

May 17, 1972

MEMORANDUM FOR:

MR. JOHN D. EHRLICHMAN

In writing this memorandum to you, I want you and Haldeman to use it as a basis for discussion with Mitchell or anyone else in the political shop who has some responsibility for Michigan and similar States.

Despite the obvious inference that the size of Wallace's victory in Michigan was in part due to the shooting on Monday, any honest observer will have to agree that, even without the shooting, he would have won overwhelmingly.

This is the most striking proof we could possibly have of the potency of busing as an issue in those States where people are concerned about it. It also shows that the only way to strike home on the issue is to be simple, direct, and uncomplicated, as Wallace was.

This does not mean that, with the position of responsibility I have, that I can talk like Wallace does. On the other hand, I fear John Connally is correct when he made the statement to me three days ago that on busing, while we probably came out with the right decision and a responsible one, we moved on it perhaps a little too late and then in a way that was not simple enough to be understood clearly by rank and file voters in a State like Michigan where it is a burning issue. I know, too, that it can be claimed that, in a final campaign, whoever is nominated by the Democrats will take a position which in one way or another is pro busing. On the other hand, we have to bear in mind that, to get Democrats to vote for Wallace--a fellow Democrat on the busing issue--is not too difficult. To get a Democrat to leave his party and vote for a Republican is far more difficult. This means that, if the issue is to be helpful to us, we must present it in a more simple, uncomplicated, direct manner.

As of course you realize, we are taking the same heat for coming out with a half-way measure as we would have taken if we had come out for a Constitutional amendment. I realize that responsibility was the key to moving in the way we did but, on the other hand, from a political standpoint we must clearly understand that what we did was not as effective as it should have been.

I think the best procedure at the present time is to try to zero in on the busing issue on a State and local basis, rather than to handle it as we have tried it to date through national statements and through the national media. In other words, busing is an enormous issue in Michigan and has no effect in Wisconsin or in Ohio or in Illinois. It might even be an issue in parts of New York State. I don't think polling is going to help you too much here because many people who feel strongly on busing are just as reluctant to indicate their feelings in a poll as they are to indicate anything other than very liberal attitudes with regard to racial equality in a poll. But Michigan, a State we normally would have no chance whatever to win, is now certainly up for grabs. But we can win it only if we strike home in Michigan in a clear, unequivocal way on busing. I think that the meeting you had with the women who came down from Michigan was a good starter. I think, however, it needs to be followed up with statements that get into the Michigan Press in every way we can possibly think of between now and election day. Any major speaker who goes to Michigan must be directed to hit the busing issue stand in a strong, unequivocal way. We should find ways through Griffin or some other Congressmen who are involved to get statements made which will get back to Michigan. We must also find ways to do something, whether intervening in cases or what-have-you to get through on the issue. If you have not already done an editorial board and a television program in Michigan, you should arrange it on your schedule. You should not have it right now, but I would say around the 10th to 15th of June would be a good time--always pointing out, of course, that the position of the President has not changed in this issue, he has held it consistently from the year 1967 and will continue to take that position.

In a subsidiary way, forced integrated housing must also be hit and hit hard. One collateral issue is the problem of Romney. You and John Mitchell probably should have a talk with him and tell him that, if he cannot enthusiastically support us on the busing and housing issues, it would be best for him to say nothing at all in Michigan on those issues.

I want the whole country studied State by State and city by city to see where a Michigan situation may exist. Where it does exist, follow exactly the same pattern that I have indicated above in order to get through to the public as to what our position is.

I realize that Harper and others on the Domestic Council Staff have been trying to peddle the idea that busing really is not an important issue, or at least that it is not an issue which will on balance help us. They have a right to their political opinions. But they are so grossly inexperienced in this field that you should pay no attention to their opinions while, of course, giving them the impression that you are listening. The Michigan result comes through loud and clear-- busing is a potent issue and can make the difference in some northern States which otherwise we would have no chance whatever to win. Incidentally, Texas with all of the liberal leanings that it has at the present time must not be taken for granted. We must do a far better job of getting through our stand on busing in Texas than we have done to date. Here I want you to talk to John Connally and of course work through Tower and anybody else who may be able to get through our position.

THE PRESIDENT

cc: H. R. Haldeman

May 18, 1972

MEMORANDUM FOR:

DR. HENRY A. KISSINGER

As I told Al on the phone last night, I am still totally unsatisfied with the efforts we are making on the propaganda front on Vietnam. What I am referring to here is not so much to what is said in Washington by White House spokesmen or in Paris by Porter, but statements that are made by Mac V and, even more important, the propaganda directed to the people of North Vietnam and North Vietnam's military forces in South Vietnam, Cambodia and Laos.

What concerns me is that my study of every war in this century indicates that a propaganda chief was an almost indispensable adjunct to the military and political leaders. This was true in World War I and World War II particularly. In Korea, of course, we forgot everything we learned in previous wars and did most things pretty poorly.

It is too late perhaps to do anything except on a patchwork basis as far as this present operation is concerned. At least, however, we can push Helms and the intelligence community to come up with some fresh ideas with regard to how we deal with propaganda directed to the North Vietnamese wherever they may be.

But looking to the future I think we have to have a topflight man probably on the White House staff and of course as a direct deputy to you at the NSC to advise on and to direct where necessary the propaganda offenses which are always needed to complement our military and political actions. Of course at the present time we rely on a number of people around the White House to give us advice in these fields--Ziegler, Scali, Klein, and even sometimes Haldeman.

But we must realize that not one of these that I have mentioned has the all-round qualifications to assume the responsibilities that I have in mind. I want someone full time who will direct his attentions to how we handle things in a propaganda way, both covertly and overtly. I do not have in mind that this individual should ever directly or indirectly talk to the Press. He should be an inside man advising us and also carrying out the ideas that we may have on the propaganda front. This is a very specialized field and we need someone who will bring us a broader gauged understanding of the situation so that we do not make mistakes with the best of intentions in the PR area, and also so that we take better advantage of some of our positive actions than has previously been the case. Immediately upon our return from Moscow I want to talk to you about this and see if we can't work out some way to tackle the problem.

THE PRESIDENT

May 18, 1972

MEMORANDUM FOR:

H. R. HALDEMAN

I was distressed to learn from Don Kendall that in his trying to get Business Chairmen for us in the various States, he had struck out in city after city after going down the list of names that he received from people on the White House staff, the Campaign Committee, and from other sources. He said that he had to date called 12 business leaders in San Francisco and not one of them would agree to serve as the Nixon Chairman. He said that he had also had some difficulty in Los Angeles although he had finally come up with a name. Only through Connally's intervention was he able to get Clement to take the job in Texas.

As I have already told you, Kendall's reaction of course was that, immediately after the election we had to spend more time romancing the business community and developing a group of them to support us. I told him that, if I looked back over my calendar for the last three years, that businessmen probably took two-thirds of my time when we figured my appearances before Chambers of Commerce, NAB, the Business Council, and the terribly boring series of meetings I have had with business advisors and consultants on a number of issues.

I told Don that we have to realize that the old establishment just like the old establishment in the university community and in the media simply weren't going to be with us and that we had to build a new establishment. I told him that we needed people like himself, Bob Abplanalp, Mulcahy and others who, though they don't fit socially with the business elite, have real character. There are simply bound to be a number of people around the country who will fit this category. Stans probably knows some of them because he had to build a whole new group of contributors when he went through the last campaign. I would also imagine that the wire and letter response to the May 8 speech might prove very useful in getting some names for Kendall to approach.

What I am sure of is that what we have been doing to date with the business community is altogether wrong. When I think that we have had the likes of Irwin Miller in to Blair House meetings and when I look over the lists as I sometimes do of those who are invited to such meetings, I find that even our most conservative people on the White House staff inevitably go to the so-called business elite when they want to get support for some of our policies.

I want you to have a really tough talk with Flanigan and Ehrlichman on this subject and eventually, as a result of your discussions, perhaps we can give Kendall some help in attempting to develop this new group on the business side. Malek, of course, could be helpful in such a discussion and Stans, also, from time to time.

In sum, what I am trying to say in this memo is that we have been striking out over and over again in attempting to enlist business support for our policies due to the fact that we have been talking to the wrong audience. The business elite, if anything, has less guts than the labor elite or the farm elite. What we have to do is to find those few people in the business community who have some reputation as being successful in business but who haven't been taken in by the idea that they must only attach themselves to "fashionable" causes.

THE PRESIDENT

MONDAY, MAY 22, 1972

VIP AND STAFF INSTRUCTIONS

3:40 p.m. 970 arrives Vnukovo II Airport. Passengers are escorted to a viewing area.

NOTE: All briefcases containing classified material that are to be offloaded should be left in your seat on board the aircraft. Arrangements will be made to transport them to a secure area at your hotel.

4:00 p.m. S'76 arrives Moscow, Vnukovo II Airport.

FULL PRESS COVERAGE
LIVE TV

The President and Mrs. Nixon descend the forward ramp followed by:

Secretary of State Rogers
Dr. Kissinger
P. Flanigan
Assistant Secretary Hillenbrand

After official greeting the following descend forward ramp:

H. R. Haldeman
R. Ziegler
Brig. Gen. Scowcroft

Chief of Protocol Boris Leonedovich Kolokolov introduces President and Mrs. Nixon and party to the Soviet officials and Ambassador and Mrs. Jacob Beam.

VIP AND STAFF INSTRUCTIONS

Remaining VIP's and staff aboard S'76 deplane via the rear door, remain at the foot of the ramp for the national anthem and inspection by honor guard.

Moscow, May 22 - 1

*Vain stopped
Sun came out*

Boris Kolokolov

MONDAY, MAY 22, 1972 - Continued

Introductions completed, the President is escorted by the Soviet leader and the Chief of Protocol Kolokolov across the runway to a position facing the honor guard ceremonial flag where they are met by the commander of the honor guard.

SPECIAL NOTE

Mrs. Nixon and the other members of the official party deplaning from the front door remain at the foot of the ramp until the anthems are played.

The President returns the guard commander's saber salute with a nod.

The President stands with hands at sides while U.S. and Soviet national anthems are played.

Anthems completed, the Soviet leader invites the President to inspect the guard.

The President inspects the guard, walking on the left of the guard commander. The Soviet leader and the Chief of Protocol follow.

