

GEORGE ANTHEIL'S *SECOND SONATA*  
*THE AIRPLANE - A POETIC BOUNDARY*

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In people's eyes, in the swing, tramp, and trudge; in the mellow and uproar; the carriages, motor cars, omnibuses, vans, sandwich men shuffling and swinging; brass bands; barrel organs; in the triumph and the jingle and the strange high singing of some aeroplane overhead was what she loved; life; London; this moment in June. Virginia Woolf, *Mrs. Dalloway*, 1925

**Introduction**

George Antheil wrote the *Second Sonata The Airplane* for piano in 1921, a time of great flux, both in his life and in technological developments. I feel that the work encompasses the naive genius of a young composer, along with a cultural sense of awe at limitless potential of newly discovered technology, already alluded to with the title. There are numerous miraculous examples in the music that are influenced by this technological mastery in society.

The quote by Virginia Woolf cleverly describes the density and energy of the time. Of all the breakthroughs that were being investigated after the First World War, from Schrodinger in physics, Stravinsky in music, Freud in psychology, and Picasso in painting, why was the airplane selected by Antheil? The airplane, having only first been flown by the Wright brothers in 1903 when Antheil was 3 years old, is still an adolescent technology when Antheil is writing his *Second Sonata*. In 1919, airplanes are being used to transport passengers, yet Lindbergh's historic flight across the Atlantic is 6 years off (Gibbs-Smith 242-249). In Stephen Kern's book, *The Culture of Time and Space 1880-1918* (p. 242), there is a valuable discussion on the appeal of airplane which might explain

Antheil's vision: "Its cultural impact was ultimately defined by deeply rooted values associated with the up-down axis: low suggests immorality, vulgarity, poverty, deceit; high the direction of growth, hope, source of light, heavenly abode of angels and gods. From Ovid to Shelley the soaring bird was a symbol of freedom."

In a tragic example of the power of this cultural response the following scenario describes English spectators during the First World War: "Londoners braved the danger and remained in the open, staring up at the enormous Gotha bombers even as they were dropping their bombs. One report of a raid on June 13, 1917, described the fascination as enemy aeroplanes journeyed through the clouds like little silver birds and their passage was watched by thousands of men and women... it was amazing because it was so beautiful. That particular display of beauty killed 162 people, marking a new level of destruction of civilian life and property." (Kern 311)

Even in 1938, Gertrude Stein comments on the relationship between the airplane and cubism, "So the twentieth century is not the same as the nineteenth century and it is very interesting knowing that Picasso has never seen the earth from an airplane, that being of the twentieth century he inevitably knew that the earth is not the same as in the nineteenth century, he knew it inevitably he made it different and what he made is a thing that now all the world can see. When I was in America I for the first time traveled pretty much all the time in an airplane and when I looked at the earth I saw all the lines of cubism made at a time when not any painter had ever gone up in an airplane. I saw there on the earth the mingling of lines of Picasso, coming and going, developing and destroying themselves..." (Kern 245) As we see, the airplane is simultaneously characterized as a means

of growth, beauty, destruction.

The *Airplane Sonata* was composed in Trenton, New Jersey, months before he left for his decade long stay in Europe. The music was premiered in London in 1922 and in Paris the very next year. Paris became his home for most of his stay in Europe and he quickly became friends with Igor Stravinsky, Gertrude Stein, Ernest Hemingway, James Joyce, Ford Madox Ford, Ezra Pound, F. Scott Fitzgerald, Sylvia Beach, Man Ray, Fernand Leger, and Pablo Picasso. The preparatory inspiration and influence thereafter of this *Second Sonata* are frequent topics of Antheil's throughout his life. In his autobiography *Bad Boy of Music*, he writes, "I dreamed, simply, that I was living during some future period, a time of the great peace... I found myself walking along a pathway of small buildings. Out of each of them came the music of a symphony orchestra playing my music! But it was not music similar to anything I had written or indeed to anything I had known. It was a sort of 'Brotherhood of Man' music, the quadruple essence of nobility and man's greatest spiritual efforts... I woke up, snatched a piece of music paper and for the next two hours, wrestled with the problem of getting down as many fragments of the music as I could remember... When a month later I suddenly turned to this piece of paper ... I sat down at my piano and played the hieroglyphics and then grabbing a piece of music paper, I wrote as if by automatic writing a whole but very difficult piano sonata, the *Airplane Sonata*. I called it that because, as a symbol, the airplane seemed most indicative of that future into which I wanted to escape." (Antheil 20-22)

In 1946, 13 years before his death he wrote, "Little by little my music reverts back to the *Airplane Sonata*". The crucial timing of this music, just prior to Antheil's life-changing move to

Europe, and its constant presence throughout his musical career, are evidence of its extreme importance in understanding Antheil's compositional techniques which he briefly touches upon in the autobiography: "I have always felt better when I worked out a composition in my head first -- with the help of plenty of notebooks to keep high points or accumulative details in mind. I am a good pianist, too good in fact to be permitted to compose at the piano. I compose mostly by planning it out in advance in my head, taking bits of thematic material which have caught my fancy, or which seem to have something to do with me personally. Then I reshape them again and again until they seem just right. A 'melody' for me hardly ever comes out all in one piece as most persons seem to imagine that melodies are born. Rather, it comes out in chunks; I fit these together time and time again, until they seem to fit, paying attention to the harmonic possibilities...as much as rhythm or counterpoint. Then comes the actual construction, the planning, and finally the note-by-note building of the edifice -- but my having obtained the quadruple essence in advance permits me to make it all of one piece without bothering with of style..." (Antheil 111)

These comments will continually reverberate as they dissolve from abstraction into actual application. We know that the *Sonata* was planned, and thus requires proportional care in unraveling its essence. The score was published in *New Music* IV/3, 1931; and although there is no extant ms., Whiteshitt's catalogue of Antheil's works does mention a corrected copy of the printed version in Antheil's own hand. After contacting Whiteshitt and the Library of Congress, I located the corrected version held by Charles Amirkhanian, the Executor of the Antheil Estate. My discussion of the first movement, and all examples, are based on the corrected version which amends missing measures, register shifts, and inaccurate accidentals.

## *Second Sonata The Airplane - First Movement*

### **Structure - The Four Sections**

The overall structure is dominated by the repetition of 'block' phrases with occasional short transitions and determined by prominent signs: double bars, dynamics, pedals, meter changes, expressive indications, phrases' repeats, linear changes, climatic point. This first movement can be divided into four distinct sections based on the presence of these block phrases, Ex. 1.

The lengths of the four sections are shown in Ex. 2a. Because the glissando-introduction has an ambiguous duration, I have not assigned it any, thus the duration of Section I is approximately 132 eighths. Section III clearly stands out because of its great length, almost 75% longer than each of the other three which approximately have the same length. It is interesting that the negative Golden Mean of the movement closely corresponds to the length of Section III, while the other three combine (401 eighths) to roughly the positive Golden Mean. Section III's duration is also an exact Fibonacci number.

These rhythmical timings are reinforced by the spatial construction, Ex. 2b. Again, Sections I-II-IV are almost identical in terms of the absolute size of their ranges, even if not the same in terms of their actual pitch members; while Section III is distinct in its extreme total range, which is also the total range of the movement! The Golden Mean proportion of the total range is 51:31, where the Golden Mean is divided by C#5 and D5, and the negative Golden Mean is divided by F#3 and G3. These specific pitches, and the central pitch E4 of the total range, will become significant when we discuss the language of the individual phrases.

