Interim Report

User Acceptance of ATIS Products and Services:
A report of qualitative research

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Objectives and method

This report summarizes the lessons drawn from a series of twelve focus groups carried out in Fall 1996. The groups were conducted as an early stage of a larger project, undertaken on behalf of the *USDoT Intelligent Transportation Systems Joint Program Office,* to appraise the potential customer acceptance for key ITS products and services directed at individual consumers. The product concepts explored in the focus groups were all applications of Advanced *Traveler Information Systems* [ATIS], broadly construed:

- *A pre-trip travel information system* with several possible means of access, offering information applicable to all available transport modes;
- A *public transportation information system,* providing up-to-the-minute service information at terminals;
- *An in-vehicle static navigation system,* providing the most sophisticated features of currently available units but not real-time traffic information;
- *An in-vehicle dynamic navigation system,* with the same features as the above unit but also providing real-time traffic information and dynamic routing capabilities; *and*
- A simple *in-vehicle Mayday device,* that can contact emergency (breakdown or rescue) personnel with the exact location of the vehicle, and operating automatically when a vehicle airbag is deployed.

The focus groups had two principal objectives:

- To improve our understanding of current consumer reactions to these ATIS product concepts; and
- To help develop improved methods for subsequent quantitative customer acceptance surveys.

Executive summarv

In all, twelve discussion groups have been held so far, using a variety of diierent criteria for respondent selection. Two groups were conducted in each of six locations chosen to reflect various relevant travel categories:

- *"General travelers"* by both private and public transportation, stratified by local and longer distance ("intercity") trips *[Boston* and *Philadelphia].*
- A*"polar transit case"* of transit users *in* the *New York metropolitan area,* stratified by suburban commuters and central city tripmakers.
- A *"polar congested highway case"* of private vehicle drivers in *Orange County, California,* stratified by "slow commuters" and "heavy travelers."
- *"Road warriors with upscale new vehicles":* recent purchasers of high-end vehicles, with extensive private vehicle travel and an orientation towards high-tech equipment, stratified by commuters and driving occupations [Los *Angeles* and *Washington DC].*

Focus groups, like other qualitative market research methods, are inherently limited in the nature of the information they generate, and the substantive findings should be regarded as *indicative* rather than authoritative. There's no guarantee that the opinions expressed in the discussions are quantitatively representative of the viewpoints of larger populations. And the participant responses are solely their *first impressions* immediately after learning about product category concepts that are largely outside their personal experience. These opinions could change markedly – either positively or negatively – after significant "hands on" experience in using the product over a period of time, or if market penetration were to reach a critical mass.

Did focus group participants confirm the conventional wisdom about ATIS?

One useful way of summarizing the substantive findings from the focus groups is to ask how far the participants' expressed opinions support or negate the current ITS community beliefs about likely customer acceptance of ATIS product and service concepts. In the following paragraphs, we characterize several items of "conventional wisdom" about ATIS and comment on the light that the participants' opinions shed on each of these matters.

People detest traffic congestion delays, and would value highly any means of avoiding them. Hence, time-sensitive travelers of all types will find

value in more accurate, mode- and route-specific ATIS information, and will be willing to pay for such information.

People do indeed *complain* bitterly about travel delays, expected or unexpected, by any mode (road, air, or transit). They are obviously very concerned about delays, find them stressful, and are ever ready to recount "horror stories." However, there's also a great deal of fatalism, coping behaviors, and skepticism about improvements.[1] Moreover, even in the very congested highway conditions of Southern California, many respondents did not appear to be strongly motivated to *seek* out better information about current traffic conditions.

Many participants do pay attention to traffic/transportation reports on the broadcast media (radio more than television), before starting the trip or while *en route.* The information is judged to be worthwhile, but also often incorrect, outdated, insufficiently specific, or limited in geographic coverage. Almost all focus group cities had some additional sources of traffic information with greater detail, accessible by telephone or from the World Wide Web. Except for the Boston *SmarTraveler* system (for which there has been strong local promotion), awareness of these alternatives was low. But more importantly, the people who *were* aware hadn't been strongly motivated to *explore* the alternatives, and one-time users hadn't repeated the experience, even when they thought the service was relatively good.

The broadcast traffic reports require very little action (or concentration to the exclusion of other activities) on the part of recipients. By contrast, the small amount of extra time, effort, and concentration necessary to place a telephone call, boot up a computer, or access a web page were seen by many people as too onerous. This implies that the expected value of (and hence willingness to pay for) the additional information is currently quite small. The focus group opinions reinforce the small amount of marketplace experience that has shown that the demand for real-time traffic information, charged for by the enquiry, is quite price-sensitive.

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1 Attitudinal questions included *in the 1995 Nationwide Personal Transportation Survey* of over 2,300 nationally-representative households showed relatively high levels of user satisfaction with the current performance of the highway system. Also, the highest user priorities for improvements were not aspects that would be most directly affected by ATIS.

Executive summary

Travelers will find "pre-trip" travel information sources (about the current and future conditions on the transportation system) to be a valuable resource in planning their travel.

It should be stated at the outset that the "pre-trip" ATIS concepts described to focus group participants fell somewhat short of the full vision for such products described in the ITS literature. Advocates for pre-trip ATIS foresee it providing highly reliable, personalized information on the travel times and costs of alternative travel choices, with travel times on the system forecast accurately from a combination of temporal regularities and the two-way communication that a traveler has departed on a specific trip. Moreover, good pre-trip system performance information would be integrated seamlessly with other sources of information about potential trip destinations,[2] for use in deciding where to go as well as *if, how, when,* and *by what route* to go.

For ease of understanding, the pre-trip concepts used in the focus groups were closer to the most advanced forms of pre-trip ATIS *currently available:* a geographically-detailed, up-to-the minute database of *current'* conditions on the transportation system, with limited destination ("points of interest") information and no capability of *predicting* system conditions. This database would be interrogated in a fast, possibly personalized way, using a microcomputer, cable TV, personal digital assistant (PDA) with wireless communications capabilities, or telephone. The more portable of these devices could be used inside a vehicle as well as purely "pre-trip."

Focus group participants evidenced several worries about such a system:

- Most importantly, for frequent trips (such as to and from work), they thought that pre-trip traffic information – particularly about non-recurrent, incident-caused congestion – would be stale by the time the trip was being made.

2 Such information might include, for instance, event descriptions and timings, retail promotions, forecast parking availability, hotel room or restaurant availability and booking, and so on.

- The proactive efforts necessary to access the information (navigating telephone, cable TV, or computer menus, for example) were seen as significantly more onerous than turning on the radio or television.
- The PDA offering demonstrated to some respondents – the most advanced developed so far – had some physical and software limitations that affected interest: too large for easy portability, yet too small and indistinct to be used regularly within a vehicle as a portable alternative to permanently-mounted navigational aids.
- To be used, pre-trip information must offer a significant improvement – in scope, detail, and/or quality – over that available from the broadcast media "for free" and requiring minimal engagement. There was some skepticism about the feasibility of such improvement.