SPECIAL NOTE

When the President has almost completed inspecting the guard, Mrs. Nixon, U.S. official party, and Soviets from the reception party are escorted to their respective reserved areas. The U.S. area is located to the left of the line of Soviet officials. A Soviet protocol official acts as escort.

At the end of the honor guard the honor guard commander takes his leave.

Moscow, May 22 - 2

*fair honor guard
→ deplane near ramp*

MONDAY, MAY 22, 1972 - Continued

The President, on the left of the Soviet leader, moves past his official party now standing to the right of the group of Soviet officials.

The President, rejoined by Mrs. Nixon, proceeds to the group of Soviet officials, who are introduced to them by Chief of Protocol Kolokolov.

VIP AND STAFF INSTRUCTIONS

VIP's and staff who deplaned via the rear door proceed to the left, behind the honor guard, to a viewing area at the northeast corner of the terminal. They are escorted by a Soviet protocol official.

The President and Mrs. Nixon walk past a group of U.S. and Soviet greeters. At the end of the line the President, the Soviet leader, and the Chief of Protocol Kolokolov return to a reviewing position in front of the terminal.

SPECIAL NOTE

Mrs. Nixon is escorted by a Soviet protocol official to her place behind the President.

President stands and faces left (toward aircraft) to receive the honor guard passing in review from left to right.

Moscow, May 22 - 3

*U moved for
rear ramp
to viewing area
as intro going on*

MONDAY, MAY 22, 1972 - Continued

VIP AND STAFF INSTRUCTIONS

VIP and staff who deplaned via the rear door of S'76 are escorted by a Soviet protocol official around the northeast corner of the terminal to their assigned vehicles.

As the band passes the reviewing position, the Soviet leader and Chief of Protocol Volukhin escort the President through the terminal to the motorcade.

SPECIAL NOTE

Mrs. Nixon rejoins the President as he reaches the main entrance to the terminal.

The U.S. official party are escorted by a Soviet protocol official through the terminal to their assigned vehicles in the motorcade.

4:20 p.m. Motorcade departs Vnukovo II Airport.

SPECIAL NOTE

It is customary for the Soviet hosts to distribute cards with car and room assignments for the entire visit to Moscow.

4:50 p.m. Motorcade arrives at the Kremlin.

POOL PHOTO OPPORTUNITY

4:55 p.m. The President, Mrs. Nixon and Secretary Rogers and Dr. Kissinger are escorted by the Soviet hosts to a sitting room on the third floor where tea and coffee are served.

Moscow, May 22 - 4

over
30 min
L. Khrushchev

MONDAY, MAY 22, 1972 - Continued

VIP AND STAFF INSTRUCTIONS

At the entrance to the Kremlin, the motorcade splits. Those individuals staying at the Rossiya Hotel proceed to the hotel. U.S. party members proceed to their respective rooms.

SPECIAL NOTE

VIP and staff members are requested to remain downstairs until the President and Mrs. Nixon are in their quarters.

5:05 p.m. The President and Mrs. Nixon arrive at their residence.

PERSONAL/STAFF TIME

(1 hr. 50 mins.)

NOTE:

Meals at Rossiya

The host government has reserved a dining area for members of the Presidential party on the 21st floor of the Rossiya Hotel. Meals will be served daily 7:30 a.m. to 11:00 p.m.

Meals in Kremlin

For those staying in the Kremlin, meals will be served in the dining room of the Staff Wing as follows:

Breakfast	9:00 a.m.
Lunch	2:00 p.m.
Dinner	8:00 p.m.

Sandwiches and refreshments available during the day and early evening by calling room service.

Moscow, May 22 - 5

MONDAY, MAY 29, 1972

Morning Private breakfast.

SPECIAL NOTE

Following is a schedule for plenary session. If President's meeting, use previous schedule.

INSTRUCTIONS FOR MEETING PARTICIPANTS

9:40 a.m. Motorcade departs Hotel Rossiya en route Grand Kremlin Palace.

Motorcade Assignments

To be determined

Moscow/Kiev, May 29 - 1

MONDAY, MAY 29, 1972 - Continued

VIP AND STAFF INSTRUCTIONS

From Hotel Rossiya:

2:40 p.m. Motorcade departs hotel en route to the Grand Kremlin Palace.

Motorcade Assignments:

To be provided

2:50 p.m. Arrive at the Grand Kremlin Palace. Party is met and escorted by a Soviet protocol official to St. Vladimir Hall.

2:55 p.m. Arrive St. Vladimir Hall to await the conclusion of the diplomatic reception.

VIP AND STAFF INSTRUCTIONS

From Kremlin Residence:

2:45 p.m. Members of the U.S. party attending the reception are met in the Kremlin residence and are escorted by a Soviet protocol official to the Grand Kremlin Palace.

2:50 p.m. Arrive at the Grand Kremlin Palace. Party is met and escorted to St. Vladimir Hall.

2:55 p.m. Arrive St. Vladimir Hall to await the conclusion of the diplomatic reception.

Moscow/Kiev, May 29 -6

MONDAY, MAY 29, 1972 - Continued

Dress for Diplomatic Reception: Business suit and short dress.

2:35 p.m. President and Mrs. Nixon depart the Kremlin Residence en route to the Grand Kremlin Palace.

Motorcade Assignments

To be provided

2:40 p.m. President and Mrs. Nixon arrive at the main entrance to the Grand Kremlin Palace.

Chief of Protocol Kolokolov and Commandant of the Palace Kazakov greet President and Mrs. Nixon.

Chief of Protocol Kolokolov escorts President and Mrs. Nixon up the main staircase and through St. George Hall and St. Vladimir Hall to the Granovit Hall.

Moscow/Kiev, May 29 - 4

MONDAY, MAY 22, 1972 - Continued

Dress for official dinner: Business suit and street-length dress.

Guests receive invitations which also contain seating assignments for the dinner. A seating chart is available in St. Vladimir Hall.

VIP AND STAFF INSTRUCTIONS

From Hotel Rossiya:

7:40 p.m. Motorcade departs hotel en route the Grand Kremlin Palace with the following:

Sec. Rogers	Mr. Scali
Amb. Beam	Mr. Price
Mrs. Beam	Mr. Safire
Asst. Sec.	Mr. Hyland
Hillenbrand	Mr. Negroponte
Amb. Mosbacher	Min. Klosson
Mr. Flanigan	Mrs. Klosson
Mr. Ziegler	Mr. Andrews
Brig. Gen.	Mr. Codus
Scowcroft	Interpreter
Mr. Klein	Mr. Matlock

7:50 p.m. Motorcade arrives at the Grand Kremlin Palace. Party is met by a Soviet protocol official, who escorts group to St. Vladimir Hall.

From Kremlin Residence:

7:45 p.m. The following members of U.S. party attending the dinner meet in the residence and, escorted by a Soviet protocol official, walk to the Grand Kremlin Palace:

Dr. Kissinger	Mr. Sonnenfeldt
Mr. Haldeman	Mr. Walker
Mr. Chapin	Mr. Lord
Miss Woods	

Moscow, May 22 - 6

MONDAY, MAY 29, 1972 - Continued

2:45 p.m. Arrive Granavit Hall.

Chief of Protocol introduces the heads of the diplomatic missions and their wives, who will be standing in a line running around the room, to President and Mrs. Nixon.

3:00 p.m. The Chief of Protocol escorts President and Mrs. Nixon to St. George Hall where they are greeted by the Soviet leaders.

The President and Mrs. Nixon and the Soviet leaders proceed to the head table at the opposite side of the room.

Members of the U.S. party, heads of the diplomatic missions, and other guests enter St. George Hall after President and Mrs. Nixon.

The U.S. and the Soviet national anthems are played.

Brief toasts follow.

Reception continues.

4:00 p.m. President and Mrs. Nixon bid goodbye to the Soviet leaders in St. George Hall and proceed through the White Corridor to the Kremlin residence escorted by a Soviet official.

STAFF TIME: 10 minutes

Moscow/Kiev, May 29 - 7

MONDAY, MAY 29, 1972 - Continued

4:05 p.m. VIP and staff motorcade departs Grand Kremlin Palace en route airport.

4:05 p.m. VIP and staff motorcade departs Rossiya Hotel en route airport.

4:35 p.m. Motorcades arrive airport with members of U.S. party. They are escorted to an area to view the departure ceremony.

4:15 p.m. The President and Mrs. Nixon depart the Grand Kremlin Palace en route airport.

VIP AND STAFF INSTRUCTION

Those accompanying the President and Mrs. Nixon to be determined.

4:45 p.m. Presidential motorcade arrives airport.

The President, escorted by the Soviet leader and Chief of Protocol Kolokolov, move through the terminal and across the tarmac to a position facing the honor guard ceremonial flag where they will be met by the commander of the honor guard.

Moscow/Kiev, May 29 - 8

MONDAY, MAY 29, 1972 - Continued

SPECIAL NOTE

Mrs. Nixon and other members of the U.S. party arriving with the President are escorted to a reviewing area by a Soviet protocol official.

The President returns the guard commander's saber salute with a nod.

The U.S. and Soviet national anthems are played.

Anthems completed, the honor guard commander invites the President to inspect the guard. The President inspects the guard, walking left of the guard commander. The Soviet leader and the Chief of Protocol follow.

After the inspection, the honor guard commander takes his leave.

The President walks to the reviewing area and joins Mrs. Nixon and party.

The President and Mrs. Nixon bid farewell to Soviet officials.

VIP AND STAFF INSTRUCTION

Members of the U.S. party manifested on the Soviet aircraft follow the President and Mrs. Nixon.

Moscow/Kiev, May 29 - 9

MONDAY, MAY 29, 1972 - Continued

Those boarding S'76 include:

SPECIAL NOTE

Mrs. Nixon and those manifested on the Soviet aircraft follow the President to a reviewing area.

The President receives the honor guard passing in review.

After the honor guard has passed, the Chief of Protocol escorts President and Mrs. Nixon to the front of the ramp.

VIP AND STAFF INSTRUCTION

Other members of the U.S. party boarding the Soviet aircraft precede the President and Mrs. Nixon aboard the aircraft.

The President and Mrs. Nixon bid farewell and board the aircraft.

5:00 p.m. Soviet aircraft departs en route Kiev.