The block phrases within the sections become prominent when discussing their specific timings and spaces -- the fact that they are constructed, not so much independently of each other, as some have very intimate commonalities, but from such different raw materials and packaged in such well-defined blocks. Such a construction has philosophical implications in terms of the techno-industrial commentary. In the phrases I sense an assembly line mentality, expressed as compartmentalization; prepared independently and pieced together in a wise and utilitarian fashion without the finesse of a high art, rather showing the craftsmanship and logic of a technology.

### **Discussion of the Four Sections**

**Section I.** The opening glissando is referenced in many phrases to varying degrees of subtlety although here segregated with its own tempo marking, *Lent*. The section begins in m. 3 with the marking "1st Movement (To be played as fast as possible)" and presents 5 phrases. Phrase 1, mm. 3-11, is the backbone of the first movement with an ostinato bass and semi-periodic treble line. Phrase 2, mm. 12-14, has a different rhythm in the treble, along with a bass ostinato different in pitch-class and number of pitches. Phrase 3, mm. 15-19, has a sixteenth ostinato as opposed to the eighth ostinatos of phrases 1 and 2; and a unique treble line again. Antheil is helpful in the notation as phrases 2 and 3 are divided by a double bar after measure 14 just as he signals the end of phrase 3 with a double bar after m. 19. Phrase 4, mm. 20-23, is the seedling of one of the truly remarkable developments in the first movement. It is short and introduces material that is used in a much larger capacity later, as soon as in Phrase 5, and later in Section III. The two halves of this phrase seem to be in opposition: the first half exhibits a fluid and sparse material that is the heart of the final phrase; the latter half introduces clusters, a rather static and dense music,

that is likewise developed later. Phrase 5, mm. 24-31, follows with an extension of the material hinted at in Phrase 4: departure from the bass ostinato, static nature, ending with the two chords.

Phrase 1 also opens a decreasing durational pattern, where every following phrase is shorter than the previous by 7-8 eighths until Phrase 5 which is approximately the same duration as Phrase 1 providing symmetry to the section as a whole. This pattern does not decrease to any arbitrary value, but ends with Phrase 4 and a duration of 13 eighths, precisely the negative Golden Mean of both outer phrases, each lasting 35-34 eighths respectively. Section I is clearly divided into the glissando-introduction and these 5 phrases with very consciously organized durational timings, Ex. 3a.

Ex. 3b shows the ranges of the individual phrases. The glissando, despite its brevity, has many interesting features: the G3 is the pitch that determines the negative Golden Mean of the total range of the movement; it includes 60 pitches; the chord ending it contains the extremes of the range, and therefore the glissando is contained within the range of the chord; it includes the B6, highest of Section I (only the final phrase supercedes it in absolute range). The entire range of Phrase 1 comes directly out of the glissando, an inward motion by an interval of a tritone at both extremes produces this range. For the remaining phrases, the lower boundary seems to be determined thereafter by a chromatic rise from F#-G-A, ignoring octave displacement. The glissando maintains the largest range until Phrase 5 which is larger by only three additional pitches. The glissando and Phrase 5 share comparable ranges that overshadow the sizes of the interior phrases with the final phrase encompassing the total range of

the section, a characteristic that will be encountered again.

**Section II** presents 4 phrases: Phrase 6 is an extended version of Phrase 1 ending with a double bar; Phrase 7 is an extended version of Phrase 3; Phrase 8 is again a replica of Phrase 1 but lasting only 2 measures; and Phrase 9 is a contracted form of Phrase 2. The section is entirely made up of previous material but stretched and then contracted. The durations of the four phrases are shown in Ex. 4a and the ranges in Ex. 4b. Just as in Section I, where one phrase contained the extremes of the range, the range of Phrase 7 does so here. The last two phrases are extremely similar in range and smaller in size than the first two phrases, accentuating the two-phrase pairing already exhibited in the durational values. It is interesting that the lowest pitches of each phrase are one of the two pitches, F#2 and C2, a tritone, contrasting with the chromatic movement of the lowest pitches in Section I. Here is the upper limit of the ranges of each phrase that follow the chromatic nature found in the lower limits of the phrases in Section I.

**Section III**, by far the longest, presents 8 phrases divided in two parts. It is an exciting section as it contains material and events that are unique -- the most surprising event which signals the end of Section II is the break in sound and motion in measure 59 followed by new material. In m. 71 the second and final break occurs, marking the ending of the first part of the section. The Golden Mean seems to dictate the structure of the two parts: the first three phrases are approximately the negative Golden Mean (91 eighths), whereas the second part is approximately the positive (142 eighths). The new material, which begins both parts of this section have about the same duration. The first part (Phrases 10-12) is balanced between the new material of Phrase 10, 44 eighths, and the next two

phrases based on older material, 47 eighths. The second part (Phrases 13-17) is likewise initiated by the new material with 48 eighths, while the remaining phrases have a duration of 94. Thus Phrase 13 of the second part is balanced in a 1:2 ratio with the remaining phrases, as opposed to the 1:1 ratio of Phrase 10 and the two following phrases of the first part. It seems that the larger scale structures are becoming clearer, along side completely new material and events. Phrases have been growing and evolving through all three sections, while others have been shrinking and stabilizing. As we already mentioned the development of all of these phrases is realized in Section III leading us into the dramatic climax of the first movement. Exs. 5a-b show the durations and ranges.

The last two phrases together make up the entire range of Section III which is also the entire range of the movement. The range of Phrase 10 is approximately the negative Golden Mean of the movement; and when the material is repeated in Phrase 13, the range is larger by such an amount that the negative Golden Mean of Phrase 13 is the range of Phrase 10. The first part of the section is symmetrical in terms of range sizes. Phrases 10 and 13 balance each other on either side of the slightly larger Phrase 11. The ranges of the first part of the section are all similar in size; in the second part they increase until by the end are more than twice the size of the ranges in the first part. This differentiation of the ranges among phrases contributes in distinguishing the two parts of Section III.

**Section IV** has only 2 phrases, despite the fact that it is the same length as both the first two sections. Phrase 18, mm. 96-121, is again the omnipresent Phrase 1. It is separated from Phrase 19, mm. 122-130, by a double bar; the appearance of triplets which have yet to be heard; and likewise material from

the short, but persistent intro-glissando. Exs. 6a-b show the durations and ranges of these two phrases. Here as well, although not as dramatic with only two phrases, Phrase 19 contains the complete range of Section IV. The range of Phrase 18 is the same as the range of Phrase 1, thus along with the restatement of the intro-glissando it creates an unmistakable symmetry to the movement.

