Section 2. Purpose of the Genesis Field Operational Test

2.1 Project Proposal

Genesis was one of the early projects sponsored by the U.S. Department of Transportation (USDOT) Intelligent Transportation System (ITS) Field Operational Test (FOT) program. The project origin is from the formulation of a ten-point anti-congestion plan developed by the Minnesota Department of Transportation (MnDOT) in 1989. From that plan, MnDOT proposed the Genesis Advanced Traveler Information System (ATIS) project, which was accepted by FHWA and incorporated into the national ITS operational test program in 1991.

The purpose of the project, as proposed, was to demonstrate and test a series of personal communications devices (PCDs) by broadcasting alphanumeric traffic information to test participants in an urban expressway corridor of the Minneapolis area, to determine the effect on traveler behavior and possibly traffic as well.

The original project goals are as follows:

1. Influence individual travel decisions
2. Facilitate transit usage
3. Determine technical feasibility
4. Complement and integrate into Travlink and the ITMS program
5. Expand traffic monitoring capabilities
6. Integrate traffic and transit information databases
7. Determine appropriate dissemination messages and advice
8. Manage the traffic operations database
9. Define, design and implement the FOT through public/private, private/private and public/public partnerships
10. Improve transportation performance
11. Evaluate costs, benefits and infrastructure of the operational test
12. Evaluate user acceptance of the PCDs

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</tbody>
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Figure 2-1

Genesis Project Planned Phases

12. Evaluate user acceptance of the PCDs
2.2 Project Plans

The original plan called for four phases of the project (A-D), with each phase being funded separately. This phased plan is illustrated in Figure 2-1.

Phase A (Concept Definition and Preliminary Engineering) was performed by BRW Inc., Battelle Memorial, JHK & Associates, and Barrientos & Associates. Additional participants were Motorola (December, 1991) and IBM - later to become Loral Federal Systems (January 1993). The Concept Definition & Preliminary Engineering document was published in March, 1993.

The original vision at that time called for the following functions to be provided by the PCD:

- Incident reports
- Trip planning with dynamic reminder alert
- Transit schedule information
- Parking availability information
- Planned event, road construction and road maintenance information
- Weather-related roadway information
- Dynamic carpool matching
- Request for roadside services, and
- Request for Paratransit services

Phase B (Detailed system design) was performed by Loral Federal Systems and completed in March, 1993. For the test, the Genesis PCDs were divided into following three categories:

1. Alphanumeric pager
2. Personal Digital Assistant (PDA)
3. Off-the-shelf traffic-information-only device (subsequently not included)

Phase C involved the five separate tests, which included a pilot pager test, and a pager and PDA test each in Minneapolis, and then in St. Paul. This phase was truncated to a combination pager/PDA test covering a major segment of the Minneapolis area, as illustrated in Figure 2-2.

2.3 Project Organization

Phase D (Independent Evaluation) was performed by SAIC International and supported by the University of Minnesota Human Factors Laboratory. The Independent Evaluator was not brought under contract until mid-year, 1994, which required some catch-up on their part to develop an overall Evaluation Plan and Individual Test Plans. These plans will be discussed further in Section 3 of this report.
Figure 2-3 provides an overview of the Genesis project organization. This organization reflected one of the early public-private partnerships in ITS FOTs, and involved organizations that were from diverging backgrounds (i.e. JHK from traffic and transportation, Loral from the Department of Defense and MnDOT from the public transportation sector.

### 2.4 Genesis System Description

The Genesis system was configured into four subsystems, illustrated in Figure 2-4:

**The Data Collection System (DCS)** - Consisted of two workstations located in the MnDOT Metro Division Traffic Management Center (TMC). Operators used the DCS to enter traffic incident and event messages into the Genesis system. Three types of messages were provided:

- Figure 2-4
  Genesis System Configuration
1. Congestion (i.e. slow, heavy, stop-and-go)  
2. Incident (i.e. accidents, disabled vehicles, lane closures)  
3. Planned Event (e.g. stadium events, construction, etc.)