(Flying time: 1 hr. 10 mins.)
(No time change)

Moscow/Kiev, May 29 - 10

SCHEDULE

MRS. NIXON'S VISIT TO AUSTRIA

SATURDAY, MAY 20, 1972

10:30 p.m. Arrive Salzburg

(No Separate Schedule)

SUNDAY, MAY 21, 1972

(No Separate Schedule)

MONDAY, MAY 22, 1972

10:20 a.m. Depart en route Moscow

(No Separate Schedule)

Mrs. Nixon - 1

SCHEDULE

MRS. NIXON'S VISIT TO THE USSR

MONDAY, MAY 22, 1972

No separate events for Mrs. Nixon.

8:00 p.m. Official Dinner (Short Dress).

TUESDAY, MAY 23, 1972

11:15 a.m. Secondary School tour.

3:15 p.m. A ride on the Metro.

4:30 p.m. Tea given by Mrs. Brezhneva and
Mrs. Podgornaya, Great Kremlin Palace.

Evening Private Dinner.

WEDNESDAY, MAY 24, 1972

11:15 a.m. Visit to Moscow University.

3:00 p.m. Shopping -- Gum Department Store.

7:00 p.m. Attend Moscow Circus.

THURSDAY, MAY 25, 1972

11:15 a.m. Visit Bolshoi School of Choreography.

2:30 p.m. Visit to All Union Fashion House.

7:00 p.m. Attend Bolshoi with the President.

FRIDAY, MAY 26, 1972

Morning OPEN

2:30 p.m. Visit second Moscow Watch Factory.

Mrs. Nixon - 2

MRS. NIXON'S SCHEDULE - Continued

FRIDAY, MAY 26, 1972 - Continued

7:30 p.m. President and Mrs. Nixon host an
Official Dinner.

SATURDAY, MAY 27, 1972

Trip to Leningrad with the President.

(No Separate Schedule)

SUNDAY, MAY 28, 1972

9:00 a.m. President and Mrs. Nixon attend church.

2:00 p.m. Tour Armory Museum, Diamond Fund, and
Cathedrals.

Evening Private

MONDAY, MAY 29, 1972

(No Separate Schedule)

After attending the afternoon reception
with the President, they depart en route
Kiev.

TUESDAY, MAY 30, 1972

9:25 a.m. Visit Kiev Pioneer School.

10:30 a.m. Join the President at St. Sophia Cathedral
for tour.

11:45 a.m. Depart Kiev for Iran.

Mrs. Nixon - 3

THE WHITE HOUSE

WASHINGTON

Under Sany Plan

4 yrs

2 completed

2 to go

need no edue under AF



OK
OK
OK
OK



ARIZONA HEART INSTITUTE

May 30, 1972

Mr. Llewellyn J. Evans
Route 3 Box 230
Warrenton, Virginia 22186

Dear Mr. Evans:

As Chief of Cardiology of the Arizona Heart Institute, I thought I should let you know what a blow it would be to our program if we lost Dr. Vince Friedewald. The field of exercise testing in evaluation of patients with coronary arterial disease, both in the screening and in therapeutic testing, is a recent innovation, and therefore, Dr. Friedewald is one of the few young men specifically trained in the area. As you know he has already started our exercise laboratory and has a number of research projects underway.

As chance would have it, during his training in Houston, diagnostic ultrasound became sophisticated enough to be used as an important tool in Cardiology, and therefore Dr. Friedewald has been developing techniques and investigating the vast number of possibilities for application of this exciting new field. He has planned a number of research activities related both to the treadmill exercise study and diagnostic ultrasound. Some of these studies are already under way, and obviously would not be completed as it is impossible at this time to replace a person with his background.

As you know, the activities of the Arizona Heart Institute include patient screening, diagnostic evaluation, operative therapy and post-operative follow-up and evaluation. I can truthfully say that if Dr. Friedewald is not able to remain with this Institute, the first of these areas of activity will not be possible and all the other areas will suffer greatly as he has specific projects related to all areas of endeavor of the Heart Institute.

This would not be quite so urgent if it were not for the fact that the field of exercise testing and diagnostic ultrasound is very recent, and research activities in these areas must progress quickly, and I am sure that they will be considerably delayed or will not be done at all if Dr. Friedewald is not here to direct these endeavors.

Sincerely,

Sam A. Kinard
Sam A. Kinard, M.D.
Chief of Cardiology

SAK:LCL

**RICHARD NIXON PRESIDENTIAL LIBRARY
DOCUMENT CONTROL SHEET**

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1. Dr. Friedewald has finished his specialty training - (this is an important point to remember).
2. Dr. Friedewald is the only person in the innovative cardiovascular field with such aptitude, experience and operational technical training - experience with an ultra-sonic/sonar early cardiac technique device.
3. This unique early diagnostic detection device operates without invasion of the body and its benefits would potentially be great in the technology and treatment areas of the cardiovascular field. (This is one of our Nation's most serious disease areas).
4. At the Arizona Health Institute, Dr. Friedewald's work is considered of paramount importance and a loss to the Institute would bring this work to a standstill. The potential loss to the United States (as well as the Air Force), if Dr. Friedewald's work were terminated at this time, has prompted both, Doctors Diethrich and Kinard to request an extension of his assignment by the Air Force.

CARDIOVASCULAR DIAGNOSTIC LABORATORY

ARIZONA HEART INSTITUTE

CARDIOVASCULAR DIAGNOSTIC LABORATORY

The incidence of cardiac disease due to coronary atherosclerosis has reached almost epidemic proportions among middle aged and elderly Americans, as evidenced by the fact that over 600,000 persons died from this disease last year. In addition, many other types of cardiac and vascular disease continue to afflict thousands of new patients each year.

Due to the overwhelming numbers of persons who have known heart disease, and the millions more who are at risk for developing these diseases, drastic new approaches to their diagnosis and treatment are urgently needed. The old, traditional approach of waiting until a person becomes ill and then initiating expensive, dangerous diagnostic techniques in order to delineate the type of cardiac disease is grossly insufficient if we are to significantly reduce the morbidity and mortality of cardiac disease.

Despite the obvious inadequacies of the usual approaches to meeting this problem head on, few medical centers seem concerned with attempting new methods for screening large numbers of persons for the detection of early stages of disease. However, at the Arizona Heart Institute, under the guidance of Doctor Ted Diethrich, a new concept of diagnosis is under development, and it has, at its core, the Cardiovascular Diagnostic Laboratory.

We are aware of only one other similar laboratory in the world which is entirely devoted to developing and perfecting testing procedures which are entirely safe, easily performed, and carry a high degree of reliability. Indeed, until such tests become readily available, accurate diagnosis of large numbers of patients will be impossible.

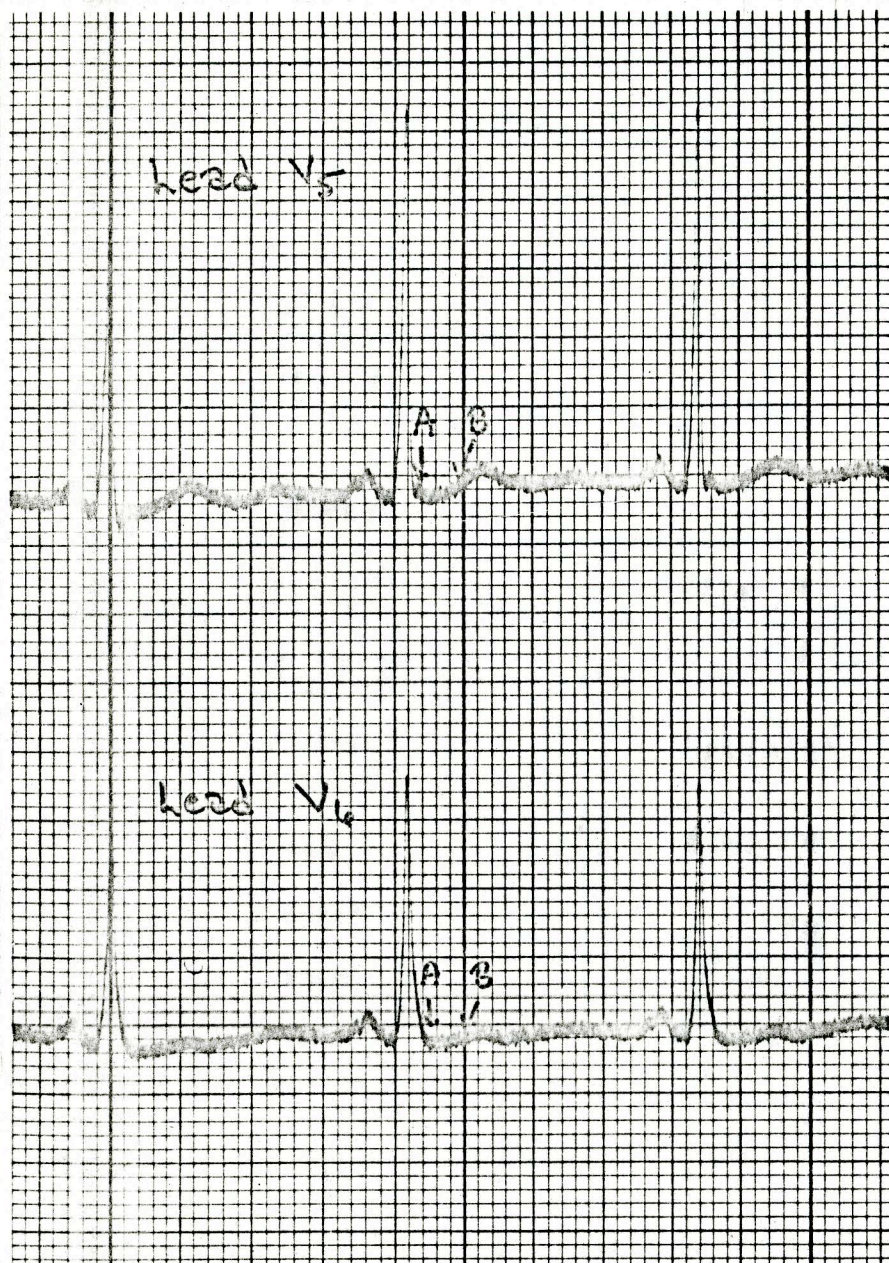
Doctor Vincent E. Friedewald, as a fellow in cardiology, trained in the other similar laboratory under Doctor Ted Wright at The Methodist Hospital and Baylor College of Medicine. This unique opportunity provided him with experience

in exercise physiology and exercise testing, diagnostic ultrasound, ejection time analysis, vectorcardiography, phonocardiography, rhythm analysis, and pacemaker evaluation. While in Houston he came to know Doctor Diethrich and he agreed to come to Phoenix to apply his experience to the development of a laboratory which would provide the types of "non-invasive" tests needed. In addition, the new dimension of computer analysis of data would be added to make this laboratory the prototype to be followed for the hospital of the 21st Century.