### **Structure, The Phrase-Groups**

In order to see how the 19 phrases within the four sections relate to each other, I am using boldface letters with numbers to label like phrases and denote order of appearance, Exs. 7-8. In Ex. 7, the temporal structure of the movement is laid out; and then grouped by like phrase displaying structural details; and Ex. 8 shows temporal and like-phrase comparisons of duration and range. At one glance it is immediately obvious how much the **A** Phrase-group predominates -- more than a third of the movement's music. The Intro-phrases are the least predominant, and occur only at the very beginning and end to give the movement a sense of symmetry. Together they combine to a total duration of 247 eighths (32+215), approximately the negative Golden Mean of the movement. The **B-C-D-E** Phrase-groups are all approximately the same duration (86-95-81-92) and each is present three times in the course of the movement, except **E** that only appears twice. These Phrase-groups also present the most striking symmetrical subdivisions. Both the **E** Phrases are approximately the same length, and therefore balance each other; the **D** durations are peculiar because **D1** and **D3** are the same length, and with **D1**, the durations are exact Fibonacci numbers (13, 34). The length of **D1** being the negative Golden Mean of the length of **D2 = D3**. The **C** Phrase-groups are also nicely symmetrical. **C1** and **C3** are equal and added obtain **C2**. The **B** Phrase-groups are

symmetric about the Golden Mean -- **B1** and **B2** are the duration of the positive of the total **B** duration; and **B3** is the length of the negative. There are other characteristics that will accentuate these groupings; but to begin we need to discuss the structure of these Phrase-groups in detail and how these come to have meaning in the first movement.

The Intro-Phrase-group. The first two measures and final nine represent the entirety of this group. Despite its minuscule size and relatively uneventful and sparse content, this music permeates through the entire first movement-- it is incorporated into most of the phrases consistently. The beginning G3 in measures 1 and 31 is the boundary of the negative Golden Mean of the movement's range. Both glissandi are approximately centered on E5 which plays so prominently in the **A** phrases and final measures. The most important characteristic of this group is the intervallic structure of the first chord in m. 2, Ex. 9a. It is an all-interval hexachord divided into two halves of three pitches each. This is the general construction of the ostinatos in Phrase-groups **A**, **B**, and **C**, two three-pitch halves of a larger pattern. Each half's total intervallic range is a 14 (chromatic steps), the bass consisting of two superimposed 7s and the treble of a 9 and 5. These occurrences will be noted individually in their respective Phrase-groups. The Intro-chord influences the intervallic structure of the simultaneous attacks in the treble and the ostinato in the bass of the **C** phrases, likewise in both halves of the **D** ones, the descending cell and the clusters. It appears in the last two chords of **D2** directly before the second glissando, as if the first two measures have returned in reverse, and likewise it appears at the end of **C2**. The two Intro-phrases provide symmetry to the first movement, as its initiating and terminating phrases, but their influence extends more deeply into the movement as its

derivatives appear in other phrases.

The A Phrase-group. The 6 phrases are the support behind the first movement, with the ostinato pattern an obvious characteristic except at the climax, end of Section III. Ex. 9b shows the six-pitch ostinato. The tritone between the final and initial pitches is common among the separate Phrase-groups as we will see. Although the ostinatos of each Phrase-group tend to present certain differentiations, the similarities among each are remarkable and a technique used by Antheil to reinforce continuity. The treble line is also consistent.

In **A1** the treble alternates between two and one voices: mm. 3-5 with two, mm. 6-7 with one, and mm. 8-11 with two decaying to one in the last half of the last measure. Despite some movement in m. 6, it is clear that pitch E5 dominates the phrase. This pedal point, just as the ostinato, is a common feature in each phrase-group, and provides the continuity. In the **A** Phrases it forces the treble line to appear static balancing the fluid ostinato in the bass. After we examine the other **A** phrases, it will become clear how much possibility for development there is in this first small phrase; for in fact, all the material of the other phrases comes right out of these nine measures and the musical cells -- Phrase 4 is a vivid example.

Cell 1, m. 3, Ex. 9c, will become the familiar doormat -- not one **A** phrase will begin without it (**A5**, for instance, is entirely made up of Cell 1). The cell is characterized by the closing interval, from the octave to the implied unison (a 2 in the restatement of the cell, m. 8). Of course, the closing intervals final destination is the E5 which is the essence of the static nature of the pedal point made explicit in m. 7. Cell 1 is in fact only the initial step and in the next cell of m. 4 its partner is

found. The union that Cell 2 has with Cell 1 is more obvious when we look at their final forms in mm. 8-9, Ex. 9d. Cell 1 initiates the move from the octave to the unison only able to get to the 2; Cell 2 elongates the process by opening again from this interval class 2 to 7 and back to 2. This circular extension is what gives the last half of **A6** its engine like quality, as if Cell 2 is a well-oiled piston that moves back and forth indefinitely, alternating from its two end-points, the intervals of 2 and 7. In **A6** when Cell 2 is at its extreme, lasting 12 measures alone, the sense is augmented by the likewise continual bass ostinato that acts as its own piston, moving at a different velocity, but working in unison with the treble. It is only at this point that the treble and bass seem to be acting together; otherwise, the two seem to be in opposition, as static and fluid.

Cell 3, m. 5, Ex. 9e, presents a veritable break, almost out of place, as we now hear two quarter durations away from the 16ths and 8ths; but when we discuss the **B** Phrase-group it will become clear that m. 5 is a foreshadowing. The ostinatos of **A** and **B** will be seen to contain common pitches, and therefore provide the means to join the two with smooth adhesive. Each occurrence of the **B** is preceded by an **A** phrase, thus making such smooth transitions necessary. However, Cell 3 is more than just a foreshadowing, it is a brilliant alternative adhesive to join the two. We see this in the transition from **A3** and **B2**, where the foreshadowing actually becomes the point of adhesion.

Mm. 6-7 provide a short break from the intervals of Cell 1-3, before they return in m. 8. As I already mentioned, m. 7 is simply the idealized goal of Cells 1 and 2, the static pedal point on E5; m. 6 on the other hand looks to be the lone example of anything non-static in the treble voice. However, it is just a

descending line of intervals 2 and 1 with octave displacements. These and seedlings of non-static motion, provide the impetus for the dramatic development of this one-voice segment of the **A** group. This development is given in **A2** and **A6**. The rest of **A1** is the restatement of Cells 1-2 and the dovetailing into **B1**.

Given the wealth of material of **A1** those qualities that are absent are significant: in the treble voice, the lack of any 1 or 6 intervals. In the intervallic journeys of Cell 1-2 there is neither the 1 or 6. In m. 6 the linear motion of a chromatic step is disrupted by the octave displacements. The only place where either a 1 or 6 are made explicit is between the final and initial pitches of the ostinato in the bass, and this will become more of a characteristic of ostinatos in general than with the **A** Phrase-group. For this reason their role in the single voice lines of **A2** and **A6** brings about a sense of crucial development.

Mm. 35-43 and 99-108 (**A2** and **A6**) are practically identical, as is **A4** to **A1**. The general structure is divided into 3 parts, beginning with downward motion characterized by large intervals and octave displacements; then upward motion with small intervals; and finally settling into a tritone oscillation, Ex. 10. We are at last given the tritone explicitly in an **A** phrase! In fact, the tritone is present even earlier in the downward motion, as we will see.

There are four patterns in Part I, each consisting of four pitches, that make up the descending motion of mm. 35-38. Obviously, the last two intervals of each pattern are kept constant at 5, followed by a 6. This is the first time the tritone is in the treble voice and it is repeated four times in the same context. The initial descending interval for each pattern wanders from 8, 6, 9, and again 8 intervals. In order to continue the descending

motion via these large intervals, octave displacements are used to keep each pattern basically within registers 4 and 5. Once the octave displacements are removed from the great leaps in between the patterns, they reveal a pattern within themselves that makes the transition into Part 2 seamless, mm. 39-41. The interval between the first two patterns is an octave reduced to 0; the next is two octaves plus a 1, reduced to 1; then between the third and fourth pattern the interval is an octave plus a 2, reduced to a 2. Then to lead into the small intervallic increasing Part 3 after the final descending quadruple is none other than the 3 to initiate Part 4 that is made up almost entirely of intervals less than 3.

