PART 2. GROUP REPORT

#	Combined Problem Statement	Evidence (Tape Time)	Individuals Referenced
1	**Power requirement not clear** - The user doesn't realize Palm Pilot needs to be on before accessing find function. User taps "find" while the Pilot is not powered on, and cannot access the find feature.	315000	EB1, FF1, TL1, BY1
2	**Uncertain which button turns Pilot on** - User looks for a way to turn on Palm Pilot and presses address book button. User reproduces interviewer's actions to turn on Palm Pilot.	330000	EB2, FF2, BY2
3	**No clear way to remove previous find text** -User attempts to click on current text with no positive result.	347000	FF3, SG1, BY3
4	**Find field size is limited** - "Publications Committee" did not fit in find field. User settles for "Publications Co"	361000	FF4, TL2, BY4
5	**Search results do not open by tapping** – user must hit "Go To" button, which can be confusing.	376000	FF5, TL3, BY5
6	**Current application is not clear** - User cannot tell what application she is using ("I'm not sure what application I'm in now…" - 380600).	380000	FF6, BY6, SG2
7	**Delete button is hidden from the user** - User says "now I have to delete here" and "I want to get rid of this." (400000) User incorrectly backspaces over selected record in an attempt to delete it – should use "details -> delete" instead.	394000	EB4, FF7, BY7, SG3
8	**Calendar navigation is unclear** - User notices "Go To" button, which would let her quickly get to her destination, however she chooses the "Week" button, even though she is not sure what it does either.	429000	FF8, BY8, TL4, SG4
9	**Specific week unclear** - Current week selection is unclear to user at "week" view.	441000	FF9, SG5, BY9
10	**Week becomes clearer** - "That's not too bad, this is kinda cool." The user notices that the days are being displayed as she scrolls through them.	449700	FF10, EB5, FF10, SG6
111	**Blocks confusing** - Blocks are not obvious representations of meetings. The user says: "I don't know what these blocks are."	462000	FF11, TL5, BY10, SG7
12	**Day/Week views confusing**- User has troubles switching between the Day and Week views of the calendar.	471500	FF13, SG8, TL6
13	**Appointment creation not possible in week view** - Since the user wants to create an appointment that spans two days; it makes sense to add this	471500	FF12, SG8, TL6

	appointment on the week view. Unfortunately, the user must first tap on a specific day in the week view and enter meeting there.		
14	**Day view recognizable** - User clicks on day and appears thrilled that she has arrived at a day view.	483000	BY11
15	**"New" feature not clearly visible** - Unclear how to create a new appointment when in day view. User says, "I don't know what to do here." (503700)	503700	FF14
16	**No conflicting events reminders** - User makes a design suggestion that they would like to be reminded of conflicting events. Note: user does not create appointments that span entire days.	518500	FF15, BY14, TL9, SG10
17	**Meeting time manipulation unclear** - No straightforward method of setting time for an event that spans multiple days. The user says: "I just put in any time…"	564800	FF16, TL10, BY15, SG11
18	**User incorrectly completed task** - the times are not set correctly, and the event is not entered as spanning two days.	585000	TL11
19	**Address book not linked to Date Book** - No system-level way to associate an address book entry with a date.	623800	FF18, BY18, SG14, EB6, TL15
20	**Memo pad not linked to Date Book** No system-level way of memo pad entry with date. User seeks out this option in memo application, however memos cannot be associated with dates.	600000 690000 827689 1097300	FF21, TL18, SG15, BY19, EB7, BY42, SG29, FF26, FF20, BY17, TL12, EB6, FF29, FF31, SG22, BY27
21	**Features of "details" button in memo pad are unclear** - User says, "What is this? Unfiled? Category?"	700000	FF21, TL19, BY20
222	**No "back" feature** - No clear way to "go back" to calendar application. The user conceives her progression as linear and does not get the impression that she is jumping between applications.	718230	FF22, TL20, BY21, SG18, FF26
23	**"Unfiled" is an unclear option** – displayed in upper right corner of screen. User exclaims dissatisfaction with menu labels.	733500	FF23, SG18, BY22
24	**Function of "font sizing" buttons is unclear** - User presses font size and does not achieve desired result. Appears to be attempting to explore interface.	743000	FF24, SG18
25	**Impossible to copy date book entry** - User exclaims "nothing is happening – this is frustrating", creates workaround using "find" function.	798000	FF25, TL21, SG19, BY24
26	**Transitions unclear** - System does not give indication that the user has arrived at a new function. User hits "cancel", returns to "memo" function. No	788500	SG20