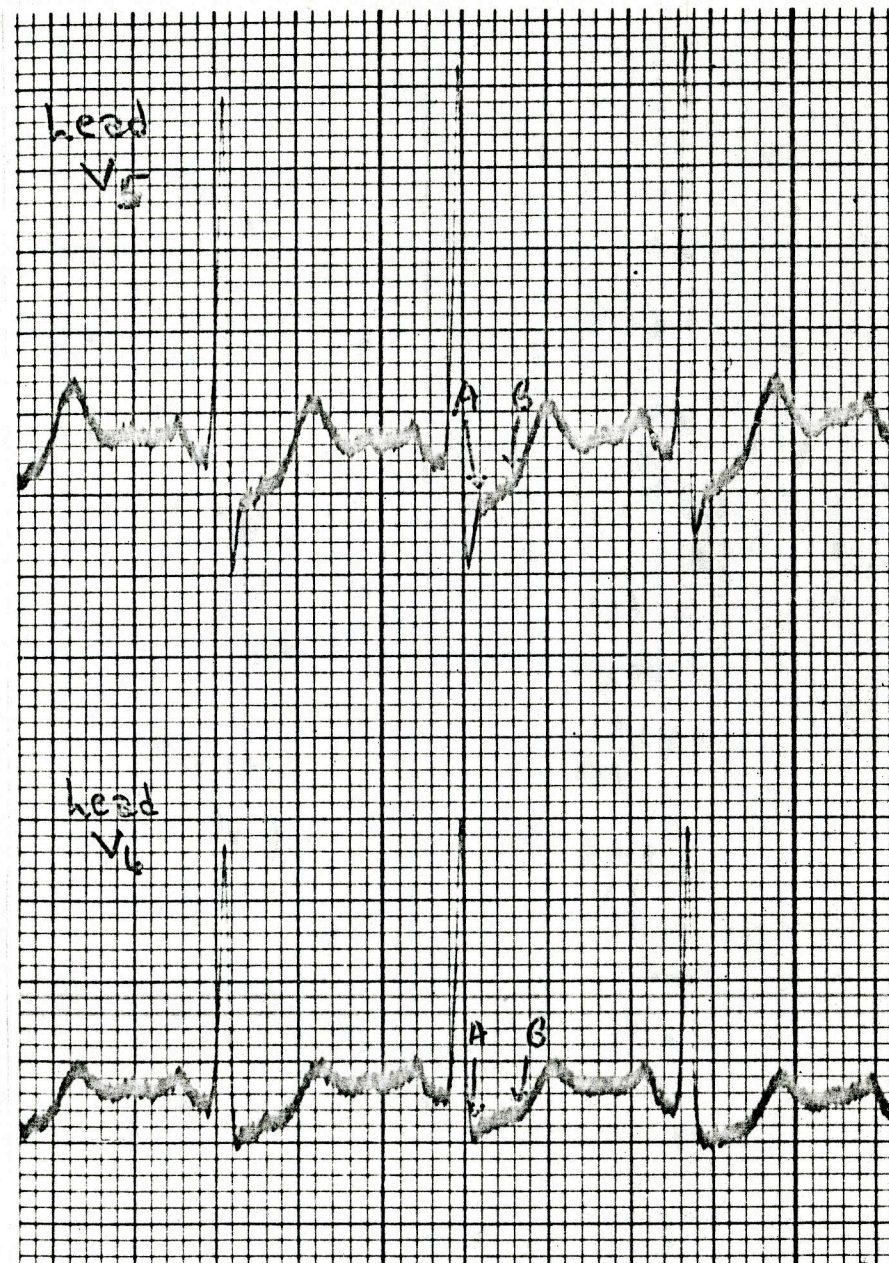
EXERCISE TESTING

Low grades of work with EKG analysis have been utilized for several years as a provocative means of identifying obstruction to coronary blood flow. As recently as 10 years ago, however, only about 20% of persons with serious coronary obstruction could be identified in this way. With improving testing techniques and better equipment, the procedure now utilized in this laboratory can identify over 90% of all patients with significant coronary atherosclerosis. This involves quantitation of two parameters while a person is exercising on a treadmill, the electrocardiogram and the ejection time as determined from analysis of the waveform from the carotid artery, measured with an external transducer. Shown in Figure I is the typical EKG response of a patient with coronary disease. The diagnostic feature is the depression of the ST-segment after exercise compared to the resting tracing. For the purpose of illustration, only two electrocardiographic leads are shown. In all, nine leads are recorded and analyzed during and for six minutes after the test.

At the present time we are developing, in conjunction with the Grumman Aerospace Corporation, a method of computer analysis of all nine EKG leads. Except in a very limited manner, no one has yet attempted this type of program. A summary of our present state of development follows.



Before exercise



After exercise

Fig. 1

Note that the "S-T" segment, from A to B, becomes depressed after exercise. If this depression exceeds 1 mm, the test is positive. Here this segment is depressed $2\frac{1}{2}$ mm in V₅ and $1\frac{1}{2}$ mm in V₆.

COMPUTERIZATION OF EXERCISE TESTING

1. General

Stress (or exercise) EKG examination is an integral and necessary part of the diagnostic work to be performed in the Cardiovascular Diagnostic Lab. Basically, the examination involves exercising the patient on a treadmill while collecting nine specific lead configurations of EKG data. The stop-wise test proceeds an average 12 to 15 minutes and results in large amounts of data. Some of this data is subsequently analyzed by a physician.

2. Purpose of the Computer

The PDP-11 computer will be used to perform EKG analysis comparable to that performed by the physician. The analysis will be done concurrent with the exercise process. The three primary advantages afforded by the computer are:

A. Increased patient load

The number of patients which can be served by the exercise examination is limited by qualified physicians to analyse the EKG data. The present manual analysis permits approximately six patients per day to be served. Use of the digital computer will increase the capability to 20 patients per day. This three fold increase facilitates mass screening.

B. Patient safety

The computer analyses the EKG data concurrent with the exercise examination. In addition to searching the data for signs of cardiovascular problems, the computer also monitors for cardiac arrhythmias. The computer will be capable of terminating the exercise examination should prescribed arrhythmias be detected. Rapid detection of cardiac abnormalities is of primary importance in insuring the patients well being during this type of examination.

C. Information file

Upon completion of the exercise examination, the computer will provide hard copy output of the EKG data together with the results of the analysis. The information will also be entered in a magnetic tape file. Being in digital form, the information can be correlated by the computer with data from subsequent examinations or treatment.

3. Feasibility

While computer analysis of exercise EKG data is not common place, the application is technically realistic. The ability of The Arizona Heart Institute to undertake this computer augmentation is, in large measure, due to a donation of 2½ man years of programming support by the Grumman Aircraft Corp. The results of this effort to date have been excellent. Working with EKG data collected from our own treadmill, software has been developed to smooth, average, and locate essential characteristics of the EKG wave form. Figure II a, b, and c are photographs of the waveforms before and after computer processing.

4. System Format

Figure II pictures the structures of the computer aided hardware. Bioelectric signals from the patient are transmitted to a summing and amplifying device in proximity to the treadmill. The present plan is to telemeter the bioelectric signals to a receiver/demodulator. The Jet Propulsion Laboratory is now preparing a quote for a ten channel telemetry system developed in conjunction with NASA. The bioelectric signals can also be hardwired in a conventional manner. The decision to telemetry will be based on cost and integrity of the EKG information. Either method will require design and fabrication of special hardware by our own staff.

The analog EKG signals are then transmitted via coax wires to remotely located digital computer. The EKG signals are then converted into a digital format by the A/D converter and loaded into the PDP-11 computer.

The status and TM (treadmill) control unit will also be designed by our own staff. The unit contains lights to display the status of the test, switches for test control, and meters to monitor treadmill operation. The device is located in proximity to the test and communicates with both the treadmill and the computer.

The 4010 display terminal has a CRT with graphics capability and a keyboard. The keyboard/CRT provides the basic man/machine interface. Variable data, such as patient data, can be keyed in under program control. In addition to alpha-numeric presentations, the CRT may also be used to display EKG data. The 4610 Hard Copy unit can produce paper records of any CRT display which should become part of the patients file.

In addition to the equipment shown, several PDP-11 Unibus interface cards, coax cable, and line drivers will be required.