The line eventually ends up in the static oscillation of the tritone between the familiar E5 and Bb4. I cannot help but wonder when in mm. 35-43 not a single interval of 4 is heard, except in the beginning of m. 42 a pair appears, if these two intervals were not placed there to remind us of the the **B** Phrase-group, just like chords of m. 5. This one line development is important because it is an example of the non-static element, both temporally and spatially. I have referred to the ostinato as fluid, which is true in terms of space, but as an ostinato it is a steady state, it never changes from its repetitive pattern. The one-line development in **A2** and **A6** is fluid both temporally and spatially, even though as we have just seen there structure in fluid flow.

The **B** Phrase-group. There are three **B** phrases, each one preceded by an **A** phrase. These phrases change very little, leading to their consistency in terms of range, duration, and total attack point density. The ostinato pattern is a five-pitch collection, Ex. 11a. It is clear that this ostinato is derived from the **A** phrase-group ostinato -- the pitches C#-F#-C are shared

between the two and provide the means of making the transition between the phrases smooth in the bass. The D3 is another shared pitch, however, with the G3, the second pitch of the **A** phrase ostinato, absent in the **B** phrase ostinato, the descending interval of two 5s in the **A**-ostinato is replaced with the descending interval of 10 (5+5) in the **B**-ostinato. The structure of the ostinatos is almost identical, except for the extension from A3 in the **A** to A#3 in the **B**.

The treble voice here is simple. As we mentioned the **A** phrase foreshadows the **B** phrase with two quarter chords of 4 chromatics. In the **B** phrases they have dramatically longer duration, the first two and three quarter-durations in the *Sonata*. The chords slowly revolve around a loose central pitch: in **B1** and **B3** the pitch is G4 and in **B2** it is Bb4. The chords all move in intervals of 2, Ex. 11b. Despite their triadic implications, the motion in whole steps does not allow any easy tonal interpretation. I feel Antheil uses these traditional chordal constructions again in the **E** phrases, but in no sort of tonal sense. Perhaps these are implications of the old procedures, but more importantly I feel these are simply means of presenting breaks and pauses in the very vibrant atmosphere of his new sounds. We will find that both the **B** and **E** phrase-groups have the most confined ranges and most sparse attack point densities. In fact, phrases **B2** and **B3** ease into the two **E** phrases seamlessly and with no extra transitory material.

The **C** Phrase-group. The three phrases of this group represent a higher level of intensity and act as preparation to the climatic **D** phrases. The six pitch ostinato here share a form similar to the **A** and **B** phrases, Ex. 12a. The intervals are on the same order as the previous ostinatos, and the interval between the final and initial pitches is again a tritone (displaced an octave).



However, intensity is increased in the C-ostinato by the halving of the durational values of eighths before to sixteenths. The two halves of the current ostinato have the same intervallic structure, simply transposed down a 5. The fact that they are so similar gives the complete ostinato pattern a sense of passing twice as fast again. Clearly, the momentum is increasing with the C phrases. Here for the first time the ostinato develops and even disappears through the course of the phrases. In **C2** the ostinato is again composed of sixteenth and of two halves that are identical intervallically with respect to each other, in fact they are both comprised of descending intervals of 9 and 5, the 14 of the Intro-phrase chord. The ostinato, however, loses the tritone that separates the final and initial pitches. In **C3** the ostinato is dropped completely.

The treble voice also has similarities to the previous phrases, particularly the A phrases. In **C1** the treble is comprised of the repetition of triads and dyads. It is static and includes a clear pedal point, the pitch F#4. The intensity is increased in the treble voice with the voicing of a three-pitch chord. Not since the Intro-phrase chord has a triad been heard. In fact, the initial triad in **C1** is comprised of the intervals of 10 and 4, directly derived from the Intro-phrase chord. The chords alternate between the mentioned triad and the dyad of a 9. In half of measure 15 and measure 17, the alternation between triad and dyad collapses on itself, and the triad encompasses the 9 of the previous dyad with intervals of 5 and 4, and the new dyad is an interval of 4, Ex. 12b.

In **C2** the chordal structure is almost identical with the addition of two chords used as intermediaries to the eventual collapse to the triad comprised of 5 and 4. It is interesting that in m. 49, without missing a beat, everything is transposed up 5 chroma-

tics. This occurs at none other than the negative Golden Mean of the phrase. The final three chords, m. 53, are again based on the Intro-phrase chord. The bass triad is comprised of two 7, and the treble triad of 8 and 6. Both outline the 14 chromatics' Intro-phrase triad.

**C3** is the most highly developed with no ostinato. Even the intervallic structure of the triads is developed, but the rhythmic pattern is the same and the constant alternation between chords is still present. The intervallic structure instead, seems to have taken on a new pattern, Ex. 12c. The 4 interval seems to determine the outer interval, both in the treble and bass, and it is coupled with regularly increasing intervals of 9, 7, and 5. Again, this phrase seems to be the most compact and intense version. I feel it is a means of building intensity and momentum to prepare us for the climax in the **D3** phrase coming soon.

The D Phrase-group. The three phrases represent the most energetic state of the first movement. Here the cluster is introduced and used to gather the final momentum with the third phrase. The two components of this group are exposed in its most simple form in **D1**: a four-measure phrase containing two distinct halves; the first characterized by descending intervals in both hands, and the second by clusters. The descending pattern, although not ostinatos, are in three-pitch groupings as the previous ostinatos, and the Intro-phrase chord. Both the treble and the bass have the same structure with two 7s based on the 14 interval structure of the Intro-phrase chord, Ex. 13a.

The eight clusters in mm. 22-23 come quite suddenly and intensely. They alternate between 10-9-10-9-10-9-9-9 pitches, and in terms of total range between 14-9-14-19-14-19-14-19

chromatic steps. I feel the interval of half the clusters, of 14 steps is based on the Intro-phrase triads of the same interval. After the first two clusters, in which the lowest pitch is C#5 the lowest pitch member of the remaining clusters alternates between G#4 and F#4, Ex. 13b.

**D2** is a development of the first half of **D1** with the descending 7s. However, in this phrase, for the first time, we encounter a static ostinato-like pattern and a highly fluid treble. The ostinato alternates between a 14 dyad and the E2 pedal. This phrase is significant in its departure from standards that were generalized with the first three Phrase-groups. Now the bass is static both temporally and spatially, and the treble has become fluid and descends in pairs of 7s.

**D3** shows how the two seemingly bipolar halves of **D1** come together to form one complete phrase. Again, we begin with descending 7s, accompanied with the likewise familiar static repeated pattern of a 14-dyad alternating with consistent pedal point. As this is the climatic phrase of the first movement, the treble and the bass have both extended outwards by an octave, ultimately creating one of the widest registers of any phrase. In m. 88, however, after two measures of descending 7s, in order to gain even wider register, Antheil introduces a glisando-like feature. The bass comes up an octave and the treble sounds ever increasing octaves until m. 89 when we have reached the widest range of the phrase, in which we remain until the next phrase almost mimicking the procedure of **C2** where the whole pattern was transposed up a 5.