The second of these "worries" could possibly be addressed by promotional/educational activities stressing that a few minutes of extra time and effort expended before the trip will be compensated by greater time savings *en route.*[3] The third concern could be addressed by technological improvements in the hardware and software. However, the problem of timely information about incident-caused delays is likely to remain an *intrinsic* concern for pre-trip ATIS information.

The types of pre-trip ATIS uses that were most attractive to focus group participants were those concerning:

- trip *timing* decisions for the journey from work to home;
- travel choices by those transit users who have a key "decision point" (about mode, routing, or timing) at or near the very start of the trip, rather than at some place *en route; and*
- longer distance ("intercity") trips, particularly by people interested in learning about temporary but not transient sources of delay (such as lane closures for construction work).

3 This has, in fact, been a prominent theme in the Boston *SmarTraveIer* promotion.

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In-vehicle ATIS information – such as static navigation aids, dynamic route guidance assistance, and "'points of interest" information – will provide value for a segment of the traveling public, such that they would be prepared to pay for the information and for any products needed to access it.

There's a growing public awareness of in-vehicle GPS-based devices, traceable to recent motor vehicle and rental car advertising in the popular media, press coverage, marine applications, military experience, and the like. However, *static navigational devices* – of the sort now appearing in a portion of the rental car fleet and in a few (but rapidly growing number of) high-end vehicle models – have only a limited current appeal in focus group discussions. For *local* travel, only the people who do a lot of driving professionally to unfamiliar areas saw much functional utility to themselves. There's broader interest for making longer *distance* trips outside familiar territory. But even these people said that they currently manage quite well with the low cost alternatives of street atlases and calling ahead to obtain 'phone or fax directions from the destination.

There's also some "high-tech toy" appeal among high-end vehicle purchasers and among specific interest groups.[4] Not many group participants have realistic expectations of the current prices of the more sophisticated in-vehicle static navigational devices; they tended to suggest amounts considerably below the $2,000 to $3,000 cost of OEM options. Even at the lower capital costs that they were guessing, most respondents thought that the devices would cost more than the perceived value to them. However, there was an expectation that prices would fall markedly from current levels, and that vehicle owners would grow to expect such devices as a common vehicle accessory.

The addition of real-time traffic information is a definite plus. Respondents do see a clear additional benefit from the incorporation of timely traffic information. There is a fixther increment in *going* from the *traffic information* alone to using the information in *route guidance,* but (at least for local travelers making habitual trips) this increment seems to interest people less than does the availability of the traffic information *per se.* They are curious about how the technology would work, and (as previously noted) somewhat skeptical that the traffic information

4 For example, golfers locating golf courses.

would be of markedly superior quality to that available now from the broadcast media.

If the traffic information does indeed offer a superior product to that currently available without charge, they would expect to have to pay to receive it. A monthly fee equal to baseline cellular 'phone, CATV, or ISP charges (currently around $20) would be expected, but people would prefer to be charged entirely by the usage level. Bundling the information with other services was not explicitly discussed.

For all in-vehicle devices, respondents were invariably concerned whether they would diminish safety by adding an extra distraction to the driver's task.

In complex public transportation networks, particularly those requiring a change of mode or operator, users appreciate routing and scheduling information tailored to their own specific travel needs. For the US air system, this works quite well through computerized information and reservation systems accessible by telephone, computer, and the ubiquitous coverage of retail agents/brokers. For complex transit systems (such as the New York system that comprises subway and bus transit, commuter rail, ferries, and express buses, provided by a diverse set of operators), coordinated information and assistance is much harder to come by. Transit users would appreciate improved information systems including intermodal schedule options and real time performance data, but they also expect such information to be freely provided by the carriers, just as for the airlines.

If a database of complete and accurate traffic and transit information were made available at no or low cost, information service providers would develop a large number of profitable ATIS products.

This may or may not prove true. What we can say from the focus group evidence is that people are currently skeptical that the ATIS product concepts that we discussed with them would provide a sufficiently enhanced information product that they would be prepared to pay much for it. The baseline against which all information enhancements should be judged is provided by the low- or no-cost methods now used widely: listening to the broadcast media (either pre-trip or en route), consulting maps, and calling ahead for directions.

But this customer skepticism does not preclude the development by ISPs of ways of adding significant additional value to the data: for example, by seamless

bundling with other types of information or applications, or software capable of delivering *personalized,* highly *focussed* ATIS information with no more user effort or concentration than is involved in turning on the radio.[5]

As OEM- or dealer-installed options on new vehicles, personal security-related ATIS products (such as "Mayday" devices) are likely to sell better in the near term than navigational and traffic information devices.

Focus group participants appeared to confirm this conventional wisdom. Among both the general population groups and the groups more focussed on people likely to have a relatively high interest in in-vehicle ATIS, Mayday devices were seen as potentially cheaper and offering greater benefits than they can currently envision from navigational aids.

Moreover, Mayday has less functional overlap with cheaper methods of achieving the same objective. Some respondents were not comfortable imagining themselves in such a severe accident that they would be unable to use their cell 'phones (the closest functional substitute), but did see a utility if *other members of their families* had such an accident.

What are the implications of this work for future quantitative surveys?

It is worth repeating that it is dangerous to draw strategic or tactical conclusions on the basis of qualitative survey research *alone*, before quantifying the relative importance of the opinions expressed. Moreover, although qualitative studies provide better opportunities to communicate and explore new product concepts than do larger sample surveys conducted using less intensive methods, the lack of any significant degree of "hands on" experience with the concepts limits the realism of our participants' responses. In general, ATIS operational tests have

5 There's circumstantial evidence from analogous situations (in which large, complex databases are interrogated) to suggest that details of the access method and software can greatly influence usage patterns. For example, while airline reservation systems contain information about large numbers of fare and routing options, along with on-time performance information, in the SABRE system over 80% of flights booked are from the three choices listed on the first screen, and about 40% are the first flight listed.

found *an enhanced level of enthusiasm* for various ATIS concepts after trying them out.

In line with a primary objective for these focus groups, we drew several conclusions relevant to developing improved methods for future quantitative surveys:

- Carefully crafted verbal descriptions of these ATIS concepts appear to work quite well *in conveying the essentials* of the concept. Relatively little was added by using videotapes and/or very brief demonstrations.
- However, when asked to consider the implications of using the ATIS product in the context of a specific trip they have made in the past, respondents tend to focus exclusively on the most obvious and most personally-experienced effects. *Saving personal travel time* by avoiding delays to the specific trip under consideration was the primary focus of most people's thinking. In other words, while the respondents didn't need additional detail to imagine *the products,* they were somewhat less adept at *imagining the various different* ways in which the products might have value in their daily lives.[6] This is a frequent (and critical) problem in market research on new product categories, or on products that require behavioral adjustments.
- The attributes of ATIS information that appear to be most important to respondents (cutting across the various different ATIS applications) appear to be
  - accuracy
  - timeliness
  - reliability
  - costs (both one-time and recurrent)
  - the level and personalization of the decision guidance
  - the ease of access of the specific information needed
  - the perceived safety implications.