	clear transition.		
27	**No copy function readily available** - Unclear why user is seeking function, but says "help, I don't know how to copy."	807500	FF25, TL21, BY25, EB10, SG21
29	**"Find" feature straightforward** - The user finds the item being searched for	883967	BY28
30	**User cannot complete the task** – User does not associate information with the dates, rather with the term: "Publications Committee," by using a workaround because she couldn't find an acceptable alternative.	910000	FF29, TL22, BY29, EB6, SG23
31	**No clear way to associate to do list with a date** The user is trying to make a to-do item on a certain date. The user is trying to associate events between the two applications but it is not possible. "...no, it's not connected, so this is not going to do any good at all!" (1059000). She works around it by adding "publications committee" to the to do list entry so she can use the find feature to associate the entries. The user complains about having to do a work-around: "I wish there were a better way..." (989700) The user tries to put a to-do item on a given day in the address book (1033000).	960000 989700 1033000 1059000 1124880	FF31, TL23, BY30, SG24-5, FF32, EB10, BY33, BY34, SG27, FF37, TL25, BY40, SG29, EB11, TL26, BY43, SG30, TL27
32	**Checkbox not clear** - Not clear what checkbox does on To Do list. "Is this a priority list? I don't know what this little check thing is..."	975000	FF28, TL24, BY31
333	**Calendar button not easily identifiable** - Doesn't know where the calendar is. "Now I want to go to the calendar... is this the calendar?"	101000	FF30, SG28
34	**"Hotspots" on week view unclear** - User expressed surprise that a day pops up when she clicks on part of the week view on the calendar.	1042000	FF32, BY37
35	**User fails task** - She never actually associates a reminder with the next day. Her workaround consisted of putting the item to do on the calendar at a random time a week before the event.	1129000	TL28, FF35

Observations Omitted From Combined Critical Incident List		
#	**Description**	**Why not**
TL 14	User was able to create a new entry in the address book	User did not express any surprise or show signs associated with critical incidents
TL 17	User was able to create a new memo in the memo pad	User did not express any surprise or show signs associated with critical incidents

PART 3. CRITIQUE OF THINK-ALOUD

The instructions given to the participant in this videotape largely followed Gomoll's suggestions on how to collect data in a think aloud study (1990). The interviewer sets up the observation by providing the user with written instructions of a realistic situation (as seen in the video, and the actual task instructions given to us). We assume he has recruited a novice user of the Palm Pilot. The interviewer also describes the purpose of the observation in the general terms ("we are redesigning the Palm Pilot", 0002300), just as Gomoll recommended.

The first action the interviewer takes is getting the user to sign a permission form, obtaining consent to videotape the process (0008780). Although this step is not included in Gomoll's outline, it is an ethically and legally mandated step. Next, he tells the user that it's okay to quit at anytime, but prefaces it by saying that he doesn't "know why this would happen" (0004700). The preface, in addition to his comment that this is "not a test" (0002870), helps to ease any possible anticipation on the user's part that this will be a strenuous task that she might not wish to do.

Next, he explains the equipment with which she will be working: the CoPilot simulator that is already open on the computer laptop, the camera, the microphone attached to her, and the task notes. A good addition to the demonstration is his explanation as to why she will be using a simulator and not the actual device they are attempting to redesign ("it is easier to film it", 0007000). The interviewer goes on to introduce the other person in the room by his name; this is a good technique to make the subject more comfortable.