5. Projected Cost

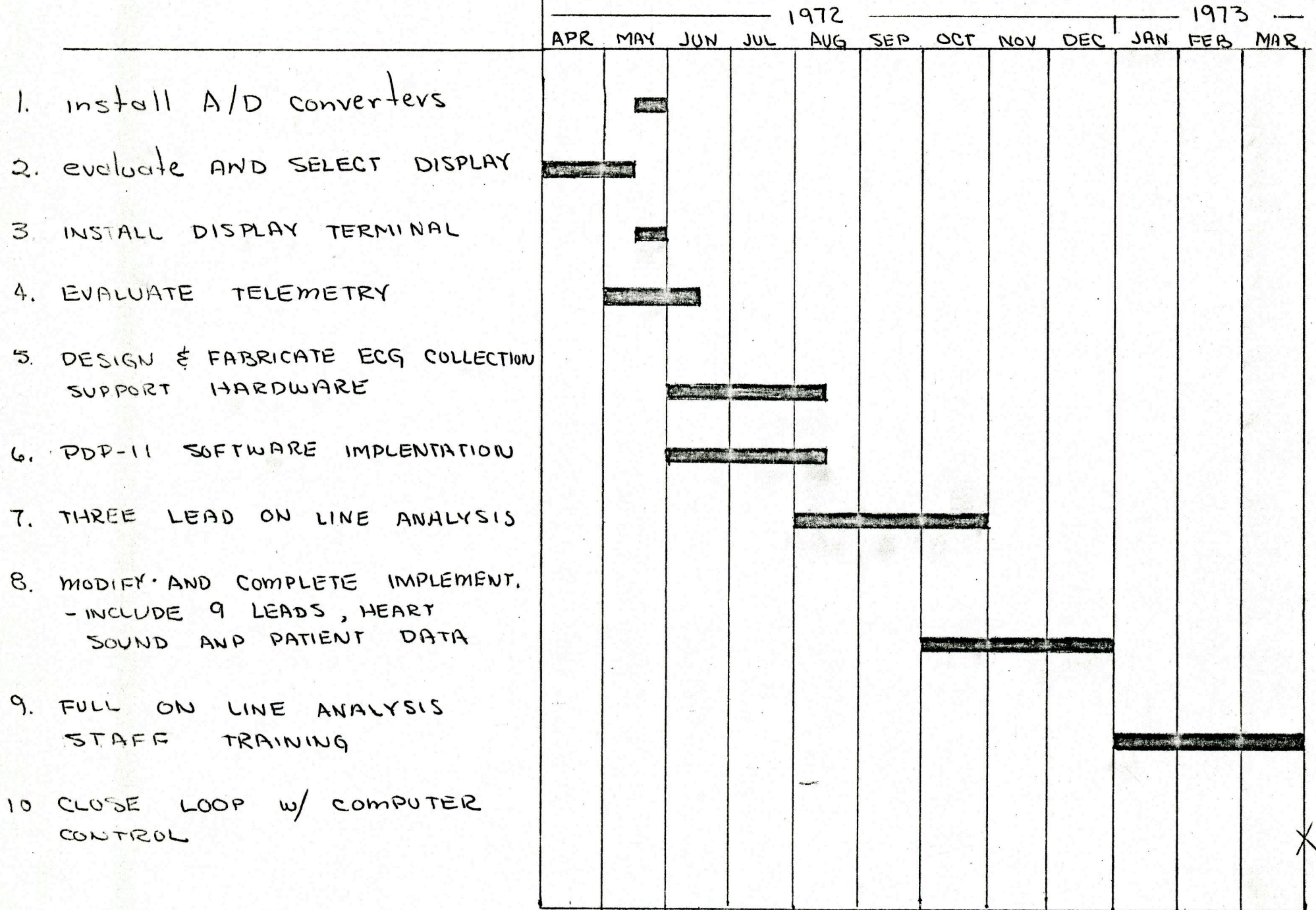
The additional equipment required to implement the computer aided system includes the EKG summing amplifiers, telemetry network, D/A converter display terminal, hardcopy unit and control unit. The projected costs shown below include manufacture installation charges but not transportation. Minimum and maximum figures are given since actual requirements will be based on performance when the software is developed.

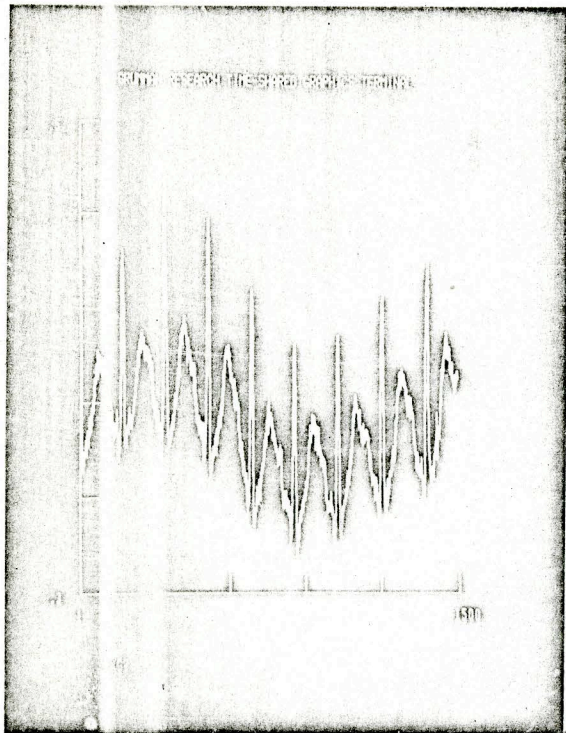
<u>ITEM</u>	<u>MINIMUM COST</u>	<u>MAXIMUM COST</u>
A/D converter	\$ 3640.00	\$ 6390.00
Display terminal	4950.00	5740.00
Hard copy unit	3550.00	3550.00
Telemetry network	4100.00	5000.00
Special design	550.00	900.00
TOTAL	<u>\$16790.00</u>	<u>\$21580.00</u>

The A/D converter funds this fiscal year are essential for programming work to continue. Negotiations with the manufacturer may postpone display terminal, hard copy, and telemetry equipment until next fiscal year.

6. Implementation Schedule

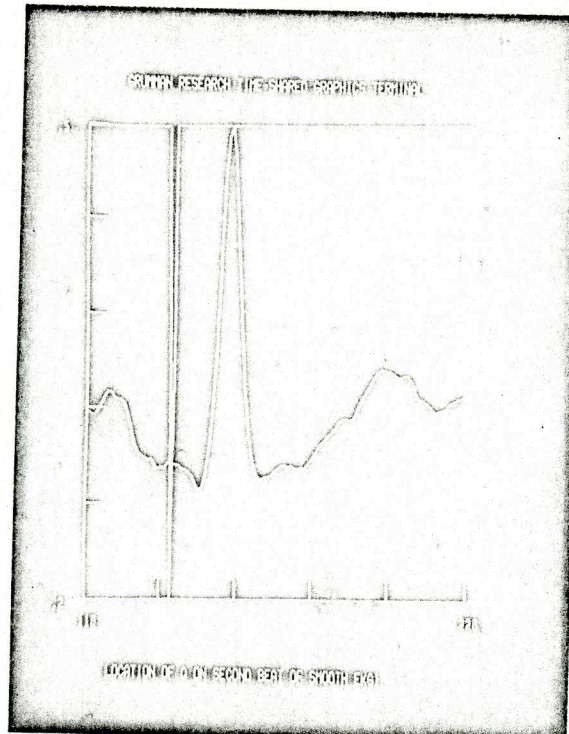
6. Implementation Schedule





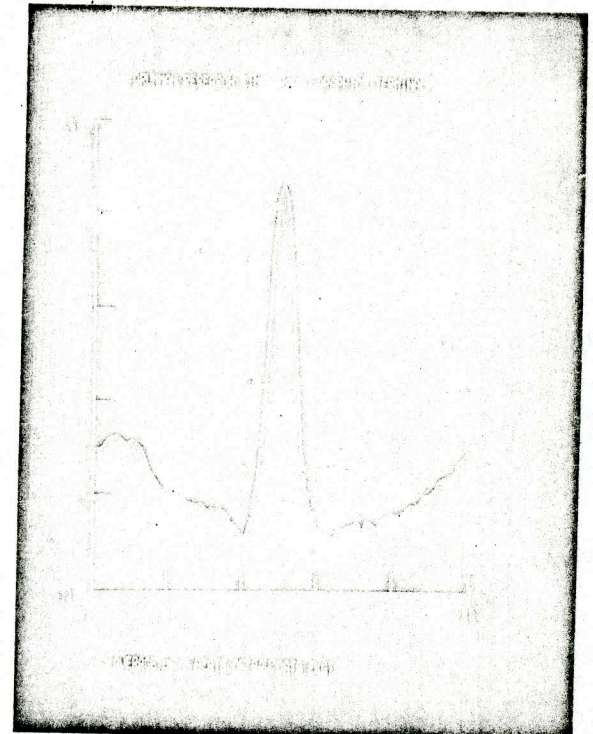
A

Raw exercise data



B

Smoothed single wave
with Q located



C

7 Beat average

Fig. 2

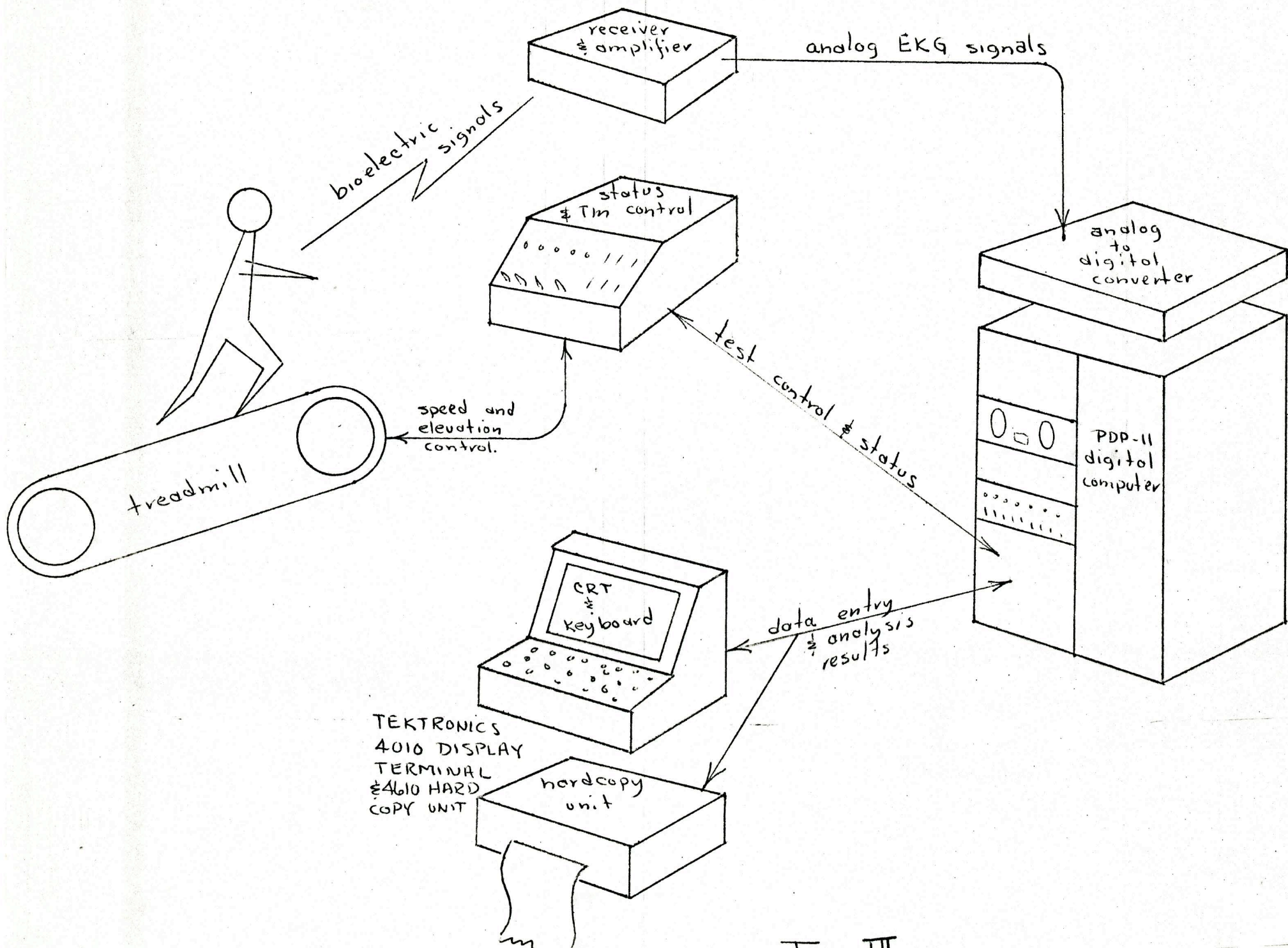


Fig III

7. Space, Manpower, and Maintenance Requirements

All additional equipment is an adjunct to current equipment, therefore additional space is not required.