These two phrases (**D3** and **C2**) are so similar that once we reach our final registral position in m. 89, we are precisely at the negative Golden Mean, just as in **C2**! Then in mm. 89-90 we

are given alternating chords, which are made up of the pitches of the descending figure cell in m. 86. The bass pattern is retained, despite the change in the treble. Once we get to the clusters in m. 91, it is clear that they are simply filling out the chord that was constructed from the descending cell. Thus in the climax of the first movement, I feel Antheil has waked us through the connection between these cells, whose union was so puzzling in the phrase **D1**, Ex. 13c. The bass line changes at this point, although it retains the overall 14 interval in a triad with a new subdivision of 12 and 2 intervals. In mm. 89-91, the clusters and bass line pattern oscillate at different frequencies, a characteristic we see in the **A6** phrase.

The E Phrase-group. The two **E** phrases provide such an opposing sound that it comes as quite a surprise. The full measure of silence that ends Section II in m. 59 shocks us. The silence is a break from which we do not know what to expect. The velocity of the music has been almost constant with ostinatos, or ostinato-like bass lines, that when these stop it is not a gradual braking, but a crash into a brick wall, from which comes a music the likes of which we have not heard. These phrases have the most similarity to **B** phrases, in fact each is preceded by a **B** phrase. The confined range and sparse attack point densities found in both (**B** and **E** phrases), but most strongly realized in **E** because of lack of ostinato in constant eight durations, are in direct opposition to the high energy, wide range, and high attack point density of the other Phrase-groups.

The bass line does repeat a pattern and is actually very similar to the ostinatos of the previous phrases. The pattern is similar especially with the **C** ostinato in that it consists of two three-pitch halves, with the same intervallic structure of 10 and 4, Ex. 14a. Again, it is the 14 interval of the Intro-phrase triad; how-

ever, here the intervals are not both descending as in previous ostinatos. Instead, the first interval ascends and the second descends. The second half is the same structure transposed up a tritone, reminiscent of the tritone that would define the interval between the last and initial pitches of the **A**, **B**, **C** ostinatos. Likewise, the durational values are varied withing the ostinato, from eighth to even five quarter durations. In fact, the ostinato elongates in the three times it repeats itself. The second repeat actually adds pitches, and the third simply holds the final pitch for five quarter durations.

The treble is also more similar to previous material than it appears. It is completely made up of dyads. If the intervals are reduced, the treble is simply intervals of 3 and 4; in fact, only three of the eighteen dyads have a 3. This structure is very similar to the **B** phrases where the treble was consistently dyads, exclusively of the 4 intervals. However, in **E1** there is contrary motion, and chords are open, giving the phrase the sense that the lines are independently moving, and not just block dyads as in the **B** phrases. This contrapuntal feeling seems to be confirmed by the fact that the independent soprano line alone is used in **E2**, and therefore is considered a cell, Ex. 14b.

**E2** is likewise preceded by a **B** phrase, and a monumental silence in m. 71, which turns out to be the negative Golden Mean of the duration of Section III. The bass line takes on the same ascending and descending form that it had in **E1**, this time consisting of two 5 intervals. Eventually, in m. 75, the bass line stabilizes into a constant period, precisely where the treble also stabilizes onto a single pitch. As mentioned before, the treble uses the cell that was introduced in **E1** as its intial cell. In the next three mm. the treble revolves around a central pitch area, just as the **B** phrases dyads do. Eventually, the treble stabilizes

in the most extreme sense, by sounding the longest single duration on the C#6. And with breath marks, we free fall directly into Phrase 5 of Section III and back among extreme range chords and eight pitch clusters.

#### **Structure, Total Attack Point Density-Pedal Points**

The continual ostinatos give the the first movement a sense of consistent horizontal or rhythmic density. It is interesting to examine how the rhythmic density evolves through the course of the movement. The rate of total attack points for each phrase is given in Ex. 15 and graphically in Ex. 16. These densities are calculated by counting the number of rhythmically independent total attack points per eighth duration. The glissandi have not been included because they would otherwise disguise the true attack point density of the phrase. The attack point density is fairly constant. Evidence for this is the narrow range of attack densities (.63 to 2.15 per eighth) and the even narrow distribution of these densities over the sections (1.27 to 1.71 per eighth). The overall average attack density for the movement is 1.46 attacks per eighth. Although the range of densities is narrow, it is not insignificant; on the contrary, these variations in density are distributed within sections in a deliberate manner. Sections I and IV have densities approximately equal to the movement average. Sections II and III have slightly higher and lower densities, respectively. In fact, both sections differ from the average by almost the same amount creating a smooth wavelike distribution pattern for the sectional densities, despite the variations in individual phrases. The attack densities of the phrases themselves show interesting characteristics, Ex. 17.

Th persistence of pedal points in the *Sonata* is remarkable even in the very first measures. The movement opens with E5 being

sounded continuously. Sometimes, the phrases do not have true pedal points, where the pitch is continuously sounded throughout; but they do have pitches that sound predominantly more than the rest. They are not so much pedal points as central pitches that the melody revolves around. Ex. 18 details the most frequently heard pitches in each individual phrase.

The first issue is the case where no pedal point predominates, and this occurs in four of the phrases. **D1**, from the descending cell to the clusters does not support pedal points; **D2**, where the descending cell is coupled with a static bass, the **E2** pedal appears. As we discussed, this is a very significant event as it is the first occurrence of a pedal point in the bass, the lowest pedal in the entire movement with no other pedal even approaching this depth and the next pedal point shifted to register four. **D3** presents multiple pedal points, but different from phrases **C2** and **A5** with similar pedals because here there are four simultaneous pedal pitches, whereas in the other two there are multiple wandering pedal pitches. We know that in **D3** the climax happens and this phrase offers a magnificent explanation of the connection between the descending cell and the clusters. The four pedal points are the four pitches in the descending cell in m. 86, the basis for the construction of the chord in m. 89 which then gets filled out in the clusters of m. 91. Therefore, these pitches are sounded predominately throughout the phrase and hence create the appearance of multiple pedal points.

The next not clear pedal point is in **E1**, expected because the **E** phrases present an opposition to the rest of the movement and do not participate in this important component of the phrases. We discussed how similar the **E** and **B** phrases are -- the **B** lacking pedal points with rather central pitches; the **E** loosing

even the central pitch even though based on the **B**. This goes for **E2** though this is difficult to see because of the held pitch.

The lack of pedal point in Phrase 14, Section III, is obvious in its short and transitory function. The next phrase with no clear pedal is **C3**. Just as the **D** phrases begin without a pedal and slowly develop to have multiple, the **C** phrases begin with multiple pedals and develop to lose them. We now need to discuss the second instance where multiple pedal points are found. **C2** has two pedal points corresponding to the level where all the music is transposed up a 5, m. 49. A pedal point is constant throughout despite the transposition. When we consider both together due to some overlap they are accountable through the complete phrase. In other words, there is no level at which the pedal is not heard. This event only occurs two other times and will be discussed shortly. It is clear that the first two **C** phrases have obvious pedal points. **C3** has lost the pedal point as well as the ostinato and presents a new intervallic structure. When we look at the pedal points in the climax and take into account the nature of **D3** I feel it is understandable why **C3** has lost its pedal point. First we have discussed the fact that except for Phrase 11 in Section III, no phrase contains an explicit pedal point, and even this phrase is an extremely shortened version of an **A** phrase. Second, the function of the **C** phrase is to increase the energy and momentum in preparation for the climatic **D** phrase. Third, the remarkable event in **D3** is the explanation for the connection between the descending cell and the clusters, via four simultaneous pedal points. Therefore, I feel the **C3** phrase lacks a pedal point, so that it does not detract from the climatic event in **D3** which is dependent on bringing attention to its own multiple pedal points.