6 Respondents rarely offered spontaneously any thoughts about (for example) how the widespread adoption of ATIS might affect transportation systems in general, or about how a significantly greater predictability of travel times might affect their lives more broadly.

- the level and personalization of the decision guidance
- the ease of access of the specific information needed
- the perceived safety implications.

These are the features for which the willingness-to-pay will be investigated in subsequent quantitative surveys under this program.

1
The nature of this research

Introduction

This report is intended to provide an interim synthesis of key findings from twelve focus groups conducted thus far as part of the qualitative research phase of a program – being undertaken on behalf of the USDoT Intelligent Transportation Systems Joint Program Office – to appraise the customer acceptance for ITS products and services. The work focussed on consumer reactions to *Advanced Transportation Information Systems (ATIS)* concepts.

The work described here comprised two series of focus groups:

- One series of eight groups was planned and executed by Charles *River Associates,* and moderated by specialist qualitative consultants Howard Gendel and Douglas Solomon. These groups began with a broad survey of potential ATIS products and services with samples of "the general public," and progressively focussed on more specialist market segments and the product concepts most appropriate to them.
- A second series of four groups was planned and executed by subcontractor *Market Opinion Research,* a division of *M.O.R.-PACE.* These groups focussed more narrowly on how selected prototype ATIS applications might be viewed by potential customers in the context of their *new vehicle acquisition decisions,* and the participants were limited to just the types of people expected to be in the "innovator" or "early adopter" categories.

The plans for the two series of groups were developed somewhat independently of each other, to benefit from the potentially differing insights and emphases of the two firms. Detroit-based *M O. R.-PACE* specializes in automotive industry market research, and has conducted substantial qualitative research into ATIS applications for major vehicle manufacturers and equipment suppliers.

The objectives of the qualitative phase

The goals of the JPO inquiry into customer acceptance among individual travelers are to develop and apply market research methods that will permit better forecasts of such impacts of potential ITS innovations as the sales of products and services,

the consumer's use of them, and the benefits (s)he obtains from using them. Working towards these goals, the primary purposes of the qualitative research described here are more methodological than substantive:

- The development of appropriate *methods of communicating ATIS concepts* (and goods and services which exemplify those concepts) to survey respondents. "Appropriate" here implies finding a balance among several considerations:
  - conveying clearly the full function and potential of the concept;
  - minimizing the likelihood of response biases; *and*
  - being suitable for incorporation into such "low engagement" survey techniques as self-completion questionnaires and telephone interviews.
- The identification *of potential market segments* of likely early adopters or other populations that have particular interests in ATIS products and services.
- The identification of the *key features or attributes* that are most important in travelers' evaluations of potential product concepts.

Like all small-sample qualitative research, the substantive findings should be regarded as *indicative* rather than authoritative. There is no guarantee that the opinions expressed in the discussions are quantitatively representative of the viewpoints of larger populations. Moreover, the participant responses represent solely their *first impressions* after having been exposed to product category concepts that are largely outside their personal experience. These impressions could change markedly – either positively or negatively – after significant "hands on" experience in using the product over a period of time, or if the market penetration were to reach a critical mass. The primary benefits of this type of data collection for new product categories are to *help develop survey research methods for deployment in subsequent sample surveys, and to help structure the hypotheses to be investigated in those surveys.*

The ATIS concepts explored in the focus groups

The discussion groups were designed in such a way as to touch on most, if not all, of the *basic functionalities* of the major types of ATIS products or services. With

this in mind, a series of hypothetical product concepts were developed, with the intention of capturing the full scope of potential market offerings, rather than representing any actual product or service which may be currently available on a limited basis or in development. Potential offerings which were examined in one or more of the groups include:

- *A pre-trip travel information* system with several possible modes of access, providing information on all available transport modes and oriented to the geographic area most relevant to the participants;
- A *public transportation information system* using either interactive kiosks or electronic signs and monitors to provide up-to-the-moment service information at subway and rail stations, and at major bus terminals;
- *An in-vehicle static navigation system* providing many of the most sophisticated features of currently available units but without any real-time traffic information;
- *An in-vehicle dynamic navigation system* that would provide the same features of the above unit but also include real-time traffic information and dynamic routing capabilities; *and*
- A simple *in-vehicle Mayday device* that allows the user to contact emergency (breakdown or rescue) personnel instantly, transmitting the exact location of the vehicle, and operates automatically if a vehicle air-bag is deployed.

An overview of the structure of the various groups

Key details about the planning, design and administration of the focus groups summarized in this report are provided in the Appendix. This section is intended as a brief synopsis.

Exhibit 1 summarizes the locations, dates, and composition of the twelve groups. Generally, a pair of groups were held successively in the same evening, at the

The nature of this research

Exhibit 1. Summary of the focus groups conducted through October 1996

ID	Location and date	Major stratification	Composition of the group	Number participan
	CRA groups			
B1	Framingham, MA 8/28/96	Local travel	• All making 7+ local trips/week • 5 working outside the home 3+ days/week • 3 making 3+ public transportation trips/week	11
B2		Long distance travel	• All making trip of 75+ miles in last 3 months • 3 traveling for business, 9 nonbusiness purposes • 7 using private vehicle; 5 common carrier	12
B3	Philadelphia, PA 8/29/96	Local travel	• All making 7+ local trips/week • 6 working outside the home 3+ days/week. • 3 making 3+ public transportation trips/week	10
B4		Long distance travel	• All making trip of 75+ miles in last 3 months • 4 traveling for business, 9 nonbusiness purposes • 5 using private vehicle; 5 common carrier	10
B5	New York City 8/24/96	Suburban transit users	• All commuting to NYC via public transportation • 2 using MTA Long Island Rail Road • 2 using MTA Metro-North Railroad • 3 using NJ TRANSIT rail and/or PATH • 2 using long distance/express bus from west of the Hudson • 1 using other long distance/express bus	10
B6		Mixed transit users	• 5 NYC residents making 3+ non-work transit trips in last two weeks, 3 of whom are private vehicle owners • 5 commuting to NYC using public transportation (2 using rail, 3 using bus)	10
B7	Irvine, CA 9/26/96	General public private vehicle	• All making 7+ trips/week by private vehicle . 5 working outside the home 20+ hours per week,3of whomare commuting to work at least 45 minutes each way . 4 having used the new toll road segment of SR-91 at least once in the last two weeks	10
B8		Early adopter private vehicle	. All age 35-55. household income $75,000+, acquired a new vehicle with price above $25,000 in last 3 years and own a PC and/or use the Internet at least once per week · 7 driving as part of their job, going to different places at least 3 times/week, 2 of whom have used the new toll road segment of SR-91 at least once in the last two weeks · 3 working 20 hours or less per week, have children under 18 in the household, and use their car for an hour or more on an average day, 1 of whom has used the new toll road segment of SR-91 at least once in the last two weeks	10
	M.O.R.-PACE groups			
A1	Manna del Rey, CA 9/17/96	High mileage drivers	• All acquired $25,000+ vehicle in last year, work full time, drive 25,000+ miles/year, use cell phone 10+ times/week, household income of $75,000+, and drive to different places each day as part of job • 25% "high tech users"	10
A2		Commuters	• All acquired $25,000+ vehicle in last year, work full time, drive 25,000+ miles/year, use cell phone 3+ times/week. household income of $75,000+, and 1 hour+ total commute time • 25% "high tech users"	11
A3	Bethesda, MD 9/19/96	High mileage drivers	• All acquired $25,000+ vehicle in last year, work full time, drive 25,000+ miles/year, use cell phone 10+ times/week. household income of $75,000+, and drive to different places each day as part of job • 25% "high tech users"	10
A4		Commuters	• All acquired $25,000+ vehicle in last year, work full time, drive 25,000+ miles/yr., use cell phone 3+ times/wk., household income of $75,000+, and 1 hour+ total commute time • 25% "high tech users"	10