The maintenance contract issued to the Uligital Equipment Corporation for the PDP-11 and PDP-12 computers would be increased to include the A/D converter. A new maintenance contract for the display terminal and hard copy unit would cost \$75.00 per month.

8. Equipment Flexibility

With the exception of the special design equipment (less than \$1000), all of the equipment is general purpose and can support a variety of monitoring, diagnostic, or research activities. Most bio-electrical signals in the hospital are analog in nature (whether from a patient or laboratory instrument). The D/A converter provides a means of utilizing the PDP-11 to process these signals. The display terminal and hard copy unit provide an excellent man/machine interface. Future applications such as the catherazation lab or research would also benefit from the equipment.

DIAGNOSTIC ULTRASOUND

Not since the advent of cardiac catheterization has a diagnostic tool become available which has the potential of diagnostic ultrasound, or echocardiography. This technique involves placing a small transducer over the chest, and by reflecting high frequency sound waves off various cardiac structures and displaying these waves on an oscilloscope in a "time-motion" mode, the following determinations can be made:

- Motion of mitral, tricuspid, and aortic valves.
- Size (diameter) of left atrium, left ventricle, and right ventricle.
- Size of root of aorta.
- Motion of wall of left ventricle.
- Thickness of left ventricle.
- Motion of septum.
- Thickness of septum.
- Amount of blood ejected per heart beat.
- Cardiac output.
- Blood flow across mitral valve.
- Presence of pericardial fluid.
- Presence of tumors within the heart.
- Prothetic valve analysis.

This represents only a partial listing of determinations which are known to be accurate by this method. Many more are being developed at this laboratory and elsewhere. On the following pages are reproductions of polaroid photographs made of some work we have done at the Arizona Heart Institute.

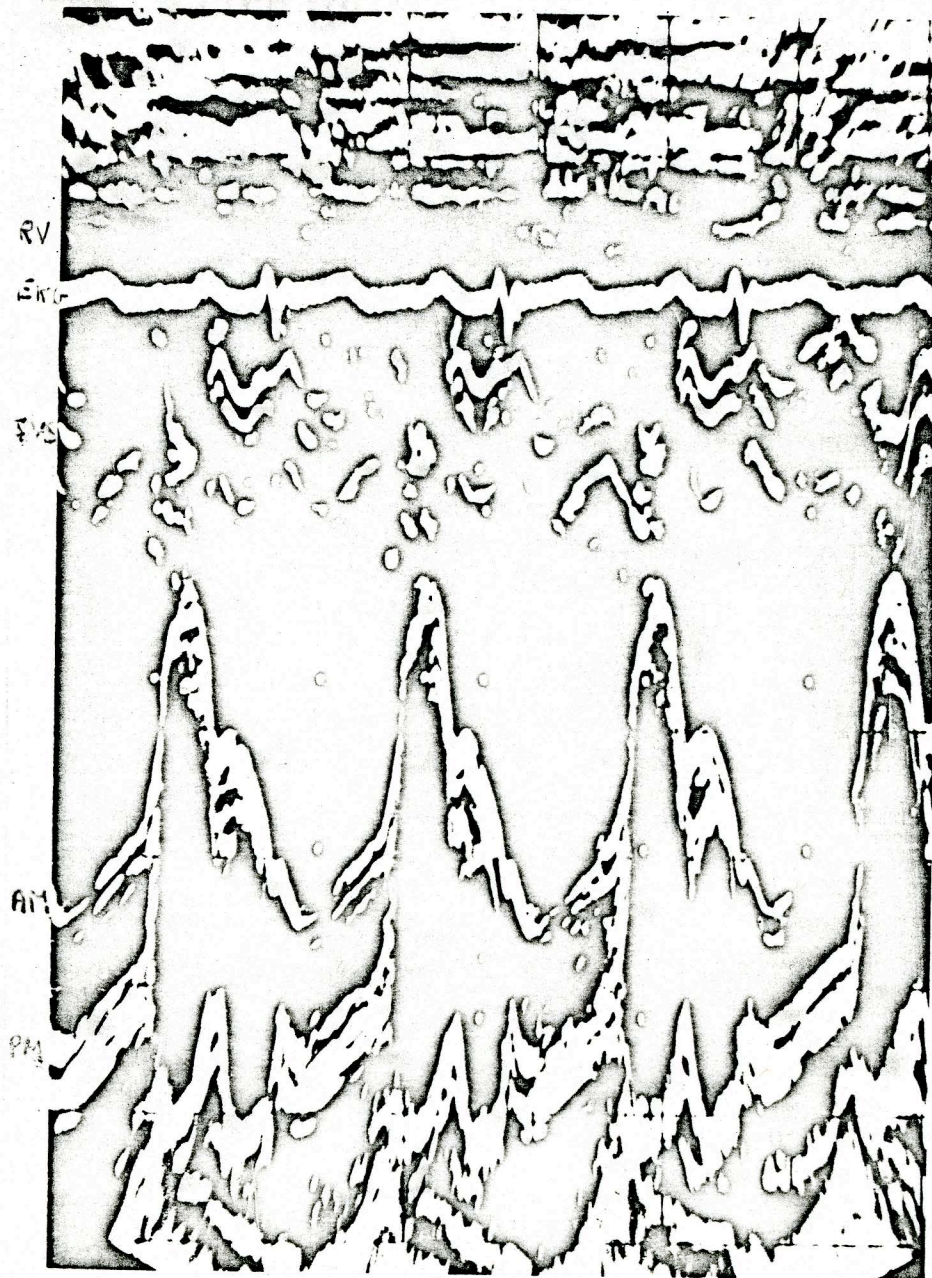


Fig. 2

This illustrates the ultrasound recording of normal motion of the anterior (AM) and posterior (PM) leaflets of the mitral valve. Also shown is the right ventricle (RV) and the interventricular septum (IVS). The small dots (markers) represent 0.5 seconds in the horizontal axis and 10 mm in the vertical axis.

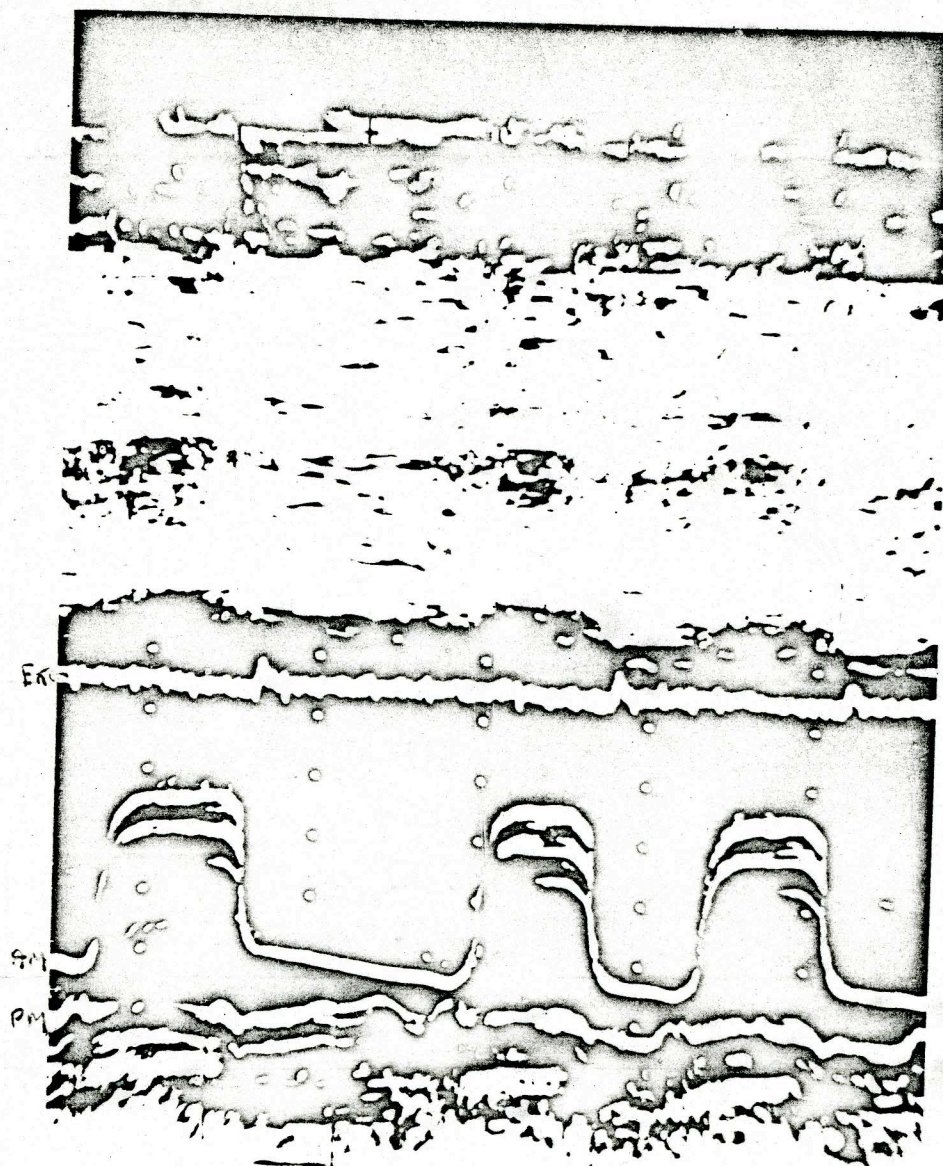


Fig. 3

Mitral stenosis. In this condition, the mitral valve is a rigid structure. Note the "flat" appearance of both leaflets, reflecting poor motion. This finding is diagnostic of this condition.