The consistency among Phrase-groups is important. In the **A** phrases, we find the remaining two anomalies in **A4-A5**. **A5** is important in that, along with **C2**, it contains a wandering pedal point. In this case, the pedal point descends from **A7** to **C7** to **F6**. In terms of the construction of the **A** phrase-group, these pedal points actually represent a transposed **E5**, seeing as every single other **A** phrase exhibits the **E5** as an obvious pedal point. Both **A4** and **A5** sound their pedal points continuously through the complete phrase. In **A4** this is due mainly to its short duration, which only had time for Cells 1 and 2. In **A5**, this occurs for approximately the same reason, as it is made up of Cell 1 and the static approach to the unison pedal, the pitch **E5**, in Cell 1, transposed in **A5** to **A7**, **C7**, and **F6**. The **A** phrases are rather adamant about proclaiming their pedal point. Along with the fact that the **A** phrases comprise a full third of the music of the movement, their consistent **E5** pedal figures dominantly in the movement. Except for **A2**, in which the one voice line is first developed, and therefore most devoid of a pedal, the remaining **A** phrases voice their pedal in more than two-thirds of their phrase duration. This is significant given the large amount of time the **A** phrases occupy.

The **B** phrases present their standard consistency. **B1** and **B3** have the identical central pitch, whereas **B2** is transposed up a 4. The amount that the central pitch is sounded is practically the same in all phrases, approximately half the time.

The **C** phrases evolve to lose the pedal point. The consistency in terms of **C1** and **C2** is clear -- the pedal of **F#** common to both, (transposed up an octave in **C2**). The amount the **F#** is sounded in both is almost equal; however, the additional pedal of **C#5** in **C2** makes that phrase's pedal point more intensive.

Pitch **E** is the predominant pedal point of the first movement. Obviously, the **A** phrase is behind this, and ultimately Cells 1 and 2. There are reinforcements: **E2**, in phrase **D2**, and more importantly, because it makes **E5** explicit, is the final phrase of the movement, the **Intro2** phrase. Here, it is the double pedal point **E4** and **E5** that slowly fades from our ears and leave us hearing the **E** ringing throughout the whole movement.

### **A Concluding Note**

Ezra Pound, while discussing Antheil's music in *Antheil and the Treatise on Harmony*, claims that, "Machines are musical. I doubt if they are even very pictorial or sculptural, they have form, but their distinction is not in form, it is in their movement and energy... A painting of a machine is like a painting of a painting, (Pound 51-52)." In his attempt to champion Antheil, Pound is making a statement that is relevant to the *Sonata*. I feel there is a great connection with this quote and the *Sonata*, although I would tend to add that the structure is what leads to the movement and energy. This music is not music of an airplane, but music in the spirit of the airplane, of efficient, utilitarian, limitless, and beautiful quality. The phrases are compact, but full of information. The joints between phrases streamlined but strong, with just enough adhesion with similar ostinato or 'melodies' to make them smooth. The consistency is miraculous despite the differences in material. This consistency -- the ostinatos, pedal points, and reference to the glissando-introduction, help keep the surface ironed, despite the local turbulence. The repetition, perpetual movement, and pure energy in the density and range keep the music flying. We tend not to look up at the sound of an airplane anymore, but if we walk by a piano playing this music, perhaps our attention would be held with the same intensity that it held the spectators of the first airplanes.

Ex. 1 *Airplane Sonata*, Section I

1

Phrasing 1 ...

3 - - - 1st Movement (to be played as fast as possible)  
(see pages 82, 83)

6

12

Phrasing 2 ...

15

Phrasing 3 ...

Phrasing 4 ...

21

24

Phrasing 5 ...

28

*Airplane Sonata*, Section II

31

Phrasing 1 ...

38

43

Phrasing 2 ...

47

51

52

Phrasing 3 ...

Phrasing 4 ...

57

Airplane Sonata, Section III

60 Phrase 1 ...

61 Phrase 2 ...

65 Phrase 3 ...

69 Phrase 4 ...

73

77 Phrase 3 ...

79 Phrase 5 ...

83

85 Phrase 7 ...

89

91

93

Phrase 8 ...

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*Airplane Sonata, Section IV*

96

Phrase 1 ...

101

106

111

Phrase 2 ...

117

124

Ex. 2 Duration and Ranges of the Four Sections

	Measures	Duration (eighth notes)	Golden Mean (pos:neg)
Section I	1-31	>132	82:50
Section II	32-59	135	83:52
Section III	60-95	233	144:89
Section IV	96-130	134	83:31
Total	1-130	634	392:242

	Range	Number of pitches	Golden Mean (pos:neg)
Section I	A <sub>1</sub> - B <sub>6</sub>	63	39:24
Section II	C <sub>2</sub> - D <sub>7</sub>	63	39:24
Section III	C <sub>1</sub> - A <sub>7</sub>	81	50:31
Section IV	C <sub>2</sub> - E <sub>7</sub>	65	40:25
Total	C <sub>1</sub> - A <sub>7</sub>	82	51:31

Ex. 3 Durations and Ranges of the Phrases in Section I

	Measures	Duration (eighth notes)	Golden Mean (pos:neg)
Glissando-Introduction	1-2	circa (>2)	circa
Phrase 1	3-11	35	22:13
Phrase 2	12-14	28	17:11
Phrase 3	15-19	20	12:8
Phrase 4	20-23	13	8:5
Phrase 5	24-31	34	21:13
Total	1-31	132	82:50

	Range	Number of Pitches	Golden Mean (pos:neg)
Glissando-Introduction: gliss chord	G <sub>1</sub> - B <sub>6</sub>	41	25:16
	C <sub>2</sub> - B <sub>6</sub>	60	37:23
Phrase 1	F# <sub>2</sub> - F <sub>6</sub>	48	30:18
Phrase 2	F# <sub>2</sub> - B <sub>6</sub>	50	19:11
Phrase 3	G# <sub>2</sub> - G# <sub>6</sub>	37	23:14
Phrase 4	A <sub>2</sub> - E# <sub>6</sub>	31	19:12
Phrase 5	A <sub>1</sub> - B <sub>6</sub>	63	39:24
Total	A <sub>1</sub> - B <sub>6</sub>	63	39:24



Ex. 4 Durations and Ranges of the Phrases in Section II

	Measures	Duration (eighth notes)	Golden Mean (pos:neg)
Phrase 1	32 - 44	53	33:20
Phrase 2	45 - 53	48	30:18
Phrase 3	54 - 55	9	6:3
Phrase 4	56 - 59	25	15:10
Total	32 - 58	135	85:52