same purpose-dedicated facility. Participants were recruited by telephone by the firm operating the facility, using specifications and screening questionnaires provided by CRA or M.O.R.-PACE.

The moderators' guides for the two series of discussion groups were (deliberately) developed independently of each other by the two firms, to take advantage of different insights and approaches. It is notable that, despite the different levels of emphasis on somewhat different *consumer actions* (travel responses and ATIS product/service purchase behavior), the agendas for the various focus groups were often quite similar. The typical group discussion included the following elements:

1. Participant introductions around the table.

2. A general discussion of those existing travel patterns that were the focus of the specific group, including the typical trips that participants make for such purposes as commuting, business-related travel, shopping, or visiting friends and relatives locally or in other cities.

3. A more focused discussion on information-seeking behaviors, intended to identify the current sources of travel-related information used by participants (including maps, broadcast traffic reports, and so on), how and when they use them, and the user satisfactions and dissatisfactions with those sources.

4. The presentation and discussion of each of a series of three or four hypothetical ATIS product concepts, to explore participant understanding, immediate reactions, and the perceived "goods" and "bads" of each concept.

5. A discussion of potential travel- or purchase-behavior responses to the concepts, and a cross-concept comparison and synthesis.

2
Participants' responses thus far

Travel delays, and information-seeking behavior

The participants in all groups related a high level of frustration with *travel delays,* whether caused by general traffic congestion, incidents or construction, weather, or disruptions in public transportation services. The most important cause for frustration was the time management problem created by the unpredictability of the delays – one is either late for work (or another appointment), or else one plans conservatively and frequently arrives too early in order to minimize the likelihood of being late. *Unanticipated delays* (those ascribable to nonrecurrent factors) are more troublesome than the chronic delays experienced every day.

But despite the high level of expressed concern the "war stories," and the strong implicit consensus that time losses from traffic congestion (in particular) are a major psychological and economic diminution in the quality of the participants' lives, two observations suggest that the high *energy* with which respondents complained about existing conditions may not be a true indicator of *willingness to pay for amelioration.* First, we observed a good deal of fatalism, coping behaviors, and skepticism about improvement – the delays are terrible, but there's nothing that the individual traveler can do about it. This viewpoint was best encapsulated by a Los Angeles participant: *"There 's death, taxes, and traffic. "*

Secondly, travelers appear to be only marginally motivated to take whatever measures are currently available to them to find out about travel delays and take evasive actions. The primary sources of current information about traffic conditions are the broadcast media, typically radio traffic reports and to a lesser extent those provided on television. People like these reports in part because they are *low-engagement sources* – they can be accessed without major concentration or effort while doing other things: getting dressed, eating breakfast, or driving the car. Most focus group cities had other sources of up-to-date traffic information (by telephone or World Wide Web page, for example); awareness of these was low, but even when people knew about them or had used them occasionally with favorable outcomes, there was little interest in relying on them more intensively. Even in very congested conditions, many people do not seem to be strongly

motivated to seek out better information about traffic conditions if it might cost them a few extra minutes to do so.

While there was widespread use of the broadcast-based traffic information sources among the participants, they commonly complained that the information provided is frequently incorrect, outdated, insufficiently specific, or overly limited in geographic coverage. There were typically stories of situations in which broadcast reports had been belied by a driver's personal observation. With or without incident information, significant proportions of participants reported varying their private vehicle or public transit routes to avoid expected nonrecurrent delays. These decisions were often taken without any assurance that the route variation would save time.

As mentioned earlier, there was very little awareness about the extant alternate sources of travel delay information in each city. The exception was in the Boston area, where advertising and public service mentions of the *SmarTraveler* system had raised awareness that it was easy (and free) to access the system from a cellular telephone. Nevertheless, even with this heightened awareness, some Boston respondents had an incorrect memory of the cellular telephone number to call, and few travelers had personally tried to use *SmarTraveler*. And even with the very high levels of cellular phone owners in the Los Angeles and Orange County groups, there was almost no experience with using the phone to get traffic information.

Reactions to ATIS concepts

It is worth repeating that although qualitative studies provide better opportunities to communicate and explore new product concepts than do larger sample surveys conducted using less intensive methods, the lack of any significant degree of "hands on" experience with the concepts limits the realism of our participants' responses. In general, ATIS operational tests have found an *enhanced level of enthusiasm* for various ATIS concepts after trying them out.'

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7 Charles River Associates Incorporated (1996), *User Acceptance of ATIS Products and Services: What do we currently know?,* pp. 6-7.

With that caveat in mind, the reactions to the various ATIS product and service concepts presented in the focus groups can be summarized by the following generalizations.

Timeliness concerns limit the appeal of pre-trip information systems

The primary concern is that, for nonrecurrent delays largely caused by incidents, the pre-trip information will be too stale by the time the person is traveling. The skepticism about the accuracy of the current broadcast information sources also carries over to the new delivery methods (PC, PDA, cable TV, or telephone-based systems, etc.), as does the lack of motivation to *seek out* information. Any effort required in being proactive or requiring concentration to acquire the information (dialing the telephone, booting the computer, and so on) is seen by some as onerous or too disruptive of normal routine. The pre-trip information applications that have the greatest appeal are

- trip *timing* decisions for the journey from work to home;
- those transit users who have a key "decision point" (about mode, routing, or timing) at or near the very start of the trip, rather than at some place en route; *and*
- people making longer distance ("intercity") trips, interested in ascertaining temporary albeit not transient sources of delay (such as lane closures for construction work).