The interviewer mentions briefly that the user will be performing a think aloud usability and provides an appropriate justification as to why they are doing it: "We've found that we get a lot of great information from this kind of observation" (0008100). He then asks her if she wants to watch a demonstration (0010850), an "optional step" according to Gomoll. This is potentially harmful because he is relying on her admitting her ignorance of think-aloud usability testing in order to get instructions; he should probably give a demonstration to all users. On a good note, he does accurately demonstrate possible criteria such as stating

goals and demonstrating surprise for defining a critical incident. On a bad note, he demonstrates *on* the CoPilot, which later on biases the fulfillment of one of her tasks (0032900). Instead, he should have demonstrated on another object, e.g., a telephone.

Gomoll's suggestion to inform the user that the interviewer will not provide help with the task was incorporated into the introduction rather well. He asserts that he will not respond to her questions (0164100), but that even questions were important so she should articulate her thought process (0178900).

When the interviewer finally introduces the task, he reads from the pieces of paper in front of the user (0184400). Referring to the given handout is an excellent tactic because it makes her familiar with what she will be referring to when the interviewer will not be able to help her. Furthermore, he does not elaborate on the written task so as to maintain consistency among users in the experiment. He does not, however, explain beyond the first task on the list with the user once she jumps in to begin the experiment (0301500). This inconsistency can be a possible confounding variable explaining her ability to complete the first task with relative ease (although incorrectly fulfilled) in comparison to her observed difficulty and frustration in the remaining tasks. This could possibly have been prevented had he asked whether the user had any questions before allowing the study to begin. Finally, within the interviewer's reading of the first task an unintentional bias can easily be detected when he places vocal inflection emphasis on "publications committee" (0026600). Although this is not noted in the remaining tasks, the user seems to latch on to this phrase as a means of maneuvering through the CoPilot applications.

Although having the user work on the CoPilot emulator was helpful for the recording of the user's actions, we feel that this introduced other issues into the think-aloud. For example, when the user is trying to enter "publications committee" into the Find dialog (347700), she presses the backspace key in an attempt to clear the previous search term. A real Palm Pilot doesn't have a backspace key (or any keys for that matter), which means that the user would have probably reacted differently to the situation, thus that aspect of the usability was not tested. In another instance, when the user is entering the title of her meeting (532033), she accidentally hits the caps lock button, which would not have happened on a physical Palm Pilot.

PART 4. COMPARISON TO HE AND CW

Between the Cognitive Walkthrough and the Think Aloud, two of the tasks were extremely similar (finding and deleting, and creating a new entry). This is where the majority of our refuted predictions came from. As far as the Heuristic Evaluation goes, it was almost impossible to refute any of our critical incidents, because everything uncovered in the Heuristic Evaluation was a problem itself.

All of the omitted Think Aloud entries in this list were those not covered in either the Cognitive Walkthrough or the Heuristic Evaluation. This happened a great deal more than we expected, primarily because the user strayed from the route predicted by the Cognitive Walkthrough. Once this occurred, the specific problems that the user ran into were not addressed by our predictive methods, so we could neither refute nor support them as usability problems.

Analysis Predicted	Short Problem Description	Tape Time	Supported/Refuted
CW	Delete button is hidden from the user	394000	Supported
HE	Calendar navigation is unclear	429000	Supported
CW	Day view is recognizable	471500	Supported
CW, HE	No "new" feature	503700	Supported
CW, HE	Unclear how to adjust times on a Date Book entry	564800	Supported
HE	Features of "details" button in memo pad are unclear	700000	Supported
HE	No copy function readily available	807500	Supported
CW	"Find" feature straightforward	883967	Supported
HE	Calendar button not easily identifiable	1010000	Supported
HE	Dates don't support To Do items	1033000	Supported
HE	No clear way to link To Do item to a date item	1059000	Supported

The following were not predicted as usability problems in the CW or HE, but were found to be usability problems in the Think-Aloud.

Analysis Predicted	Short Problem Description	Tape Time	Supported/Refuted
CW	Requirement to hit the power button not clear	315000	Refuted
CW	Uncertain which button turns Palm Pilot on	330000	Refuted

CW	Search results do not open by tapping directly	376000	Refuted
CW	Location not clear when the user leaves "Find" and enters "Date Book"	380000	Refuted
CW	Calendar navigation is unclear	429000	Refuted

PART 5. DESIGN RECOMMENDATIONS

Our first design recommendation stems from problem 17: there is no straightforward method for setting the time for an event. The user does not seem to notice how to set or change the time for an event, in particular an event that spans a whole day with no set time. The interface does not include a default or blank area to put these types of events in right from the start. The "Details…" button neither attracts the user's attention nor is descriptive enough that the user can determine what it does or how important it is. Hitting that button would possibly have made the task go much more smoothly.

