of the cuts in tunnel work is to add to Amtrak's future maintenance load. They said that, while it would be desirable to do a complete rehabilitation of the tunnels, it is low priority work and expendable in the face of a limited budget. Although they said the impacts on Amtrak operations will be minimal or nonexistent, the FRA and DCP engineers said the deleted work will have to be done at some uncertain time in the future. Amtrak has agreed with this prediction by including many of the NECIP deletions in its plans for capital improvements in the 1982-86 period.

One of the deletions was made for reasons other than having too much work for a limited budget. This was the elimination of tunnel chipping to provide clearance for the trains' pantographs. The DCP tunnel subsystem deputy project engineer said the chipping is not needed now because the conversion to a 25-kv electrification system has been deleted. (See p. 18.) He said increased clearances are unnecessary for the existing electrification system.

The same FRA and DCP engineers said that the tunnel deletions will have no direct impact on reliability, trip times, or passenger comfort. Track improvements in tunnels that could affect such program goals are included in other subsystems, the FRA design engineer said.

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