	Range	Number of Pitches	Golden Mean (pos:neg)
Phrase 1	F# <sub>2</sub> - F <sub>4</sub>	48	30:18
Phrase 2	C <sub>2</sub> - D <sub>1</sub>	63	39:24
Phrase 3	F# <sub>2</sub> - E <sub>1</sub>	35	22:13
Phrase 4	F# <sub>2</sub> - D <sub>2</sub>	33	20:13
Total	C <sub>2</sub> - D <sub>1</sub>	63	39:24

Ex. 5 Durations and Ranges of the Phrases in Section III

	Measures	Duration (eighth notes)	Golden Mean (pos:neg)
Phrase 1	60 - 63	44	27:17
Phrase 2	64 - 67	14	9:5
Phrase 3	68 - 71	33	20:13
Phrase 4	72 - 79	48	30:18
Phrase 5	80 - 81	8	5:3
Phrase 6	82 - 85	27	17:10
Phrase 7	86 - 91	34	21:13
Phrase 8	92 - 95	25	15:10
Total	60 - 95	233	144:89

	Range	Number of Pitches	Golden Mean (pos:neg)
Phrase 1	A <sub>2</sub> - D <sub>2</sub>	30	19:11
Phrase 2	F# <sub>2</sub> - E <sub>3</sub>	35	22:13
Phrase 3	F# <sub>2</sub> - B <sub>4</sub>	30	19:11
Phrase 4	F <sub>2</sub> - C# <sub>6</sub>	45	28:17
Phrase 5	B <sub>1</sub> - Ab <sub>6</sub>	58	36:22
Phrase 6	E <sub>2</sub> - D <sub>6</sub>	47	29:18
Phrase 7	C <sub>1</sub> - Bb <sub>6</sub>	71	44:27
Phrase 8	A <sub>1</sub> - A <sub>7</sub>	73	45:28
Total	C <sub>1</sub> - A <sub>7</sub>	82	51:31

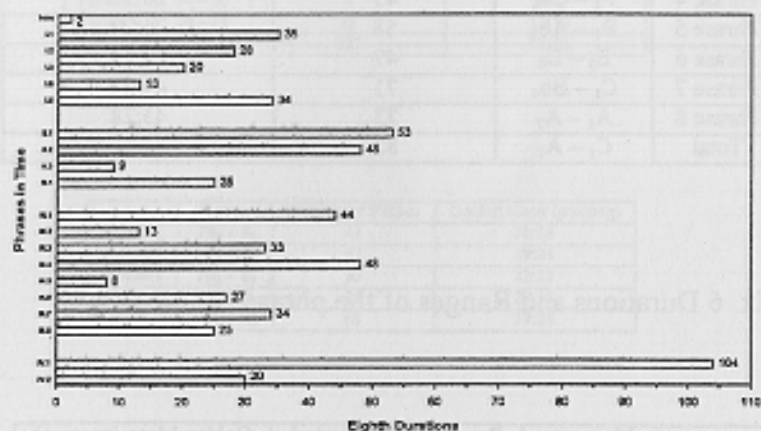
Ex. 6 Durations and Ranges of the phrases of Section IV

	Measures	Duration (eighth notes)	Golden Mean (pos:neg)
Phrase 1	96 - 121	104	64:40
Phrase 2	122 - 130	30	19:11
Total	96 - 130	134	83:51

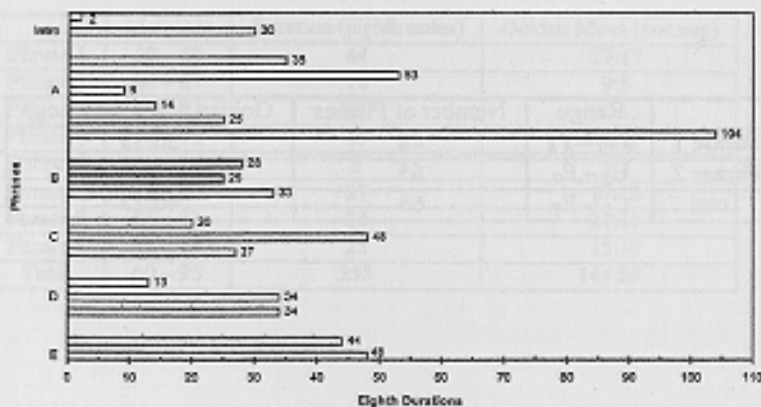
	Range	Number of Pitches	Golden Mean (pos:neg)
Phrase 1	F# <sub>2</sub> - F <sub>6</sub>	48	30:18
Phrase 2	C <sub>2</sub> - E <sub>7</sub>	65	40:25
Total	C <sub>2</sub> - E <sub>7</sub>	65	40:25

### Ex. 7 Durations of Phrases Temporally and by Phrase Type

Duration of Phrases Temporally



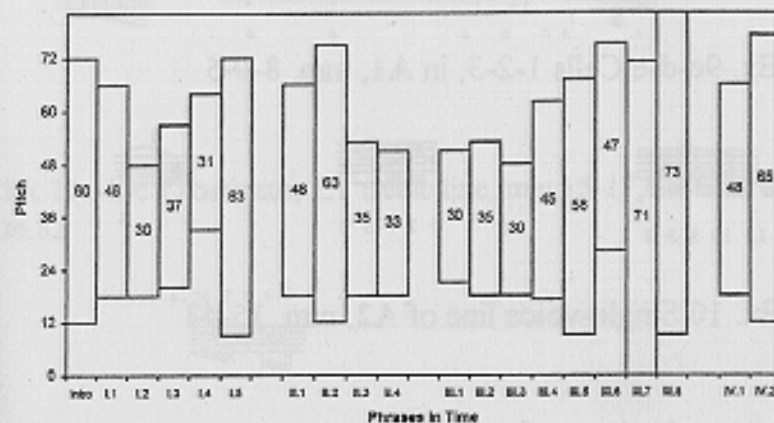
Duration by Phrase Type



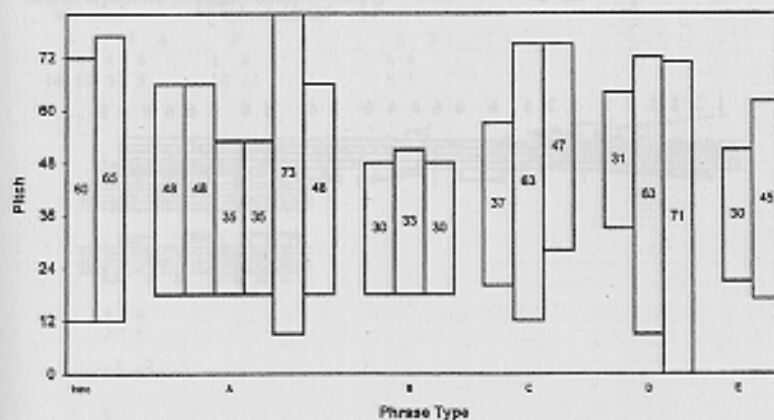
### Ex. 8 Phrase Ranges Temporally and by Phrase Type