As a result of this confusion, the user was never able to complete the task correctly (problem 18). Because the user was given no time for the event, when she enters the day view of the Date Book she is immediately confused – all you see are times. Her decision to write the event down at a random time during the day is counterintuitive, but it does correspond with the task structure for creating an all day event on the Palm Pilot. The problem is that the task structure also contains a second step: hitting the "Details…" button and modifying the meeting information.

Adding a "New" button might make the progression from writing on the calendar to adjusting the properties more natural and would also make the task structure shallower. If the user could click "New" and enter the event description and the details of the event in the same place, they would probably experience more success. When a novice user is looking to create a new entry, seeing a button with the word "New" on it would probably attract their attention. Furthermore, the Cognitive Walkthrough revealed the difficulty in creating a two-day event, but without the user ever getting to this point in the Think Aloud it is impossible to be precise about what the outcome would have been.

Throughout the user's experience, she is constantly getting lost when she switches from one application to another (see combined problem statements 6, 9, 12, 26, 33). Each time this occurs, the user statements analogous to "I'm not sure where I am." This could be interpreted as mere mislabeling, but we believe there is a deeper throughline to these problems: lack of consistency and visible transitions. This occurs first when the user presses the physical calendar button and the calendar view pops up on the screen. Immediately, she states, "I'm not sure what application I'm in" (problem 6). This continues to problem 33, when the user asks, "is this the calendar?" If this were a mislabeling problem, she most likely would have adapted more quickly. Furthermore, the user cannot refocus within the options of a single application, i.e., problem 9 when she cannot discern the weeks within the calendar or get to the details of a specific date (problem 12).

Our second design recommendation regarding said transitions takes into consideration that this particular user appears to rely heavily on mappings to real-world scenarios, a conclusion we reach after noting her ease with tasks with the notepad, to do list, and 'find' function. Each of these tasks on the coPilot are executed with a single button and open to a single screen on which she performs a task that maps directly to the real world, such as typing. Conversely, the calendar presents numerous problems. There are several different views of the calendar that have no clear physical mapping during the transition: monthly, weekly, and daily. There are multiple ways of interacting with the interface that are not easily detectable or associated with the task being performed: clicking, typing, opening menus. But, there are several ideas that could ease the user's progression from one view of the calendar to the next.

One is the page metaphor: when the user moves from one month/week/day to the next, the screen turns like a page rather than swapping out, which produces a visual cue to aid the memory of chronology. The zoom concept is also applicable wherein the user is able to zoom in and out from month to week to day to appointment details and vice versa. Both methods require a persistent

visual manipulation cue, i.e., book spine or magnifying glass respectively, that maps iconically to the real world. What is most important to solve with these methods is the jolting, indistinguishable switch between screens.

Overall, the user had trouble distinguishing between applications and understanding their relationships to one another. This was revealed in the problems the user had while looking for ways to link specific dates with applications, specifically Address entries, Memos, and To-Do lists (problems 19, 20, 21, 25, 31). This confusion stemmed from the second task where the user is supposed to associate the name, address and phone number of her hotel with the meeting dates (problem 19). In general, the basic applications on the Palm Pilot operate independently and are not easily accessible from inside any application.

While the applications must remain segregated for screen real estate concerns, several possibilities are available to ease the use of the system. Adding a "New Details" button might make the progression from writing on the calendar to adjusting the properties, for example, more natural. If the user could click "New Details" and enter the event description and the details of the event in the same place, they would probably experience more success. Novice users looking to create a new entry especially - if they saw a button with the word "New" on it would probably attract their attention. Another option is to go back to the real world metaphors again and place some kind of icon in a corner that resembles a staple or paper clip and any time the user wants to connect something, they just click on it and the piece they would like to attach it to.