Computerized telephone-based information systems (in general) are not well liked

In every case when telephone-based systems were discussed, participants would always express some strong dissatisfaction with voice mail and 'phone information systems that involve long menus. These complaints appeared to resonate with other participants; nobody ever defended such systems. People resent having to wait for what appears to be a needlessly long time to be told the full set of menu options, and these negative perceptions of this technology colored their immediate responses to telephone-based systems (as well as did some fears of inadequate line capacity at times when there are reasons to expect serious travel delays).

However, brief demonstrations of the Boston *SmarTraveler* system, and of a simulated New York transit-oriented system, helped to reduce such concerns. Potential users need reassurance that, if they already know the key codes for the specific pieces of information they are seeking, they can enter them directly without needing to pass slowly through several menu tiers.

Personal digital assistant (PDA) systems have some appeal, but a limited one

"Pre-trip" information systems were described in the concept descriptions as accessible by telephone (both fixed and portable), cable TV, microcomputer, or PDA. Most participants focused on telephone access, and it was typically only through moderator prompting that the other options were discussed. The only serious discussions of PDA-based access were in the New York and Orange County groups, where the *Atlanta Showcase* Motorola *Envoy* unit was used in a brief demonstration that real-time Atlanta traffic information could be accessed. This demonstration helped to make more concrete the idea of *visual* displays of concurrent traffic incident data, which many seemed to view as an enhancement over *aural* information.

However, only a few people showed serious interest in the unit itself, and they either expressed an exaggerated perception of its time-saving benefits, or when probed further by the moderator, indicated that the primary attraction was as a technologically sophisticated "gadget" or "toy", rather than for the utility value. There was some concern about its physical size or chunkiness, too big to be thrown into a handbag or pocket, which limited the interest of existing PDA users. On the other hand, the screen was too small and indistinct* for easy consultation while driving a car, and while portability was an asset on flexibility and security grounds, for use in a vehicle the unit functionally was no serious competitor to permanent in-vehicle navigational aids.

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8 The Atlanta units did not have a backlit screen, unlike more recent versions of the *Envoy.*

There is also limited interest in autonomous ("static") in-vehicle navigational aids

There was a good deal of interest in this idea on the surface, and a fascination with the technology by some participants. However, for local travel, only those who professionally do a lot of driving to unfamiliar areas see much functional utility to themselves. There's greater utility for longer distance trips outside habitual territory, but even here the value over traditional sources of information is limited.

For in-vehicle devices, concerns about distraction and safety are always raised, and there is some reluctance to believe that the system would really work in practice, despite growing awareness of the recently available GPS-based systems in rental car fleets, and other increasingly frequent references in the popular media. Among users of complex public transportation networks (for example, subway, bus, ferry, and commuter rail interfaces, as in New York), tailored routing and (especially) schedule assistance is valued.

Real-time traffic information is a definite plus

Respondents do see a clear additional benefit from the incorporation of up-to-the-minute traffic information. However, there is also a consistent level of skepticism about how it would work. Respondents wonder

- whether the information would really be current and geographically detailed,
- whether it would be derived from the same sources as – and with no greater credibility, currency, or detail than – existing broadcast traffic reports, *and*
- whether the system would be overtaxed with many travelers trying to use it.

However, when participants are told more about the mechanics of how the system would work, they become more receptive. As with the static navigation system the higher-income professionals who drive often for work were more interested in this concept than were the participants who are more representative of the general public.

Participants' responses thus far

In general, participants focus more on the traffic information per se than any *route guidance* that the system might give. For local trips – the focus of most of the discussions – this presumably reflects confidence in the respondents' personal knowledge of the local geography, and in the ability to determine one's own best route if the nature, location, and extent of delays is made known.

Except by a few drivers, advanced in-vehicle systems are judged to cost more than their perceived benefits

Respondents' guesses about the costs of in-vehicle static or dynamic GPS-based navigational aids were quite diverse, but were usually significantly below the $2,000 to $2,500 level that is the range for the static models just now coming onto the market as OEM- or dealer-installed options in high-end vehicles. Given the doubts about the utility of these devices for habitual local trips, most participants saw them as outside their current range of interest, even with the possible addition of dynamic traffic information.

It is worth remarking that this was even the case among the *Los Angeles participants,* who

- had recently acquired very expensive *vehicles* (several *Jaguars, Mercedes Benzes, BMWs,* and high-end sport/utility vehicles), often with high-tech communications capabilities (including in-vehicle fax capabilities);
- often traveled extensively for business over a large area, and frequently needed navigational assistance (from the ubiquitously-used *Thomas Guide* of area street maps) to locate unfamiliar destinations;
- experience routinely some of the heaviest traffic congestion and delays in the nation;
- by virtue of the density of the local road network, often have substantial opportunities to divert from congested freeways onto arterials and local streets; *and*
- were aware of the homicide (in the prior week) of a driver who "got *of the freeway in the wrong neighborhood.*"

While not currently very interested in in-vehicle ATIS products and services, respondents expect to grow into them

Although most participants judged GPS-based in-vehicle technologies to be beyond their current willingness-to-pay, they did expect that the capital costs would fall markedly over a small number of years, following the examples of the cellular telephone, the fax machine, and microcomputers. If the product works as described, they were implicitly saying, it probably has a future as a standard vehicle accessory option, and at some future price level we would become interested. For dynamic traffic information, they usually volunteered that there would be a monthly basic access or communications charge, and many people felt this would be on the order of $20 to $25 per month, akin to the typical lowest subscriptions for cellular phone service, cable TV, and intemet access. However, a method of charging that was based entirely on *usage levels* seemed most attractive.

Reactions to ATIS innovations are based very much on perceived short-run *persona/* benefits

Most respondents focus solely on the utility of the ATIS concepts to themselves alone, for their own particular pattern of travel. It was very rare that anyone raised the prospects of any collective social benefit arising from the widespread use of better travel information. In the few cases when a participant suggested that (for example) traffic congestion levels might change, participants felt that widespread ATIS should have *favorable* traffic impacts, but worried sometimes about the levels of demands overtaxing the information system. The types of "secondary impact" issues that engage transportation policymakers and system designers – whether route guidance through local streets is politically and legally feasible, systemwide vs. local optimization in route guidance information, and so on – were rarely, if ever, raised.

Similarly, people focused on the implications of ATIS concepts almost entirely for avoiding travel delays, with no wider vision of whether an enhanced ability to manage one's time might have a more pervasive impact on lifestyles.[9] When

9 The one exception to this generalization is that respondents volunteer that increased understand-ing about the nature and causes of delays gives *greater peace-of-mind,* regardless

moderators probed on some of these broader, more projective matters, the respondents were less articulate and creative than when addressing (for example) the functionality of equipment, about which they talk readily and without prompting.