Comparison of Ranges

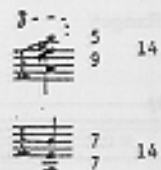
Phrase Ranges Temporally



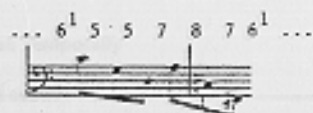
Ranges by Phrase Type



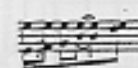
Ex. 9a The intro-chord



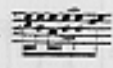
Ex. 9b The A-ostinato



Ex. 9c-d-e Cells 1-2-3, in A1, mm. 8-9-5



12 10 9 5 2



3 5 7 5 2

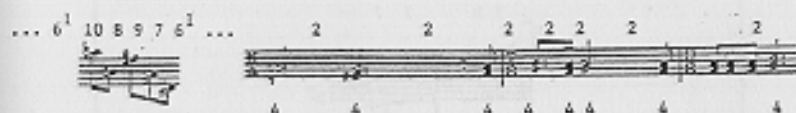


4 4

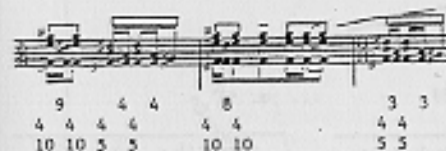
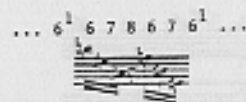
Ex. 10 Single-voice line of A2, mm. 35-43



Ex. 11a-b B ostinato and Dyads in mm. 12-14



Ex. 12a-b-c C ostinato, C1 treble line, mm. 15-17, C3 Chords, m. 82



4 4  
7 5  
10<sup>1</sup> 5<sup>2</sup>  
9  
4

Ex. 13a-b-c **D1** Descending Line and Clusters, Transformation of **D** phrase, mm. 86-91

7 7 7 7

7 7 9 7 7

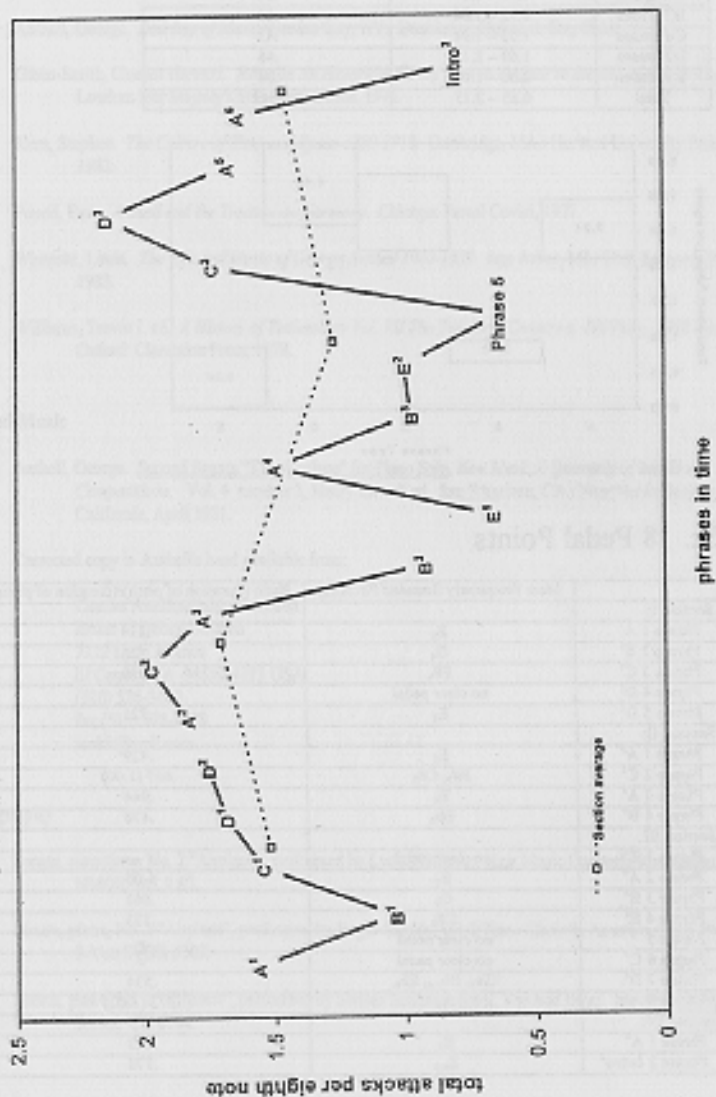
m. 86      m. 89      m. 91

Chordal analysis for m. 86:  $E^b$ ,  $E^b$ ,  $C^b$ ,  $A^b$ ,  $B^b$ ,  $B^b$ ,  $B^b$ ,  $B^b$ ,  $A^b$

Chordal analysis for m. 89:  $B^b$ ,  $A^b$ ,  $G^b$ ,  $A^b$ ,  $E^b$ ,  $B^b$ ,  $A^b$

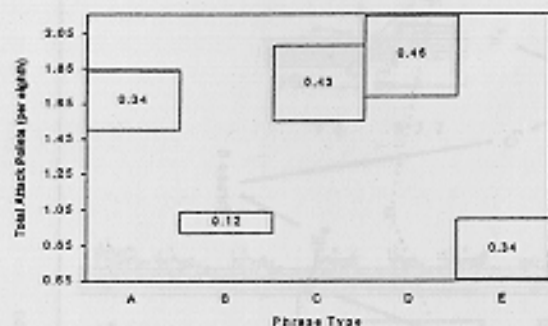
Chordal analysis for m. 91:  $A^b$ ,  $C^b$ ,  $B^b$ ,  $A^b$

Ex. 16 Total Attack Points Temporally



### Ex. 17 Total Attack Points by Like Phrase

Phrase Type	Range of Attack Densities	Difference of Extreme Densities
A Phrases	1.30 - 1.84	.34
B Phrases	0.92 - 1.04	.12
C Phrases	1.55 - 1.98	.43
D Phrases	1.69 - 2.15	.46
E Phrases	0.66 - 1.00	.34
Total	0.63 - 2.15	1.49



### Ex. 18 Pedal Points

	Most Frequently Sounded Pitch(es)	Ratio (duration of pitch)/(duration of phrase)
Section I:		
Phrase 1 A'	E <sub>2</sub>	.814
Phrase 2 B'	G <sub>2</sub>	.823
Phrase 3 C'	F# <sub>2</sub>	.650
Phrase 4 D'	no clear pedal	-
Phrase 5 D'	E <sub>2</sub>	.721
Section II:		
Phrase 1 A'	E <sub>2</sub>	.429
Phrase 2 C'	F# <sub>2</sub> , C# <sub>3</sub>	.667 (1.00)
Phrase 3 A'	E <sub>2</sub>	.944
Phrase 4 B'	Bb <sub>2</sub>	.478
Section III:		
Phrase 1 E'	no clear pedal	-
Phrase 2 A'	E <sub>2</sub>	1.00
Phrase 3 B'	G <sub>2</sub>	.661
Phrase 4 E'	C# <sub>3</sub>	.533
Phrase 5	no clear pedal	-
Phrase 6 C'	no clear pedal	-
Phrase 7 D'	Gb <sub>2</sub> , Bb <sub>2</sub> , Eb <sub>2</sub>	.534
Phrase 8 A'	F <sub>2</sub> , A <sub>2</sub> , C <sub>3</sub>	.373 (1.00)
Section IV:		
Phrase 1 A'	E <sub>2</sub>	.683
Phrase 2 Intro'	E <sub>2</sub>	.778

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