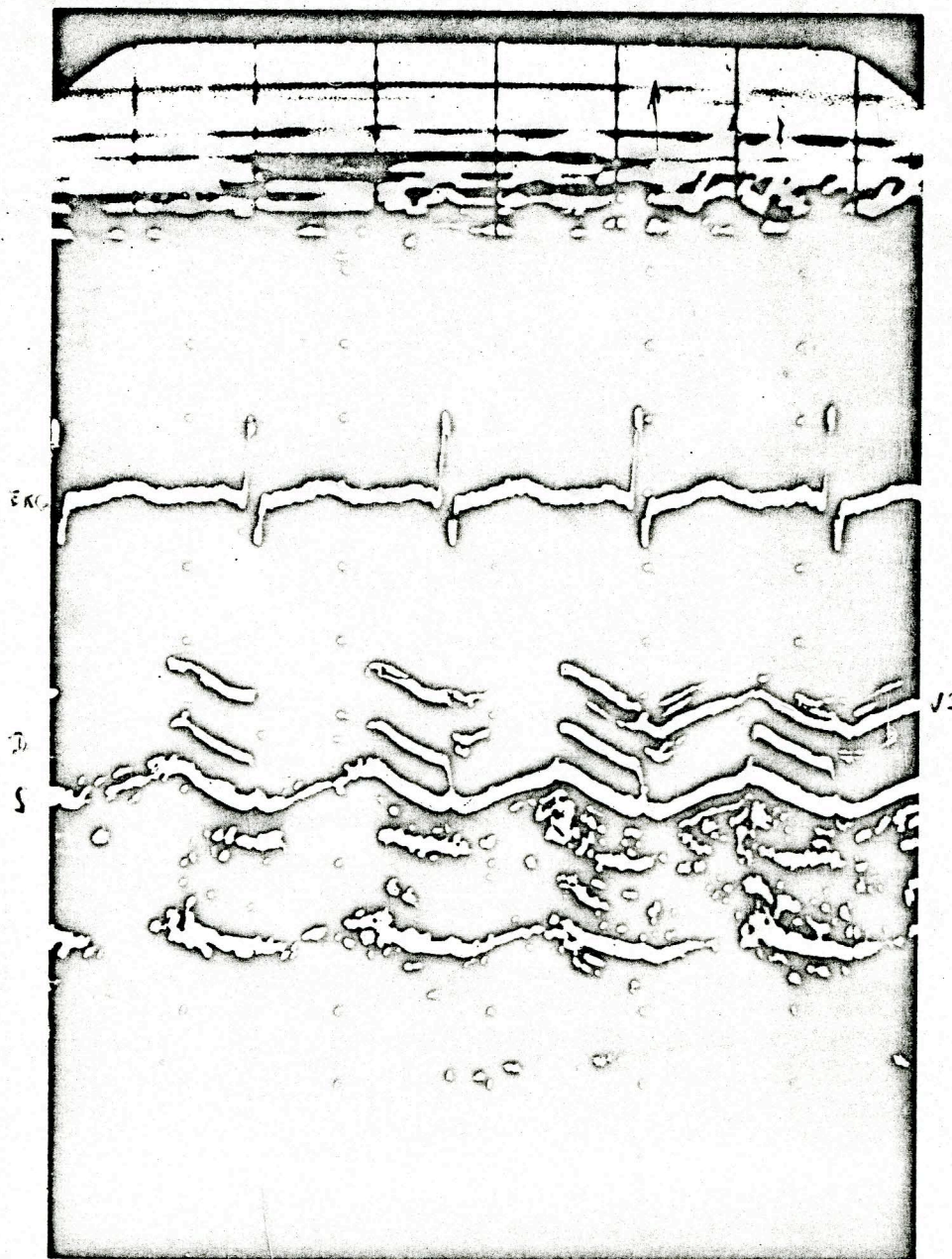


Fig. 4

Prosthetic mitral valve. Artificial valve motion appears quite different from the normal valve. All three parts of the prosthetic valve are identified: the valve struts (VS), the disc (D), and the suture ring (S). This technique affords a simple, extremely accurate method of identifying artificial valve malfunction before the patient becomes symptomatic.



Fig. 5

Mitral stenosis at surgery. In a technique we are presently developing, ultrasound recording of mitral motion is recorded with the transducer placed on the open heart immediately before mitral commissurotomy. Note the "flat" appearance of the valve.



Fig. 6

After mitral commissurotomy at surgery. Note now that the flat appearance is gone, and the valve motion measures 40 - 50 mm/sec. This signifies successful surgery and the surgeon need do no more for improving the patient's blood flow.

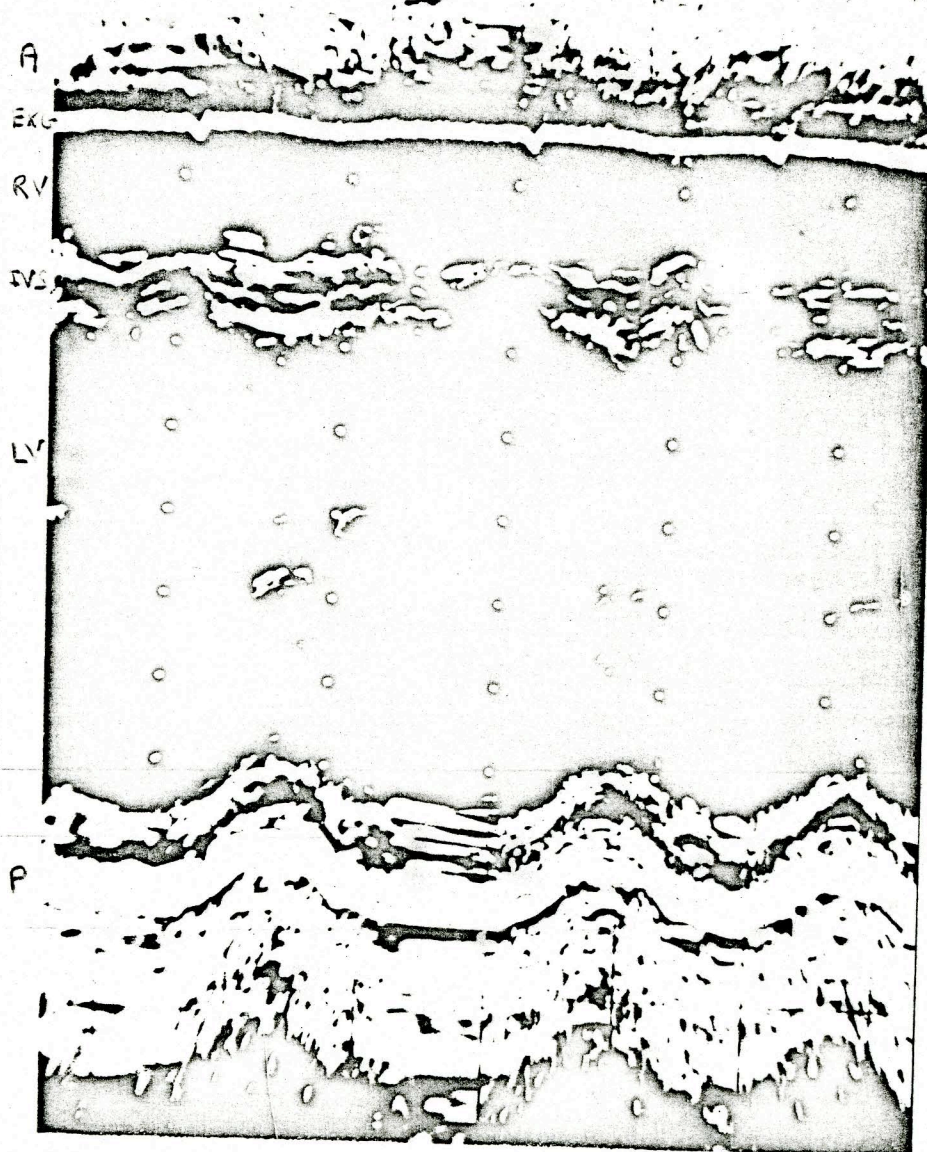


Fig. 7

Chamber measurements. Shown is the anterior border of the heart (A), the right ventricle (RV), the interventricular septum (IVS), the left ventricle (LV), and posterior cardiac muscle (P). Note the "waves" of the cardiac muscle, each representing one heart contraction. From this recording we can determine right ventricular size, septal thickness, end-systolic and end-diastolic volumes, stroke volume, and cardiac output.