These messages were designed to conform to International Traveler Information Exchange Standards (ITIS), which specify the following message characteristics:

- Event description
- Location identification
- Traffic backup extent
- Expected duration estimation (not provided in the Genesis test)

Typical Genesis ITIS format messages are illustrated in Table 2-1.

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>From/To</th>
<th>Message Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/01/95 12:48</td>
<td>S:I-35W N roadway reduced to one lane</td>
<td>From: CR 42  To: HWY 13</td>
</tr>
<tr>
<td>09/01/95 17:43</td>
<td>S:I-35W S road construction. left land closed</td>
<td>From: 46TH ST  To: DIAMOND LAKE RD (09/01) (20:00-24:00)</td>
</tr>
<tr>
<td>09/05/95 16:46</td>
<td>N: I-35E N heavy traffic</td>
<td>From: PENNSYLVANIA AVE  To: LARPENTEUR AVE</td>
</tr>
<tr>
<td>09/01/95 06:17</td>
<td>S:I-35W S disabled</td>
<td>From: I-94 (W JCT)  To: 31ST ST</td>
</tr>
<tr>
<td>09/01/95 06:32</td>
<td>S:I-494 S stop and go traffic</td>
<td>From: CARLSON PKWY  To: HWY 7</td>
</tr>
<tr>
<td>09/01/95 08:01</td>
<td>N: I-35W S accident</td>
<td>From: UNIVERSITY AVE  To: HWY 55</td>
</tr>
</tbody>
</table>

Traveler Information Processing Subsystem (TIPS) - Gathered, formatted and addressed messages entered via the DCS. TIPS determined which portion of the Genesis coverage area (north or south) should receive the information, and transferred the information to the Communications Subsystem for broadcast to the PCDs. Traffic incident information was provided for limited access roadways (i.e. freeways) within the coverage areas. TIPS also stored Genesis messages in a relational database.

Communications Subsystem (CS) - Received messages from the TIPS and transmitted them via telephone modem to a local communications provider (MinnComm) that broadcast the messages to pagers and PDAs.

Personal Communications Device Subsystem (PCDS) - The pagers were Motorola Advisor pagers, with a liquid-crystal display, capable of displaying 20 alphanumeric characters on each of 4 lines. In addition to the power switch, there were four cursor buttons, arranged in a diamond shape for moving a cursor on the display and a button to read selected messages, as well a button to access other pager functions. The pager measures 3.38 by 0.78 inches and weighs 4.11 ounces. It fits easily on a person’s belt, but not particularly well in a trousers pocket.

The main menu screen of the pager displayed two lines of triangle characters that represented messages. Each triangle symbol could represent a message, or messages, of up to 230 characters. The triangles were only displayed when messages were present.
Triangles on the first line represented personal messages.
Triangles on the second line represented group page messages
Non-group page messages included news, weather, sports and stock quotes
Up to four triangles could be displayed for Genesis traffic messages; two for the north and two for the south

When a message was being received, an icon resembling the back of an envelope was displayed on the screen. During the time that the envelope icon was displayed, the user could not review messages or use the cursor to navigate between mail slots. Thus, when a series of traffic messages was sent, users might have to wait 20 seconds or more before they were able to review or access messages.

The PDA was the Apple Newton MessagePad 110, a general purpose hand-held computer that comes with applications for maintaining personal information such as appointments, phone numbers and reminders. Instead of a keyboard interface, the Newton has a touch-sensitive surface over a reflective (no back light) liquid crystal display with a resolution of 320 pixels vertically and 240 pixels horizontally. The user operates the Newton by using a stylus to select icons on the screen. The MessagePad can recognize both cursive or printed handwriting and can accept hand-drawn objects. The device is 8 x 4 x 1.25 inches and weighs 1.28 pounds.

2.5 References for Section 2

1. Draft Genesis Profile, dated April 11, 1994 as submitted to FHWA -HTV-20 (A. DeBlasio to R. Rupert)
2. Ibid
3. Genesis Project Summary, Feb 5, 1995, Booz·Allen & Hamilton Inc,