In-vehicle Mayday devices have more immediate appeal than navigational aids

For the more "general population" groups of drivers, Mayday devices are seen as both cheaper and having greater functional value than navigational aids. They are most often compared with the cellular telephone as a means of summoning aid. While many drivers – particularly males, it seems – do not see a significant value increment (over their cellular 'phones) for themselves personally, when they think about *other family drivers* they are also prepared to contemplate the utility in more catastrophic circumstances, when the driver is unconscious or otherwise unable to use the phone. A response that emerged at several groups was *"I'm not sure that this does much for me, but I'd get this tomorrow for my wife or daughter."*

As with in-vehicle navigation systems, there is some uneasiness about whether the system would work as described, and whether it would be compromised by location or the availability or quality of local response personnel. For any Mayday device, it is obviously important that the system provide some acknowledgment of receipt of the call, and reassurance that help is on the way.

Enhanced information systems at transit stations would be valued by current transit users

While en *route* public transportation ATIS concepts were tested to a more limited extent than were private vehicle-related ideas, it appears that current heavy transit users are very interested in this concept. The pervasiveness of public transport networks in New York City probably means that our participants there have more mode and route variation choices available to them than transit users elsewhere, but travelers spoke about several key decision points in their journeys at which

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of whether or not the traveler is able to take evasive action. We can cope with problems better if we feel we are being given an honest and reasonable explanation for them.

changes may be feasible with good information about current system performance: when starting out, when entering a rail station, and while waiting for service within the system (on station platforms, at changing points, and so on). They would value appropriate information (particularly about nonrecurrent delays) at each of these points, through pre-trip systems, concourse "kiosk" displays (to help both in negotiating complex networks in the easiest way – with routing, schedules, and fare alternatives – and to provide *current* system performance information), and on-platform notification of the expected waiting time.

We saw little evidence, however, to suggest that aggregate transit ridership levels would be influenced significantly by providing such information. The value to existing transit users derives primarily from the ability of the system to give peace-of-mind by reducing uncertainty – in that sense, it might help to reduce defections from transit. There does not appear to be much interest in transit ATIS concepts among regular private vehicle users.

Conclusions about survey methods

Getting the ideas across

An important objective of this first stage of the qualitative research was to determine the most *effective* ways of *communicating* the various ATIS concepts to survey respondents (and their potential utility in respondents' own lives), in ways least likely to invoke serious response biases. We also wanted to identify any potential methodological problems that might affect future larger-scale surveys designed to appraise user acceptance and willingness-to-pay for ATIS product concepts.

Our specific conclusions with respect to the communication of the concepts are as follows:

- *Carefully crafted verbal concept descriptions appear to work reasonably* well in conveying the essentials of the concepts, and getting people to think about application to their own travel. Explicit evidence of significant misunderstanding was rare. However, we learned that it was advantageous

to add a brief, simple, factual explanation of *how* high technology devices work, to circumvent erroneous speculation and doubts about efficacy.

- *Relatively little is added by videotapes and/or short demonstrations.* People appeared able to visualize the appearance, size, and location of dashboard-mounted in-vehicle units quite well, perhaps helped by recent prime-time television advertising by major rental car companies. While some people expressed doubts about the *currency* or *accuracy* of real-time traffic information, nobody appeared to question or be overawed by the ability to (for example) view a map of concurrent Atlanta traffic conditions with a small hand-held wireless unit in New York or Irvine. The only demonstrations that appear to have altered the initial perceptions (favorably, in this case) of more than one or two participants were demonstrations of telephone voice-based information systems.

- The most notable communications diiculty is in *conveying any ideas of possibly broader impacts on the respondents' own lives, or on the transportation system as a whole.* When asked to consider the implications of using the ATIS product in the context of a specific trip they have made in the past, respondents tend to focus exclusively on the most obvious and most personally-experienced effects. *Saving personal travel time* by avoiding delays to the specific trip under consideration was the primary focus of most people's thinking. In other words, while the respondents didn't need additional detail to imagine the *products,* they were somewhat less adept at imagining the various *different ways* in which the products might have value in their daily lives. [10] This is a frequent (and critical) problem in market research on new product categories, or on products that require behavioral adjustments.

10 Respondents rarely offered spontaneously any thoughts about (for example) how the widespread adoption of ATIS might affect transportation systems in general, or about how a significantly greater predictability of travel times might affect their lives more broadly.

Identifying the key features of ATIS information

Another important objective of the qualitative research is to identify the most important *attributes* of possible ATIS product or service offerings, or more specifically, of the *information* provided by these products or services. Based on the work conducted to date, the most important cross-cutting attributes of ATIS information appear to be:

- ***Accuracy.*** Participants want to know that the information will be correct, whether it concerns the arrival time of the next train or the location and severity of traffic problems.
- ***Timeliness.*** For the information to be of use, it needs to be current and received in time to permit evasive action (that is, changing travel decisions about whether, when, where, or by what mode or route to travel).
- ***Reliability.*** Potential users want to be assured that the information source *will be comprehensive* in its coverage of possible problems within the travel corridor, and *consistent* in its quality (as measured by, say, accuracy and timeliness).
- ***Cost.*** The anticipated capital and operating expenses were important considerations for all focus groups and for all concepts for which personal payment was anticipated (that is, excluding transit facility infrastructure). When asked, after hearing the concept description, to write down "the one question about this idea that you most want answered," participants mentioned cost to a much greater extent than any other consideration.
- ***Degree of decision guidance.*** The information must be of sufficiently *detailed* and *personalized* content (with regards to locations, times, and possible evasive responses) to be instrumental in planning travel, or to allow the *en route* readjustment of plans.
- ***Ease of access*** *("convenience").* Access time, and relatedly the necessary level of user attention, is clearly perceived to be an additional cost associated with using several of these concepts. To be attractive, therefore, the concepts need to be minimally disruptive to other activities, and not require much time or skill to use in obtaining just the information appropriate to the user's specific needs at that time.

Participants' responses thus far

- ***Perceived safety implications.*** The extent to which the information can help users to avoid a dangerous situation, or to feel protected in a bad accident or other emergency, is very important. The degree to which accessing in-vehicle information may cause a distraction from driving is also relevant.

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So what potential market offerings seem the most promising, on this evidence?

We must caution again that *qualitative* research methods (such as focus groups) are more suitable for generating hypotheses for further (quantitative) investigation than they are for drawing substantive or strategic conclusions. That said, it is useful to pull together our *impressions* of what types of market offerings would best appear to respond to the types of concerns aired in these twelve focus groups.

To structure the discussion, we will first summarize the consumer reactions to various discrete types of ATIS *information*, and then address the interest in the consumer *equipment* that might be necessary to transmit, receive, or present the information.

Pre-trip information

Information accessed *pre-trip* (particularly concerning non-recurrent sources of delays) suffers from an inherent disadvantage, its potential lack of timeliness. This severely limits the consumer interest for *commuting trips*, except perhaps for those transit patrons who have an option of setting out in a different way. Pre-trip information has a little more attraction to longer-distance travelers by private vehicle or public transportation.