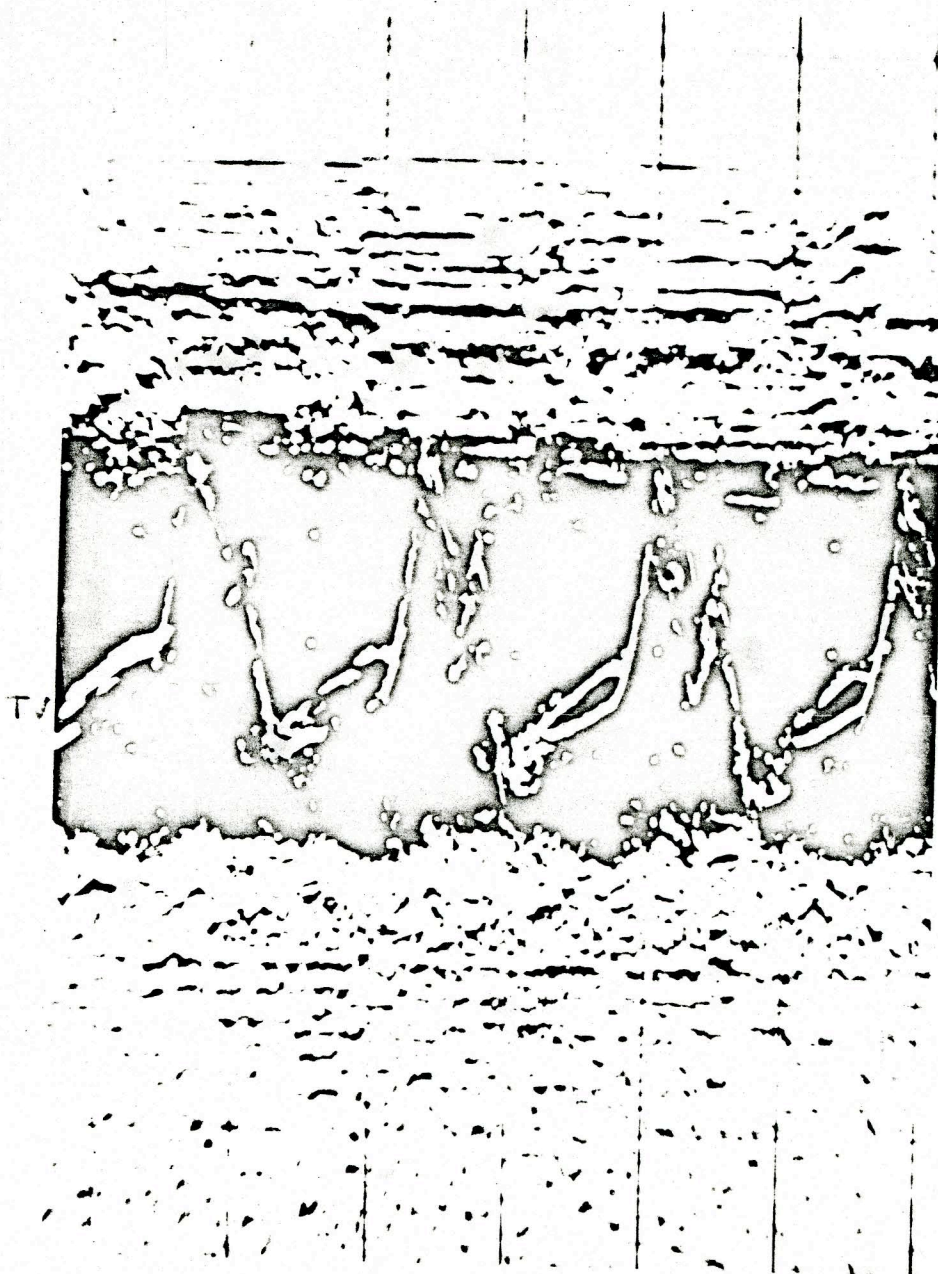


Fig. 8

Tricuspid valve. This shows normal motion of the tricuspid valve. Note the resemblance to the normal mitral valve.

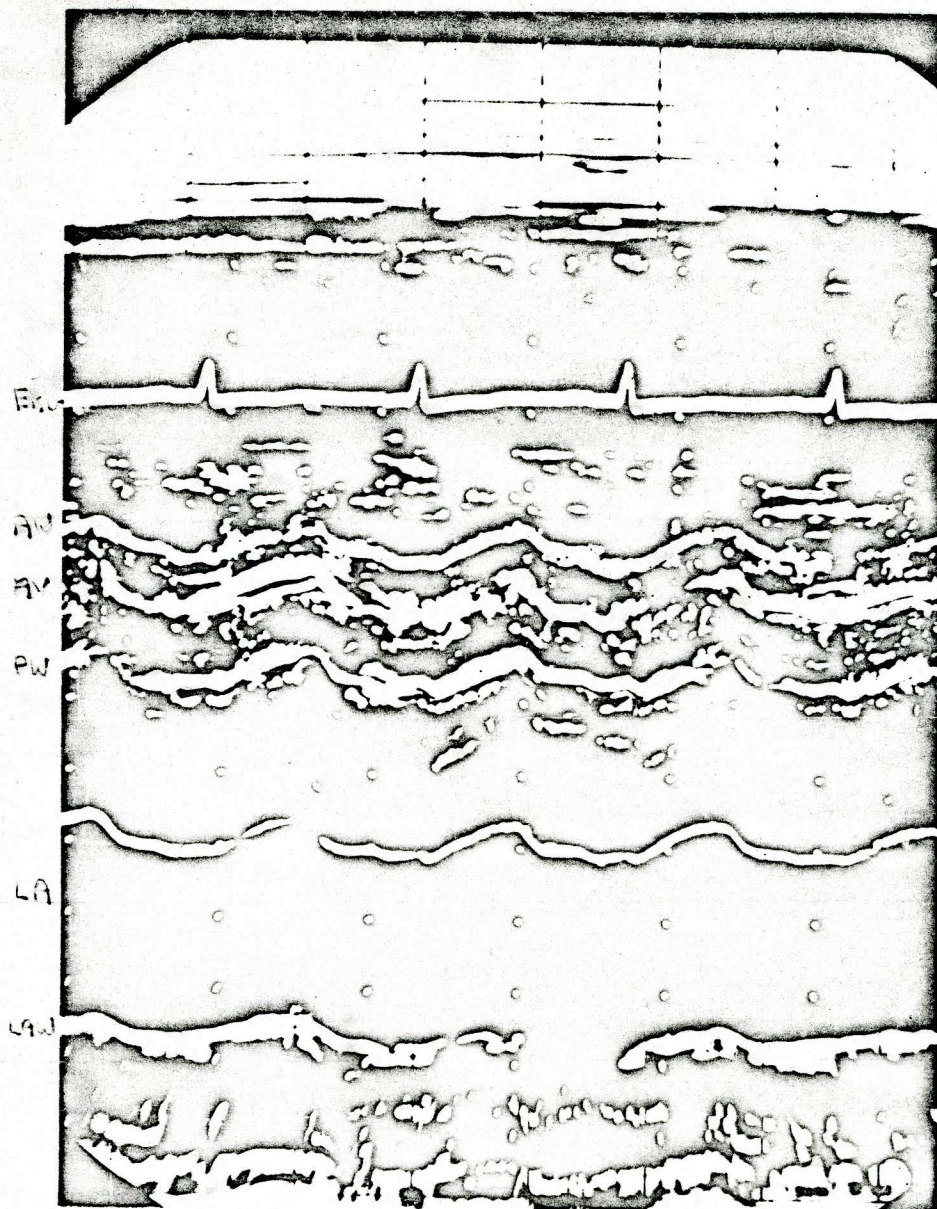


Fig. 9

Aortic stenosis. This is an entirely different view from preceding illustrations. Here is seen the anterior wall of the aorta (AW), posterior wall of the aorta (PW), left atrial chamber (LA), and wall of the left atrium (LAW). The abnormal stenotic aortic valve is seen as the heavy echoes between AW and PW, labeled AV. These echoes represent calcification and scarring of the aortic valve.

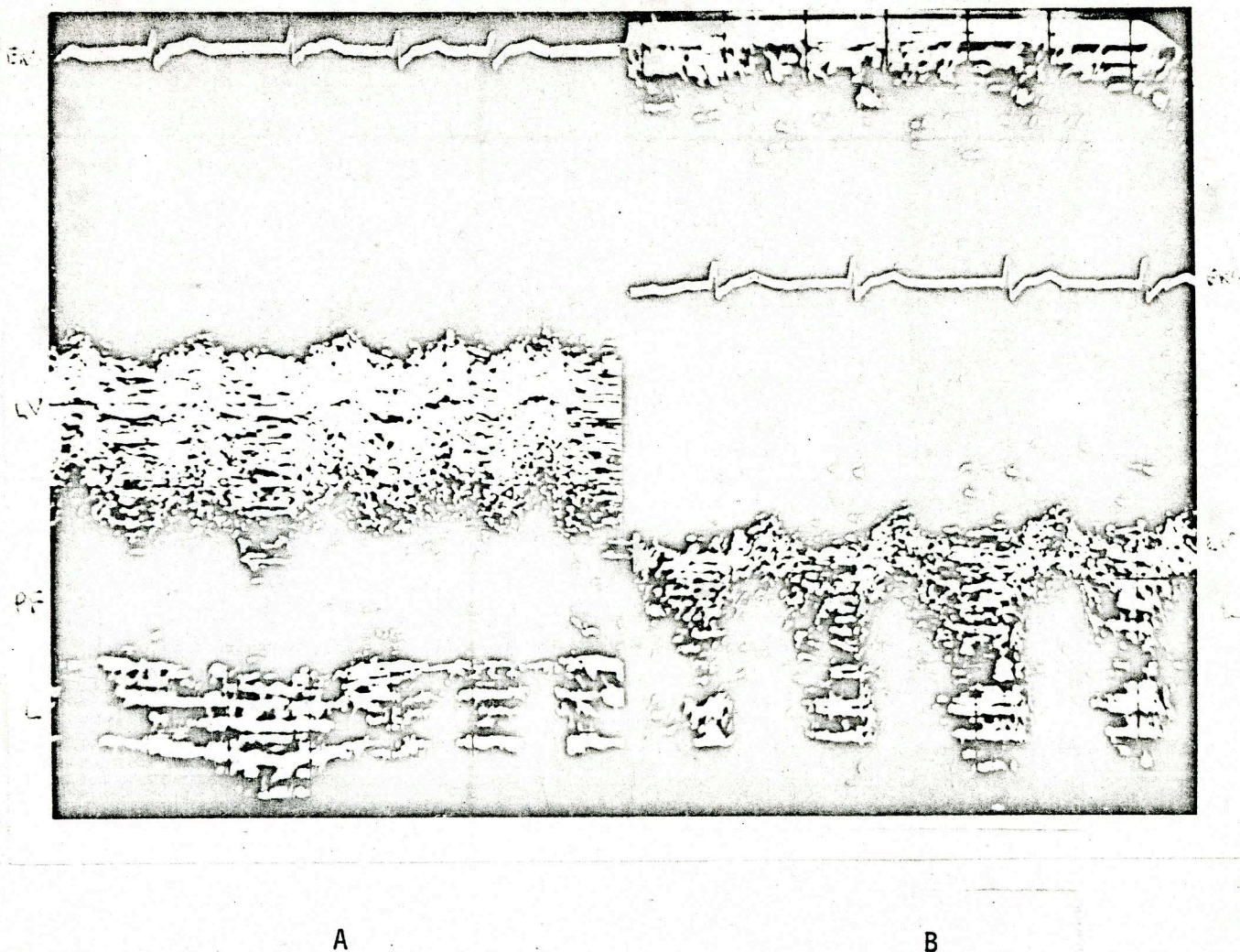


Fig. 10

Pericardial tamponade. The patient illustrated in Fig. 9 underwent aortic valve replacement. Two days after surgery he suddenly developed a low blood pressure and shortness of breath. An ultrasound was performed immediately and this revealed a large echo-free space around the heart (PF), seen in A. Also shown is the muscle of the left ventricle (LV), and the lung (L). The patient was taken immediately to the operating room where a large amount of blood was removed from around the heart. After surgery (B), the lung and left ventricular muscle are now adjacent. In this case, the ultrasound proved to be a life saver.