Limited marketplace experience to date has demonstrated a very low consumer willingness-to-pay for local pre-trip traffic information (when charged by the access), and many focus group participants echoed this by indicating that they were generally unwilling to spend even an additional two or three minutes before commute trips (at least, the *home-to-work* trip) in seeking out travel information. The current broadcast traffic information, free to the end user, is somewhat distrusted, but users do appreciate the very low level of engagement required to access it. Making telephone calls, booting up computers, or navigating menu systems is seen as relatively onerous, by contrast.

Perhaps some of these reactions could be influenced by promotional messages that the investment of a little extra time and effort before the trip has a good chance of paying off in significantly larger in-vehicle time savings. But for pre-trip travel information systems to be sought out and used in the commuter marketplace, they

do need to add discernible value over the free broadcast information – by increased personalization, specificity, accuracy, or timeliness, for example – to compensate for any additional effort or time necessary to access the information. For less routine travel than commuting and for non-local trips, there is potential added value from learning about temporary but persistent sources of delay (construction work, for example) and in linking with more information about potential destinations.

For public transportation modes, customers do need assistance in navigating through complex networks to minimize the travel time, inconvenience, and fare, but they expect this assistance to be provided, easily accessed and efficiently, by the carrier (or the carrier's agent) at no additional cost.

En route navigational information

Purely *navigational* information accessed while en *route* has value for specialized (minority) market segments primarily: out-of-town rental car users, the "road warriors" who drive substantially for work in unfamiliar or semi-familiar areas, infrequent users of complex public transportation networks, and so on. The current means of coping are to use printed maps and/or to get pre-trip directions from somebody at the destination. These methods are cheap in terms of both fixed and variable costs, and are reasonably effective for all but those who have trouble reading maps. The information value added by more technologically-sophisticated forms of in-vehicle *en route* navigational assistance are:

- more detailed or up-to-date information about one-way streets, turn restrictions, and so on;
- readily available, integrated information about destinations ("points of interest," in the trade jargon); *and*
- simplified communication methods (voice instructions or arrow displays on screens, for example), that are less distracting from the driving task than consulting a detailed map.

The capital costs associated with these increments are currently much higher than most potential users are prepared to pay for them, except for certain market

segments. As prices fall, however, en *route* navigational assistance should increase its attractiveness.

En route travel delay information

Real time information about traffic delays and public transportation schedule adjustments – particularly those of a non-recurrent nature – do have additional value to travelers. For private vehicle users, the current in-vehicle source of this information is predominantly radio traffic reports, accessed at no incremental charge or extra equipment requirements. These are recognized to have deficiencies (in terms of currency, specificity, and geographical coverage), but the focus group participants' initial reactions were to doubt whether other sources of real-time delay information would be superior in quality to the "free" alternative.

Wiigness-to-pay for additional information would appear to hinge critically on the nature and degree of improvement over this baseline. Some forms of improvement – continuously updated information, for example – could still be communicated efficiently by *broadcast* media (given favorable economics), whereas other improvements – such as greater geographical detail – would require some form of tailored *narrow*casting for efficient communication.

The growth of cellular telephones has provided a new technological means for disseminating such information at minimal incremental cost, *a la SmarTraveler.* Access is a little less convenient than the car radio, however, and distracts more from driving. To be used, telephone-based systems will need to establish both strong public awareness and a significant, well-recognized quality increment over the free radio traffic reports. These criteria will be all the more significant for more sophisticated communications equipment requiring significant capital outlays.

For common carrier modes, the airlines do the best (albeit far from ideal) job of transmitting both pre-trip and *en route* information, through computer reservation systems, telephone information systems, and in-airport displays. By comparison, urban transit is a very poor cousin. Transit users are enthusiastic about upgrading the real-time scheduling and routing information available to them in bus terminals and rail station concourses and platforms. At the same time, their range of alternate choices (of mode, route, destination, etc.) is often much more limited than that of private vehicle users, and the additional information may often be

useful more for improving their peace of mind (and hence, their general level of satisfaction with the transit experience) than for influencing their *en route* travel decisions.

Dynamic route guidance information

The integration of static navigational assistance and real-time traffic information creates the possibility of avoiding traffic delays with as user-friendly an interface as that provided by an in-vehicle electronic navigational device (that is, voice, turn direction, or simple map displays). While the focus group participants acknowledged that *route guidance* information was a distinct increment in information content over *real-time delay* information alone, they appeared to be somewhat less excited about this increment than they were about the possibility of enhanced, accurate, up-to-the-minute delay information itself In the local and commute trip context, this appeared to reflect some confidence in their own local knowledge and abilities to navigate around hold-ups if they have accurate information about the nature and extent of the problem."

It appears that the incremental value to travelers of route guidance will be determined mostly by evidence that the guidance *does* improve on the drivers' own routing capabilities in familiar areas, and, in less familiar areas, by a more convenient and efficient method than can be achieved by a driver or navigator consulting a map.

Safety-related information

The focus group participants' relatively enthusiastic reception of *Mayday* devices *vis a vis* other in-vehicle ATIS improvements primarily reflects two considerations: less functional overlap with currently available technologies (except for the cellular 'phone), and the presumption of a much lower capital cost. *Mayday* appears likely to benefit from the same "insurance investment" thinking that purportedly has

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[11] Early published results from the ADVANCE operational test are consistent with this observation. For local trips, participants compared the dynamic route guidance information unfavorably with their own routing capabilities.

contributed significantly to the acquisition and use of in-vehicle telephones. However, there is some consumer resistance to contemplating *themselves* in circumstances needing the potentially most beneficial deployment of Mayday: in a situation where the vehicle occupants are disabled by a serious accident and unable to use the cellular 'phone.

On our focus group evidence, the US automobile companies appear to be correct in their conclusion that, at near-term price levels, the customer demand for *Mayday* assistance is likely to be broader than that for in-vehicle navigation and route guidance.

Products enabling transmission, receipt, and presentation of the information

This survey has already touched peripherally on the implications for *devices* of various sorts used within private vehicles: telephones, GPS receivers, map displays, voice directions, and so on. Once programmed before beginning the trip, the more advanced of these products tend to have a simpler, less demanding user interface, particularly for a driver traveling alone, than (say) the manipulations necessary to call up locally-specific information on a cellular 'phone. On the other hand, participants expect that the extra costs to own this impressive hardware (as distinct from leasing by the day in a rental car in an unfamiliar city) currently greatly exceed the incremental value to them of either the information itself or the user-friendly interface. In fact, in making this judgment they tend to *underestimate* the current capital costs of advanced navigational systems.

Current PDA-based systems have the advantage of greater portability, but the disadvantage of being a diicult-sized product: too small for easy use within a vehicle (even with good mounting hardware), yet too bulky for pocket or purse – it is definitely a "briefcase portability." Technological advances could change that current awkwardness, for example by clearer small displays, direction-oriented programming, and/or the inclusion of voice directions. At that stage, a wireless PDA unit could reasonably substitute for a fixed display in a GPS-equipped private vehicle, with the extra advantages of portability and much broader (non-transportation) functional capabilities.

Respondents expected the cost of *Mayday* devices alone to be much less than those of navigational products, and hence feasibly within their current willingness-

to-pay. They correctly volunteered that the incremental cost of adding *Mayday* capabilities to the GPS-based navigational devices would probably be small.

Appendix: Methodological details for the focus groups

M.O.R.-PACE groups (Series A)

Because of their significant experience in conducting qualitative research for the motor vehicle manufacturing industries, including focus groups concerned with aspects of ATIS, team member *M.O.R./PACE* was given responsibility for the design and conduct of the Series A discussions that particularly emphasised vehicle (and associated equipment) acquisition decisions.

In addition to the general objectives, these groups were also undertaken to replicate for the JPO some qualitative studies purportedly carried out by the Big Three US automakers on customer acceptance of ITS-related products.

Two groups were conducted in each of two metropolitan areas: *Los Angeles* (Marina de1 Rey) and *Washington, DC* (Bethesda, MD) in mid September. At each location, the groups were stratified into two types:

- A group of *commuters* spending at least an hour a day in their vehicles traveling to and from work or work-related sites; *and*
- A group of people employed *in specialized occupations* requiring a large amount of driving to potentially unfamiliar locations.

The general composition of both sets of groups was further oriented toward potential "early adopters" by including only participants who were:

- recent purchasers (or lessees) of high-end private vehicles,
- oriented towards high-tech equipment as evidenced by PC ownership and/or Internet use,
- cellular phone users who use their phones often, *and*
- members of higher income households.

Appendix: Methodological details

CRA groups (Series B)

These groups were designed and administered by *Charles River Associates,* and were moderated by qualitative research specialists Howard Gendel or Doug Solomon. The first block of four groups was conducted during August in suburban *Boston* and downtown *Philadelphia*. These initial exploratory groups were meant to represent the "general public," and contained a mix of private vehicle and public transportation users. In each city, one group was devoted entirely to *local trips,* and comprised general travelers making at least a minimum number of local trips each week. The other group was devoted to *long distance trips,* and was made up of general travelers who had made a recent longer distance trip. In both groups, quotas were set for qualifying trips by private vehicle and by common carrier.

The second block of groups was carried out in *New York City* and *Orange County (CA)* during September. These groups were more focused in composition, and intended to represent the "polar cases" of the most *transit-oriented* city (New York) and a metropolitan region with extremely heavy traffic congestion (Los Angeles). The New York groups included only heavy public transportation (bus, commuter rail, rail transit, or ferry) users, and were further stratified into suburban commuters and central city tripmakers. The Orange County groups likewise comprised only private vehicle users, and included long-distance (or long duration) commuters. They were stratified into a general group of frequent local tripmakers and a group of potential "early adopters" consisting of high income, high tech-orientated owners of newer high-end vehicles, many of whom were employed in specialized professions that require extensive driving to often unfamiliar locations.

This second block of groups also included more practical demonstrations of ATIS applications than did the first block. Included with the descriptions of potential ATIS market offerings were demonstrations of actual (or simulated) products or services and other visual aids to provide participants with a more detailed understanding of the potential modes of information access.

Sample verbal concept descriptions, as used in the later groups, follow.

PRE-TRIP TRAVEL INFORMATION SERVICES

A pre-trip travel information system allows you to have access to a wide variety of travel-related information from a telephone, a personal computer, a "personal digital assistant" (PDA) unit, or a cable TV set. While you might normally obtain the information from either your home or workplace, with a cellular telephone or a PDA unit you could also update the information while you are *traveling.*

The system is designed to provide you the specific information that you're looking for as quickly and easily as possible.

The system can provide information about:

- events and places in and around Southern California
- current traffic conditions on all of the region's major highways
- public transportation services, schedules, and fares (including up-to-the-minute information on delays and cancellations)
- the fastest routes by public or private transportation, avoiding current delays
- weather and public safety information.

IN- VEHICLE NAVIGATION SYSTEM

A travel navigation system mounted in or on the dashboard of your private vehicle gives you turn-by-turn directions to any destination in California or Southern Nevada.

The system's screen can display the information in either of two ways:

- As a ***map*** at a scale you can vary, showing the position of your own vehicle with respect to neighboring streets, your starting point, or your destination.
- As a simple direction indicator (for example, "Third right at Franklin Road, 0.6 miles ahead" or "Turn left now", with an arrow pointing toward the destination).

The unit can also give you voice directions for each vehicle maneuver; this feature can be turned off if you like.

Your destinations can be entered in several ways: as a specific street address or intersection, a major landmark or building, or a point of interest such as a particular restaurant, or the nearest gas station or automated teller machine. You can specify whether you want to use freeways or not.

The recommended route is based on calculating the shortest travel time, assuming average speeds for roads of different types. It takes no account of either actual traffic conditions currently, or of the usual speeds on those *particular* roads at the time of day that you are traveling. It does take account of one-way streets and other permanent traffic restrictions, however.

The system works in the following way. The in-vehicle unit stores all of the map information (which can be updated periodically, or replaced by maps of other regions, by replacing a small data disk in the unit). The position of your vehicle at all times is determined by the *Global Positioning System,* which uses signals transmitted from satellites to identify exactly where on the map you currently are.

ADVANCED IN-VEHICLE NAVIGATION SYSTEM

This unit is also mounted within your vehicle, and its appearance is completely identical to the *in-vehicle navigation system* we've just discussed.

However, there will be one big difference. The *advanced system* does everything that the basic system does, but it also can take account of *current traffic conditions* on the roads between your origin and destination, and will determine a route that reflects the traffic speeds right now. It will help you avoid congested routes.

The advanced system in your vehicle receives continuously-updated wireless signals about traffic conditions. The central traffic control office monitors the situation using helicopters, cameras and speed sensors at key intersections, and (possibly) information automatically sent back by the in-vehicle units indicating the speeds at which traffic is currently moving.

PUBLIC TRANSIT INFORMATION SYSTEM

The advanced public transit information system will provide up-to-the-moment service information at subway and rail stations, and at major bus terminals.

The system uses interactive "kiosk" displays in station concourses, and electronic signs or television monitors on platforms (or at other key positions), to display information about each of the rail lines or bus routes served from or near that location.

The displays might provide (for example) the quickest route, given current travel conditions, to any specified station in the MTA, PATH, and NJ TRANSIT networks; or the time until the arrival of the next train or bus for each route or line at this station, the stops it will serve, and information about any service disruptions, delays, or cancellations as they arise.

When significant delays occur, the system will suggest alternative services if they are available.

MAYDAY SYSTEM

In a personal or vehicle emergency, an in-vehicle security system allows you to summon help quickly from any location in and around Philadelphia.

By pressing a button, you can choose to contact the police, fire department, an ambulance, a tow truck, or your vehicle manufacturer's roadside assistance program. Service personnel will instantly know the exact location of your vehicle.

In the event of an accident that triggers your airbag, the system will automatically summon emergency services without any input from you.